

M o s b y ' s

# ReView Questions & Answers

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f o r V e t e r i n a r y B o a r d s

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## *Large Animal Medicine and Surgery*

Edited by  
*Paul W. Pratt, VMD*

second edition

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# Introduction

P.W. Pratt and J.L. Rothstein

State and national board examinations have long been surrounded with mystery, misunderstanding, and anxiety. Preparing for licensure examinations can be an intimidating task. Faced with stacks of textbooks and lecture notes, you may find it difficult to know where to begin and how to study in an organized, productive fashion. Also, anxiety about examinations can interfere with your preparations.

To help candidates prepare for licensure examinations, Mosby has published a series of review volumes. *Mosby's Review Questions & Answers for Veterinary Boards* comprises five volumes to prepare candidates for the National Board Examination (NBE) in veterinary medicine. *Mosby's Review for the Clinical Competency Test* is a two-volume work that prepares candidates for the Clinical Competency Test (CCT) in veterinary medicine.

- *Candidates sitting for national and state board examinations* will find these review books a valuable resource because they comprehensively cover all subject areas included on veterinary licensure examinations.
- *Veterinary students* can benefit by using these books as practice tests during courses and also to review material before final examinations as each course is concluded.
- *Practicing veterinarians* will find the books useful for continuing education. Veterinarians moving to a new locale can use them to prepare for licensure examinations in their new state or province. The books also aid preparation for specialty board certification, particularly for certification by the American Board of Veterinary Practitioners (ABVP).
- *Foreign graduates* can use these review books as they prepare for the Education Commission for For-

Foreign Veterinary Graduates (ECFVG) certification examination.

## ***What Is Covered in These Books?***

The five volumes of *Mosby's Review Questions & Answers for Veterinary Boards* contain more than 8,000 multiple-choice questions covering nearly every aspect of veterinary medicine. The series includes volumes on *Basic Sciences, Clinical Sciences, Small Animal Medicine and Surgery, Large Animal Medicine and Surgery, and Ancillary Topics*.

## ***What Types of Questions Are Included in These Books?***

The questions in these books were prepared by highly qualified authors, including veterinary educators, content-area specialists, and experienced clinicians. The questions have been carefully constructed to test factual knowledge, reasoning skills, and clinical judgment. They will also help pinpoint deficiencies in a candidate's studies. The questions are original, and none have been knowingly "recycled" from previous national or state licensure examinations; however, certain overlap is unavoidable and not necessarily a disadvantage.

All the questions on the National Board Examination are multiple choice. Questions in these books present five answer choices. Each question has only one correct answer. There are no "trick" questions.

## ***How to Use These Books***

*Mosby's Review Questions & Answers for Veterinary Boards* was meant to be used in reviewing for final ex-

aminations or licensure examinations. Before you begin a section of questions, review your texts and course notes pertaining to that subject area. Then approach each section as you would an actual examination:

- *Carefully read each question.* Look for such key words as “most,” “best,” “least,” “always,” “never,” and “except.” Consider only the facts presented in the question, and don’t make assumptions and inferences that may not be true.
- *Carefully evaluate each answer choice.* Each question has only one correct answer, with four incorrect answers or “distractors.” If more than one answer choice appears to be correct, closely examine them for clues that would eliminate any as incorrect. Most of the questions ask you to find a single correct answer among four incorrect answers. However, some questions ask you to find an exception. For these questions the answer you are seeking is the single incorrect answer among four correct answers.
- *Select an answer by circling the letter preceding your answer choice.* If you do not wish to mark the book, use the blank answer sheets in the back of the book for practice tests.
- *Compare your answers with the correct answers.* The correct answers are listed separately at the end of each section. All answers are accompanied by an explanation as to why a specific answer is correct or why the other four choices are incorrect.
- *Identify your “weak” areas.* If you cannot correctly answer most of the questions in a particular subject area, spend extra time reviewing that subject before your actual examination. If you do not understand the rationale of why certain answers are correct or incorrect, consult the references in the Recommended Reading list at the beginning of each section.

### ***Structure of the NBE***

The National Board Examination (NBE) in veterinary medicine was developed to assess a candidate's ability to evaluate and manage clinical cases, such as those encountered by an entry-level veterinarian in practice. The NBE is given in conjunction with the CCT, in April and December of each year. Each year more than 3,000 candidates take the NBE and CCT.

The NBE currently consists of 400 multiple-choice questions. The 4-hour examination is given in two parts of 200 questions each; candidates are given 2 hours to complete each part (2 hours in the morning, 2 hours in the afternoon). Only 360 of the questions are used in the final scoring; 40 questions are deleted in final scoring, based on analysis of candidates' responses. The first part of the NBE is concerned with

gathering diagnostic data, such as the history and findings of diagnostic tests. The second part is concerned with identifying the problem, patient management, and follow-up care.

NBE questions cover all the organ systems and special sense. Approximately 29% of the questions are on small animals (dogs and cats), 21% on food animals (cattle, pigs, sheep, goats, and poultry), 14% on horses, 3% on companion birds, 3% on exotic animals, and 31% on non-species-specific topics. Each question lists five answer choices, of which only one is correct.

Following is a list of diseases or conditions that are reasonably likely to appear on the NBE. NOTE: *This list is for general guidance only and is certainly not all inclusive; conditions not listed could also be included on the NBE.*

- *Dogs and cats:* Renal failure, diabetic ketoacidosis, hyperadrenocorticism, hypoadrenocorticism, hyperthyroidism, hypothyroidism, gastric dilatation-volvulus, foreign bodies, pyometra, reproduction, osteochondritis dissecans, ununited anconeal process, fractured medial coronoid process, patellar luxation, cruciate ligament rupture, hip dysplasia, malignant lymphoma, seizures, nutrition, food allergies, alopecia, atopy, scabies, demodicosis, ringworm, allergic dermatitis, autoimmune disease, glaucoma, retinal disorders, cystitis, urolithiasis, anemia, congestive heart failure, heartworm disease, cardiomyopathy, canine distemper, feline respiratory disease complex, asthma, feline leukemia virus infection, feline immunodeficiency virus infection, feline infectious peritonitis, toxoplasmosis, rabies, kennel cough, parvovirus infection, shock, and fluid therapy.
- *Cattle:* Traumatic reticuloperitonitis, vagal indigestion, abomasal ulcers, abomasal displacement, bloat, cecal torsion, Johne's disease, foot-and-mouth disease, bluetongue, rinderpest, malignant catarrhal fever, bovine virus diarrhea, listeriosis, thromboembolic meningoencephalitis, grass tetany, poliоencephalomalacia, pseudorabies, reproduction, postparturient paresis, bovine respiratory syncytial virus infection, infectious bovine rhinotracheitis, parainfluenza virus-3 infection, pasteurellosis, *Microspolyspora faeni* infection, pulmonary emphysema and edema, tracheal edema, calf scours, black leg, tetanus, botulism, malignant edema, enterotoxemia, anthrax, anaplasmosis, tuberculosis, pyelonephritis, lymphosarcoma, ketosis, urolithiasis, vesicular stomatitis, mastitis, actinobacillosis, actinomycosis, leptospirosis, infectious keratoconjunctivitis, squamous cell carcinoma, anaplasmosis, necrotic pododermatitis, winter dysentery, nutrition, feed additives, white muscle disease, hypovita-

minosis A, trichomoniasis, brucellosis, lead poisoning, urea poisoning, warfarin toxicity, and lightning stroke.

- **Horses:** Fractures (miscellaneous), navicular disease, laminitis, thrush, pedal osteitis, osselets, ringbone, bucked shins, splints, curb, sole abscess, azoturia, wound repair, colic, dentistry, reproductive disorders, neonatal isoerythrolysis, equine viral arteritis, equine herpesvirus-1 infection, influenza, equine infectious anemia, encephalomyelitis (EEE, WEE), strangles, heaves, guttural pouch mycosis, choke, laryngeal hemiplegia, Potomac horse fever, babesiosis, joint and navel ill, tetanus, botulism, sarcoid, local and general anesthesia, recurrent uveitis, foal diarrhea, and nutrition.
- **Pigs:** Clostridial enteritis, colibacillosis, proliferative enteritis, salmonellosis, swine dysentery, cryptosporidiosis, coccidiosis, whipworm infection, epidemic diarrhea, rotaviral enteritis, transmissible gastroenteritis, actinobacillosis, pasteurellosis, atrophic rhinitis, mycoplasmal pneumonia, Glasser's disease, swine influenza, pseudorabies, porcine reproductive and respiratory syndrome, erysipelas, *Streptococcus suis* type-2 infection, group-E streptococcal infection, thromboembolic meningoencephalitis, salt poisoning, heat stroke, greasy pig disease, sarcoptic mange, parvovirus infection, leptospirosis, hog cholera, swine vesicular disease, African swine fever, eperythrozoonosis, iron deficiency, brucellosis, mulberry heart disease, osteochondritis dissecans, sanitation, ventilation, and farrowing management.
- **Sheep and goats:** Foot-and-mouth disease, blue-tongue, dermatophilosis, lead poisoning, and orf.
- **Exotic animals and poultry:** Distemper in ferrets, insulinoma in ferrets, hypovitaminosis C in guinea pigs, wet tail in hamsters, snuffles in rabbits, psittacine beak and feather syndrome, Pacheco's disease in birds, and Newcastle disease in poultry.

## ***How to Prepare for Licensure Examinations***

### **Develop a Strategy**

You can begin your preparations for licensure examinations by developing a study plan and a strategy for taking the tests. Studying the many subjects covered in the examinations is only one element of the strategy. Before you begin studying, determine which tests you will be required to take. State/provincial and national jurisdictions often have different licensure requirements. For example, all jurisdictions require the NBE, and all except the District of Columbia and the Virgin Islands require the CCT. Depending on the

state(s) you plan to practice in, you may need to pass their state board examinations (see Table 1).

### **Are You Eligible to Take the Examinations?**

Determine if you are now or when you will be eligible to sit for the required examinations. Many states allow junior (third-year) veterinary students to take board examinations (see Table 1). For many students this is an ideal time to take the national board examinations. As juniors, students are heavily involved in classroom study and the information is relatively fresh in their minds. They have also begun their exposure to clinical practice through rotations in the university's veterinary teaching hospital. Additionally, many students favor taking the board examinations at this time because there is relatively little pressure to pass; if they do not pass the first time, they can take the tests again during their senior year.

### **Know When and Where the Examinations Are Offered**

Determine the dates, times, and locations of upcoming licensure examinations. Not all states administer the examinations, and they offer them on various dates. Also, the cost for taking the examinations may vary substantially from one state to the next; knowing this ahead of time might influence your decision on which state examinations to take.

Many candidates delay their initial fact finding until a few weeks before the examinations are offered. Such procrastination is unwise and unnecessarily stressful; it may take several months to obtain all pertinent information regarding state requirements, dates tests are offered, and registration requirements and costs for taking the tests. Don't waste your energy worrying about whether you will be permitted to take the test or if you will be registered on time. Gather this information well ahead of time so you can devote your full energy to studying for the examinations. Table 1 lists the licensure requirements for various jurisdictions. Table 2 lists the addresses and telephone numbers for state and provincial licensing boards.

### **6 Months Before the Examination**

*Become familiar with the examination requirements:* Obtain information on the NBE and CCT from the Professional Examination Service (PES, 475 Riverside Drive, New York, NY 10115; telephone 212-870-3161). Candidates may also obtain a practice NBE and CCT from PES. This practice material provides insight into the subject areas emphasized on the examinations and shows you how the NBE and CCT are structured.

Gather specific information on licensure requirements, examination dates, and costs for each state

where you would like to gain licensure (Tables 1 and 2). For more detailed information, consult the *Directory of Veterinary License Requirements*, available from the American Association of Veterinary State Boards (AAVSB, P.O. Box 1702, Jefferson City, MO 65102; telephone 573-761-9937).

*Develop a master study plan:* Your study plan should include:

- A list of subjects to review and emphasize
- A realistic time frame for review of specific subjects
- A general study schedule
- Resources for studying (materials, study aids, groups, review sessions, etc.)

### 3 Months Before the Examination

*Register for the examinations:* Make final decisions about which examinations to take and then register for them. This process is often more complicated and time-consuming than you might think. Many state licensure boards require registration no later than 2 months before the examinations are given, so allow yourself ample time to register. Many state boards accept only certified checks. Some have exacting requirements you must fulfill before they will let you sit for the tests. Avoid problems and reduce anxiety by taking care of these details well ahead of time.

*Reevaluate your study plan:* Develop a fairly rigid study schedule for the last few months of study before the examination, allotting sufficient study time for both the NBE and CCT. Begin to focus more on review sessions with other people and study groups. It is easy to become bored with studying alone during the several-month preparation period. Diversifying your study techniques helps maintain your interest level and improves retention of subject information.

*Maintain a positive frame of mind:* Many candidates are overwhelmed by the immense amount of material they must review. The period of preparation for licensure examinations can be stressful; however, you can redirect the stress to your benefit. Develop a positive attitude and consider the examinations a challenge.

In preparing for the examinations, you will learn many useful things and you will review information learned earlier but since forgotten. Ultimately, all the information reviewed during your preparations will serve you well, during the remainder of your veterinary education and in the practice of veterinary medicine. By taking a positive approach and beginning your preparations early, you can reduce your level of stress and do a better job preparing for the examinations.

## Resources for Study

Following are some resources to help you prepare for licensure examinations:

### Review Books and Other Written Materials

- General texts on specific subject areas (e.g., internal medicine, surgery, etc.)
- Board review books (e.g., five volumes of *Mosby's Review Questions & Answers for Veterinary Boards*, two volumes of *Mosby's Review for the CCT*)
- Practice NBE and CCT examinations (available from PES)
- Old licensure examinations (unofficial and in circulation among students)
- Class notes (from veterinary school courses or continuing education courses)
- Review articles in veterinary journals (e.g., from *Compendium on Continuing Education for the Practicing Veterinarian*, *Veterinary Medicine*)

### Review With Other Candidates, Review Courses

- Study with a group of other candidates
- Study with a partner
- Review sessions hosted by faculty
- Licensure examination review courses, offered commercially (e.g., course offered by Dr. Richard Stobaeus, Animal Care Clinic and Conference Center, Brunswick, GA; telephone 912-264-2258)

## Conclusion

Careful preparation is the key to passing the licensure examinations. Review the subject matter and know the licensing requirements of the states in which you want to practice. Become familiar with the structure of the NBE and CCT and how they are scored. Take the practice NBE and CCT to learn how best to select answers. These preparations will reduce your anxiety and let you concentrate on passing the examinations.

What happens if you do not pass the licensure examinations on your first attempt? Certainly, not everybody passes on the first try. Try to determine the areas in which you fared poorly, and concentrate on these areas when studying for the next examination. If you fail the licensure examinations several times, it would be wise to consider a licensure examination review course. The key is to develop a good strategy as outlined here. With a positive attitude and a well-considered study plan, you should do well.

We hope these review books will serve as a foundation for your continued success.



TABLE 1  
**Licensure Examination Requirements  
for Various Jurisdictions**

<b>Jurisdiction</b>	<b>NBE/CCT offered?</b>	<b>State exam required?</b>	<b>Junior test scores accepted?</b>
Alabama	Yes	Yes	Yes
Alaska	Yes	Yes	Yes
Alberta	Yes	Yes	No
Arizona	Yes	Yes	Yes
Arkansas	Yes	Yes	Yes
British Columbia	Yes	Yes	No
California	Yes	Yes	No
Colorado	Yes	No	No
Connecticut	Yes	No	Yes
Delaware	Yes	No	No
District of Columbia	No	Yes	Yes
Florida	Yes	Yes	No
Georgia	Yes	Yes	No
Hawaii	Yes	Yes	No
Idaho	No	Yes	Yes
Illinois	Yes	No	No
Indiana	Yes	Yes	Yes
Iowa	Yes	Yes	No
Kansas	Yes	Yes	Yes
Kentucky	Yes	Yes	Yes
Louisiana	Yes	Yes	No
Maine	No	Yes	Yes
Manitoba	Yes	Yes	No
Maryland	No	Yes	Yes
Massachusetts	Yes	Yes	Yes
Michigan	Yes	No	Yes
Minnesota	Yes	Yes	Yes
Mississippi	Yes	Yes	Yes
Missouri	Yes	Yes	Yes
Montana	No	No	Yes
Nebraska	No	No	Yes
Nevada	No	No	No
New Brunswick	Yes	Yes	No
New Hampshire	No	No	Yes
New Jersey	No	No	No
New Mexico	No	No	Yes
New York	Yes	Yes	No
North Carolina	Yes	Yes	Yes
North Dakota	No	No	Yes
Nova Scotia	Yes	Yes	No
Ohio	Yes	Yes	Yes

This information was compiled in 1997. Check with the appropriate state or provincial licensing agency for the latest information.  
The NBE is required by all jurisdictions except the District of Columbia and the Virgin Islands.  
The NBE and CCT are offered in April and December every year.  
Passing scores are the same in all jurisdictions.  
Some state and provincial examinations cover only jurisprudence issues. Check with individual licensing boards.

LICENSURE EXAMINATION REQUIREMENTS

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<b>Jurisdiction</b>	<b>NBE/CCT offered?</b>	<b>State exam required?</b>	<b>Junior test scores accepted?</b>
Oklahoma	Yes	Yes	Yes
Ontario	Yes	Yes	Yes
Oregon	Yes	Yes	Yes
Pennsylvania	Yes	Yes	Yes
Puerto Rico	Yes	Yes	No
Quebec	Yes	Yes	No
Rhode Island	No	Yes	No
Saskatchewan	Yes	Yes	No
South Carolina	No	Yes	No
South Dakota	No	Yes	Yes
Tennessee	Yes	Yes	Yes
Texas	Yes	Yes	Yes
Utah	No	Yes	Yes
Vermont	No	Yes	No
Virgin Islands	Yes	Yes	No
Virginia	Yes	Yes	Yes
Washington	Yes	Yes	No
West Virginia	No	Yes	Yes
Wisconsin	Yes	Yes	Yes
Wyoming	No	Yes	Yes

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TABLE 2  
**Addresses of State and  
Provincial Licensing Boards**

**United States**

Candidates interested in practicing in the United States should contact state licensing boards at the following addresses:

**Alabama**

Board of Veterinary Medicine  
PO Box 1968  
Decatur AL 35602  
(205) 353-3544

**Alaska**

Division of Occupational Licensing  
Department of Commerce & Economic Development  
PO Box 110806  
Juneau AZ 99881  
(907) 465-5470

**Arizona**

Veterinary Medical Examining Board  
Room 230  
1400 W. Washington  
Phoenix AZ 85007  
(602) 542-3095

**Arkansas**

Veterinary Medical Examining Board  
1 Natural Resources Drive  
Little Rock AR 72215  
(501) 224-2836

**California**

Board of Examiners in Veterinary  
Medicine  
Suite 6  
1420 Howe Ave.  
Sacramento CA 95825  
(916) 263-2610

**Colorado**

Veterinary Medical Examining Board  
Suite 1310  
1560 Broadway  
Denver CO 80202  
(970) 894-7755

**Connecticut**

Board of Veterinary Medicine  
PO Box 340308  
Hartford CT 06134  
(860) 509-7560

**Delaware**

Board of Veterinary Medicine  
PO Box 1401  
Dover DE 19903  
(302) 739-4522

**District of Columbia**

Board of Veterinary Examiners  
Room 913  
614 H St. NW  
Washington DC 20001  
(202) 727-7184

**Florida**

Board of Veterinary Medicine  
1940 N. Monroe St.  
Tallahassee FL 32399  
(904) 487-1820

**Georgia**

State Examining Boards  
166 Pryor St. SW  
Atlanta GA 30303  
(404) 656-3912

**Hawaii**

Board of Veterinary Examiners  
Box 3469  
Honolulu HI 96801  
(808) 586-2694

**Idaho**

Board of Veterinary Medicine  
PO Box 7249  
Boise ID 83707  
(208) 332-8588

**Illinois**

Veterinary Licensing and Disciplinary  
Board  
Department of Professional Regulation  
320 W. Washington  
Springfield IL 62786  
(217) 782-1663

**Indiana**

Health Professions Bureau  
Room 041  
402 W. Washington St.  
Indianapolis IN 46204  
(317) 233-4407

**Iowa**

Board of Veterinary Medicine  
2nd Floor  
Wallace Building  
Des Moines IA 50319  
(515) 281-5305

**Kansas**

Board of Veterinary Examiners  
10475 Purple Sage Rd.  
Wamego KS 66547  
(913) 456-8781

**Kentucky**

Board of Veterinary Examiners  
PO Box 456  
Frankfort KY 40602  
(502) 564-3296

**Louisiana**

Board of Veterinary Medical Examiners  
Suite 604  
200 Lafayette St.  
Baton Rouge LA 70801  
(504) 342-2176

**Maine**

Division of Licensing and Enforcement  
Department of Professional and Financial Regulation  
State House Station 35  
Augusta ME 04333  
(207) 624-8603

**Maryland**

State Board of Veterinary Medical Examiners  
50 Truman Pkwy.  
Annapolis MD 21401  
(410) 841-5862

**Massachusetts**

Board of Registration in Veterinary Medicine  
Room 1516  
100 Cambridge St.  
Boston MA 02202  
(617) 727-3080

**Michigan**

Board of Veterinary Medicine  
Department of Commerce  
PO Box 30018  
Lansing MI 48909  
(517) 373-9102

**Minnesota**

Board of Veterinary Medicine  
Room 540  
2829 University Ave. SE  
Minneapolis MN 55414  
(612) 617-2170

**Mississippi**

Board of Veterinary Medicine  
209 S. Lafayette St.  
Starkville MS 39759  
(601) 324-9380

**Missouri**

Veterinary Medical Board  
PO Box 633  
Jefferson City MO 65102  
(314) 751-0031

**Montana**

Board of Veterinary Medicine  
Department of Commerce  
Lower Level, Arcade Building  
111 N. Last Chance Gulch  
Helena MT 59620  
(406) 444-5436

**Nebraska**

Bureau of Examining Boards  
Department of Health  
PO Box 95007  
Lincoln NE 68509  
(402) 471-2115

**Nevada**

Board of Veterinary Medical Examiners  
Suite 246, Bldg O  
4600 Kietzke Lane  
Reno NV 89502  
(702) 322-9422

**New Hampshire**

Board of Veterinary Medicine  
PO Box 2042  
Concord NH 03302  
(603) 271-3706

**New Jersey**

Board of Veterinary Medical Examiners  
PO Box 45020  
Newark NJ 07101  
(201) 504-6500

**New Mexico**

Board of Veterinary Examiners  
Suite 400-C  
1650 University Blvd. NE  
Albuquerque NM 87102  
(505) 841-9112

**New York**

Board of Veterinary Medical Examiners  
Room 3043  
Cultural Education Center  
Albany NY 12230  
(518) 474-3867

**North Carolina**

Veterinary Medical Board  
PO Box 12587  
Raleigh NC 27605  
(919) 733-7689

**North Dakota**

Veterinary Medical Examining Board  
c/o Board of Animal Health  
6th Floor  
600 E. Boulevard Ave.  
Bismarck ND 58505  
(701) 328-4567

**Ohio**

Veterinary Medical Board  
16th Floor  
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(360) 664-8869

**West Virginia**

Board of Veterinary Medicine  
1900 Kanawha Blvd.  
South Charleston WV 25305  
(304) 558-2016

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Veterinary Examining Board  
PO Box 8935  
Madison WI 53708  
(608) 266-2811

**Wyoming**

Board of Veterinary Medicine  
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2020 Carey Ave.  
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(307) 777-6529

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Candidates interested in practicing in Canadian provinces should contact those licensing boards at the following addresses:

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Saskatoon, Saskatchewan S7N 3R3  
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# 1

## Anesthesiology

K.K. Ewing

### *Recommended Reading*

Hall LW, Clarke KW: *Veterinary anaesthesia*, ed 9, London, 1992, Bailliere Tindall.

Muir WW, Hubbell JA: *Handbook of veterinary anesthesia*, ed 2, St. Louis, 1996, Mosby.

Muir WW, Hubbell JA: *Equine anesthesia*, St. Louis, 1991, Mosby.

Thurmon JC et al: *Lumb and Jones' veterinary anesthesia*, ed 3, Baltimore, 1996, Williams & Wilkins.

Short CE: *Principles and practice of veterinary anesthesia*, Baltimore, 1987, Williams & Wilkins.

Practice answer sheet is on page 273.

### *Questions*

- In cattle under inhalation anesthesia, dobutamine administration is commonly associated with:*
  - sinus bradycardia
  - sinus tachycardia
  - prolonged P-R interval
  - ventricular premature contractions
  - hypotension
- Which agent should **not** be used in goats with unrelieved urinary tract obstruction?*
  - diazepam
  - halothane
  - propofol
  - xylazine
  - midazolam
- In pigs, which component of Telazol is primarily responsible for prolonged recovery from anesthesia with Telazol?*
  - tiletamine
  - climazolam
  - ketamine
  - zolazepam
  - mannitol
- Which agent is **least** suitable for standing sedation in a cow during the third trimester of pregnancy?*
  - xylazine
  - diazepam
  - detomidine
  - pentobarbital
  - acepromazine

5. *In horses anesthetized with halothane or isoflurane, dobutamine administration may result in:*
- splenic contraction and bronchoconstriction
  - markedly increased systemic vascular resistance
  - negative inotropy
  - decreased urine production
  - reflex bradycardia
6. *In horses, the primary reason fasting is recommended before elective general anesthesia is to:*
- prevent residual food material in the mouth from entering the trachea during tracheal intubation
  - stabilize the blood glucose level during anesthesia
  - minimize the extent of lung collapse
  - prevent regurgitation of stomach contents
  - hasten recovery from anesthesia
7. *Concerning use of atracurium during intraocular surgery in horses, which statement is **least** accurate?*
- It causes paralysis of the extraocular muscles.
  - It has no effect on lacrimation.
  - It prevents nystagmus.
  - It causes pupillary dilatation.
  - It has no analgesic effect.
8. *In a to-and-fro anesthetic breathing system:*
- low rates of fresh gas flow (equal to metabolic oxygen consumption) must be used
  - potent volatile anesthetics must not be used
  - gases pass through the carbon dioxide-absorbent material only during inhalation
  - there is a high resistance to ventilation
  - the carbon dioxide-absorbent canister is placed between the patient and the reservoir bag
9. *Concerning intravenous regional analgesia of the bovine foot, which statement is most accurate?*
- Analgesia persists for over an hour after tourniquet release.
  - Hematoma formation is a potential complication.
  - The anesthetic solution should contain epinephrine.
  - The tourniquet should not be left in place for more than 20 minutes.
  - The foot does not become anesthetized if the animal is in dorsal recumbency.
10. *Which cranial nerves are blocked with a properly placed Peterson eye block?*
- III, IV, V, and VI
  - II, V, VI, and VII
  - II only
  - V only
  - II and V
11. *Bilateral blockade of the infraorbital nerves:*
- provides analgesia for removal of mandibular wolf teeth in horses
  - does not desensitize tooth roots if the anesthetic solution is deposited into the infraorbital canal
  - prevents blinking in cattle
  - provides motor blockade, but not sensory blockade, to the upper lip
  - provides nasal analgesia for placement of a nose ring in bulls
12. *Concerning paravertebral analgesia using local anesthetic solution in ruminants, which statement is most accurate?*
- Sweating occurs in blocked dermatomes.
  - The proximal technique requires longer needles than does the distal technique.
  - Gut relaxation is more pronounced than that produced by flank infiltration.
  - A larger volume of anesthetic solution is used than with flank infiltration.
  - Blockade of the second lumbar nerve may produce ipsilateral hind limb weakness.

13. In anesthetized horses, end-tidal carbon dioxide measurements:
- do not provide information about shunt fraction
  - cannot distinguish between intubation of the esophagus and intubation of the trachea
  - are normally slightly higher than arterial carbon dioxide tensions
  - are normally slightly lower than arterial carbon dioxide tensions
  - are the same as arterial carbon dioxide tensions
14. Concerning caudal epidural analgesia using lidocaine solution in mares, which statement is **least** accurate?
- Concurrent epidural administration of  $\alpha_2$ -adrenergic agonists extends the area and duration of the blockade.
  - Ataxia is largely preventable.
  - Straining is abolished, but the abdominal muscles are not paralyzed.
  - Rectal motility is decreased.
  - Uterine motility is decreased.
15. Concerning guaifenesin, which statement is **least** accurate?
- A 5% solution contains 50 g/L.
  - A 5% solution contains 50 mg/ml.
  - It cannot be used safely in cattle because it may produce excessive hemolysis.
  - It has sedative and hypnotic effects in horses.
  - It crosses the placenta of pregnant mares.
16. Concerning cornual nerve blockade in goats, which statement is most accurate?
- A 1% solution of lidocaine should be used because goats have a lower toxic threshold than do cattle.
  - A 1% solution of lidocaine is adequate for cornual nerve blockade.
  - Like calves, goats have two nerves for each horn.
  - After goats are about a week of age, ring blocks must be used.
  - Before goats are about a week of age, ring blocks must be used.
17. Concerning anesthesia of adult llamas, which statement is most accurate?
- With inhalant anesthesia, nystagmus indicates a light plane of anesthesia.
  - Nasotracheal intubation is not possible.
  - The preferred sites of jugular vein access are the most cranial or most caudal third of the right lateral aspect of the neck.
  - A rigid mouth speculum can dislodge the normally loose upper incisors.
  - The saphenous arteries and veins can be accessed on the lateral aspect of the hind limbs.
18. To minimize the risk of myopathy associated with recumbency and general anesthesia in large animals, routine precautions include all of the following **except**:
- minimizing the time of anesthesia and recumbency
  - preventing hypotension
  - preventing hypoxemia
  - prophylactic administration of dantrolene
  - extending the dependent forelimb
19. Which of the following is **not** an indication to begin positive-pressure ventilation in a horse anesthetized with halothane?
- spontaneous respiratory rate below 4 breaths/min
  - arterial carbon dioxide tension above 70 mm Hg
  - persistently light anesthetic plane
  - mean blood pressure below 60 mm Hg
  - respiratory acidosis
20. During eye enucleation with isoflurane anesthesia in a foal, the heart rate falls precipitously. What is the most appropriate initial course of action?
- Administer glycopyrrolate intravenously.
  - Turn off the isoflurane flow and flush the system with oxygen.
  - Administer atropine intravenously.
  - Administer atropine intratracheally.
  - Tell the surgeons to stop any surgical manipulation.



21. Which agent is most appropriate for treating a cow that collapsed after being given an equine dose of xylazine?
- tolazoline
  - detomidine
  - jingsongling
  - flumazenil
  - naloxone
22. What is the **first** sign of excessive cranial distribution of anesthetic solution following epidural administration at the lumbosacral space in a sheep?
- tremors and convulsions
  - circulatory collapse
  - respiratory paralysis
  - bradycardia
  - hind limb rigidity
23. Concerning use of atropine before inhalant anesthesia in ruminants, which statement is **least** accurate?
- Miosis during recovery from anesthesia may cause disorientation.
  - A much higher dosage is needed to decrease salivation in cattle than that used in dogs in cats.
  - The effect on salivation is short-lived.
  - It is not an absolute requirement.
  - The minimal alveolar concentration of inhalant is unaffected.
24. Concerning general anesthesia in horses, which statement is most accurate?
- Apneustic breathing is common after induction with intravenous thiopental.
  - Biot's breathing is a pathologic response to inhalants and requires immediate treatment.
  - Hypoxemia is difficult to predict clinically.
  - Hypoxemia is usually accompanied by cyanosis.
  - Eucapnia is more likely to occur with isoflurane anesthesia than with halothane anesthesia.
25. Concerning anesthesia of a foal with uroperitoneum, which statement is most accurate?
- Potassium-containing fluid should be removed from the peritoneal cavity before medical management of hyperkalemia.
  - Hypochloremic metabolic alkalosis is likely.
  - Rapid drainage of the peritoneal cavity may cause circulatory collapse.
  - Administration of dextrose and glucagon is often beneficial.
  - Administration of bicarbonate exacerbates hyperkalemia.

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## Answers

- b** Although dobutamine is normally given to large animals for its inotropic effects in cases of inhalant anesthetic-induced hypotension, chronotropic effects often predominate in cattle. Ruminants do not tend to show the baroreceptor-mediated bradycardia that may be seen in horses, nor do they commonly show any of the other electrocardiographic changes listed.
- d** Xylazine causes marked diuresis due to suppression of antidiuretic hormone secretion and hyperglycemia and may cause bladder rupture. These patients also often have marked abnormalities of hydration, acid-base balance, and electrolyte status, making them less tolerant of the cardiovascular depressant properties of xylazine.
- d** Only tiletamine, zolazepam, and mannitol are in Telazol. Unlike in some other species (e.g., cats), in pigs it is the benzodiazepine zolazepam, rather than the dissociative tiletamine, that prolongs recovery from anesthesia.
- a** Xylazine has an oxytocic effect on the bovine uterus in the last trimester of pregnancy and may cause abortion. Interestingly, detomidine, another  $\alpha_2$ -adrenergic agonist, does not seem to have this effect. The other three agents listed provide acceptable, nonanalgesic sedation, although diazepam is not normally used for this purpose in adult cows because of expense.

5. **e** Dobutamine, a positive inotrope, is normally administered for its  $\beta_1$ -adrenergic effects on the heart, to increase stroke volume and blood pressure. The  $\alpha_1$ -adrenergic effects are minimal, so, although some splenic contraction may occur (elevating packed cell volume by a few percent), systemic vascular resistance is unaffected. The  $\beta_2$ -adrenergic effects are also minor but certainly would not produce bronchoconstriction, as  $\beta_2$ -adrenergic agonism results in bronchodilation. Occasionally, as blood pressure improves in response to dobutamine, horses show transient reflex bradycardia. Urine production would be expected to increase or stay the same, as blood pressure increases in the absence of renal vasoconstriction.
6. **c** Decreasing the volume and rate of fermentation in the gut minimizes the reduction in functional residual capacity that occurs when viscera impinge on lung expansion in recumbent horses. Regurgitation is very unlikely to occur in this species unless there is gastrointestinal obstruction (nonelective cases). Flushing out the mouth, followed by tracheal intubation, is a more effective way to prevent entry of food material than is fasting.
7. **d** Atracurium is a competitive, nondepolarizing neuromuscular junction blocker that is useful to ensure a central position of the eye in the orbit during intraocular surgery in horses. Extraocular muscle paralysis precludes nystagmus. Atracurium does not provide analgesia, influence tearing, or change pupillary diameter.
8. **e** Fresh gas flows in a to-and-fro system are the same as for a circle system, so low flow rates may be used but are not required. Gases pass through the carbon dioxide-absorbent material during both inhalation and exhalation. These low-resistance machines are suitable for use with potent, volatile anesthetics.
9. **b** Sensation usually returns quite abruptly, within 5 to 10 minutes after tourniquet removal. Hematoma formation is a potential complication because the anesthetic is injected into a vein distal to the tourniquet. Use of a small needle and manual compression or a second tourniquet helps to prevent this. The local anesthetic should be free from epinephrine and other additives. Generally, 20 minutes is considered a minimum time for tourniquet placement to avoid release of a bolus of local anesthetic into the systemic circulation. Patient positioning depends on convenience and other safety factors; it does not affect blockade efficacy.
10. **a** The goal of the Peterson eye block is to desensitize the globe, periorbital tissues, and eyelids, all of which receive sensory innervation from the trigeminal nerve (V). The optic nerve (II) provides special sensory (not pain) fibers to the eye. The oculomotor (III), trochlear (IV), and abducens (VI) nerves are not an intended part of the blockade, but they become blocked because they exit the skull near the large trigeminal nerve. Nevertheless, extraocular muscle paralysis, ptosis, and mydriasis resulting from blockade of these nerves provide clinical support for correct placement of local anesthetic.
11. **e** Branches of the infraorbital nerve do not innervate mandibular teeth (there are no mandibular wolf teeth). Deposition of local anesthetic onto the infraorbital nerves, external to the infraorbital canals, produces effective soft-tissue sensory blockade of structures overlying the maxilla, nose, and upper lip. To desensitize tooth roots or bone, local anesthetic must be deposited deeper into the canal. Blinking is controlled by motor fibers from the facial nerve (VII).
12. **b** Sweating does not occur in blocked dermatomes. Longer needles are required to perform proximal paravertebral blockade than for the distal technique. Sympathetic fibers in the rami communicantes are blocked with the paravertebral technique (not with flank infiltration), resulting in an increase in gastrointestinal tone and motility. A much larger volume of local anesthetic is needed for flank infiltration (more than 100 ml, versus 45 ml). Blockade of the third lumbar nerve (not usually done for flank surgery) may cause ipsilateral hind limb weakness.
13. **d** Because there is imperfect matching of ventilation and perfusion in the equine lung during anesthesia and recumbency, some blood is shunted past unventilated alveoli. This blood has a somewhat higher carbon dioxide tension than does blood subjected to gas exchange and tends to slightly elevate arterial carbon dioxide tension relative to mixed alveolar and end-tidal gases. End-tidal capnometry does differentiate tracheal from esophageal intubation, as the stomach lacks significant amounts of carbon dioxide.
14. **e** Uterine motility is preserved.

15. **c** Guaifenesin solutions not exceeding 5% in concentration can be used safely and effectively in cattle. Stronger solutions do result in more clinically significant hemolysis in cattle than in horses.
16. **b** Goats are no more reactive to lidocaine than are cattle on a dose per weight basis. Due to their smaller size, however, it is easier to administer an overdose. A 1% lidocaine solution is adequate for peripheral nerve blockade and helps to minimize the total dose, while allowing for sufficient volume to diffuse effectively. Goats differ from calves in that their horns are supplied not only by the cornual nerve but also by the infratrochlear branch of the zygomaticotemporal (lacrimal) nerve. Ring blocks are never preferred to specific nerve blocks and usually require a larger volume of local anesthetic, although infiltration blocks are effective at a reduced concentration (0.5%).
17. **c** Unlike horses, llamas rarely demonstrate nystagmus under inhalation anesthesia. Nasotracheal intubation is possible and is sometimes indicated for relief of upper airway obstruction in recovery. The prominent transverse processes of the cervical vertebrae partially cover the jugular vein in the middle third of camelid necks. Although the esophagus is on the left side of the neck, the left jugular vein may also be accessed. Llamas have two maxillary incisors, but they are not located on the dental pad and are not normally loose. The long, straight, large saphenous arteries and veins are on the medial (not lateral) aspect of the hind limb.
18. **d** Routine prophylactic use of dantrolene is not recommended, as it may complicate recovery.
19. **d** Positive-pressure ventilation tends to decrease cardiac output and would aggravate the effects of hypotension.
20. **e** A strong vagal discharge comprises the efferent limb of the oculocardiac reflex, which may be evoked during manipulation of the globe during surgery. Life-threatening bradycardia and asystole are possible outcomes. Although anticholinergic therapy (atropine, because it works faster than glycopyrrolate) and decreased delivery of inhalant may be indicated, the first action should be to stop surgical stimulation.
21. **a** Tolazoline is the only  $\alpha_2$ -adrenergic antagonist listed. Detomidine and jingsongling are  $\alpha_2$ -adrenergic agonists, whereas flumazenil and naloxone are benzodiazepine and opioid antagonists, respectively.
22. **b** Rapid blockade of the small sympathetic fibers in thoracic spinal nerves, which normally provide vascular tone to the splanchnic circulation, could cause a precipitous fall in venous return and cardiac output. There is a reflex tachycardia (weak, thready pulse) in response to the hypotension. Although the intercostal muscles are innervated by thoracic spinal nerves, the diaphragm is innervated by caudal cervical segments, so cardiovascular collapse would precede apnea. The hind limbs are flaccid due to motor blockade. Clinical signs of systemic intoxication with lidocaine could result from inadvertent intravascular injection but would not be the earliest signs seen after epidural overdose.
23. **a** Atropine tends to cause mydriasis.
24. **c** Ketamine (not thiopental) tends to induce apneustic breathing. Biot's breathing, or "cluster breathing," occurs commonly in horses under inhalation anesthesia and does not require treatment per se. Hypoxemia is difficult to predict and detect in the patient clinically and is not accompanied by cyanosis in horses until it is very severe; hence the value of monitors, such as pulse oximetry and arterial blood gas analysis. Eucapnia is unlikely in horses during surgical anesthesia with isoflurane or halothane, as respiratory control mechanisms are depressed by both agents.
25. **c** Medical management is lifesaving and should begin immediately. Some of the peritoneal cavity fluid may be removed before induction, but rapid removal may suddenly open capacitance vessels in the splanchnic circulation and lead to circulatory collapse. Serum sodium and chloride levels tend to be low, but there is metabolic acidosis due to hypoperfusion of tissues. Dextrose, insulin (not glucagon), and bicarbonate all tend to relieve severe hyperkalemia by facilitating intracellular transport of potassium.

# 2

## Dental Diseases

G.J. Baker, R.D. Scoggins

### *Recommended Reading*

Colahan PT et al: *Equine medicine and surgery*, ed 5, St. Louis, 1998, Mosby.

Jennings PB: *The practice of large animal surgery*, Philadelphia, 1984, WB Saunders.

Rose RJ, Hodgson DR: *Manual of equine practice*, Philadelphia, 1993, WB Saunders.

Smith BP: *Large animal internal medicine*, ed 2, St. Louis, 1996, Mosby.

Practice answer sheet is on page 275.

### Questions

G.J. Baker

1. *In horses, wolf teeth:*
  - a. are vestigial in mares
  - b. are more common in the mandible than in the maxilla
  - c. have two roots
  - d. have roots half the size of the crown
  - e. do not make occlusal contact
2. *The lower canine and lateral incisor teeth of baby pigs are routinely clipped soon after birth to:*
  - a. improve weaning weights
  - b. prevent fighting
  - c. prevent damage to the dam's teats
  - d. prevent mandibular malalignment
  - e. prevent periodontal disease
3. *Concerning the canine teeth, which statement is least accurate?*
  - a. They are vestigial in mares.
  - b. They are subject to supragingival calculus in horses.
  - c. They function as incisors in ruminants.
  - d. They are void of cementum in ponies.
  - e. They do not make occlusal contact.
4. *The dental formula for the permanent teeth (I = incisors, C = canines, P = premolars, M = molars) of sheep is:*
  - a.  $2 \times (I\ 3/3; C\ 1/1; P\ 3\ \text{or}\ 4/3; M\ 3/3) = 40\ \text{or}\ 42$
  - b.  $2 \times (I\ 0/4; C\ 0/0; P\ 3/3; M\ 3/3) = 32$
  - c.  $2 \times (I\ 3/3; C\ 0/0; P\ 3/3) = 24$
  - d.  $2 \times (I\ 3/3; C\ 1/1; P\ 4/4; M\ 3/3) = 44$
  - e.  $2 \times (I\ 0/4; C\ 1/1; P\ 3/3; M\ 3/3) = 36$
5. *Complications of tooth extractions in horses may include all of the following except:*
  - a. palatine artery hemorrhage
  - b. persistent sinusitis
  - c. persistent fistula
  - d. mandibular fracture
  - e. ameloblastoma formation

R.D. Scoggins

6. *In a horse's mouth, what is the bar?*
- a. the buccal surface
  - b. the lingual surface
  - c. the maxillary interdental space
  - d. the mandibular interdental space
  - e. the palatine arch
7. *The bridle teeth of a horse are the:*
- a. incisors
  - b. canines
  - c. P1
  - d. P2, 3, and 4
  - e. M1, 2, and 3
8. *In horses, what is the **last** permanent mandibular cheek tooth to erupt?*
- a. P2
  - b. P3
  - c. M1
  - d. M2
  - e. M3
9. *A "ramped jaw" is most often seen in which horse breed?*
- a. Belgian
  - b. standardbred
  - c. Thoroughbred
  - d. Arabian
  - e. American saddlebred
10. *In horses, a ramped jaw most often involves:*
- a. the incisors
  - b. the canines
  - c. mandibular M3
  - d. mandibular M1
  - e. mandibular P2
11. *Floating or filing the teeth of horses usually avoids the:*
- a. lingual surface of the mandibular cheek teeth
  - b. buccal surface of the maxillary cheek
  - c. occlusal surface of the cheek teeth
  - d. anterior surface of mandibular P2
  - e. anterior surface of maxillary P2
12. *Determining the age of a horse by examining its incisor teeth is most accurate up to the age of:*
- a. 6 years
  - b. 12 years
  - c. 18 years
  - d. 25 years
  - e. over 25 years
13. *"Parrot mouth," or inferior brachygnathism, in horses usually includes all the following **except**:*
- a. no incisor occlusal contact
  - b. rostral hook on mandibular P2
  - c. caudal hook on mandibular M3
  - d. rostral hook on maxillary P2
  - e. worn rostral surface of mandibular P2
14. *The mouth and teeth of horses should be thoroughly examined:*
- a. when requested by the owner
  - b. only during a prepurchase examination
  - c. only on horses over 12 years of age
  - d. only on horses less than 12 years of age
  - e. as a part of every physical examination
15. *Assuming normal eruption patterns and rates, which permanent teeth would **not** be routinely floated in a 3-year-old performance horse?*
- a. P2
  - b. P3
  - c. P4
  - d. M1
  - e. M3
16. *In horses, bit seats are created by:*
- a. rounding and beveling the rostral surfaces of both mandibular and maxillary P2
  - b. removal of P1 before training
  - c. leveling the incisors
  - d. deeply drilling the infundibulum in the incisors
  - e. shortening and smoothing the canines

17. *In horses, premature removal of deciduous premolars ("caps") can be detrimental because it:*
- causes incisor malalignment
  - results in failure of full maturation of developing permanent premolars
  - causes development of rostral hooks
  - causes periosteal mandibular "bumps"
  - causes excessive molar wear
18. *Common signs of dental disease in horses include all of the following **except**:*
- head tossing
  - difficulty chewing
  - quidding
  - difficulty steering
  - cribbing
19. *Which of the following most accurately defines anisognathism in equids?*
- presence of an interdental space
  - protrusion of the maxillary incisors rostral to the mandibular incisors
  - protrusion of the mandibular incisors rostral to the maxillary incisors
  - a mandibular arcade that is narrower than the maxillary arcade
  - continual eruption of the tooth's reserve crown
20. *Concerning grazing by horses, which statement is **least** accurate?*
- The lips are the primary prehensile organ.
  - The incisor teeth are capable of nipping forage close to the ground.
  - The tooth structure resists wear associated with grazing.
  - The tongue is a highly effective prehensile organ.
  - The mandible retracts caudally as the head is elevated.
21. *Which of the following is most likely to interfere with thorough visual and digital examination of a horse's oral cavity?*
- a loose-fitting halter
  - a full-mouth speculum
  - an artificial light source
  - chemical sedation
  - a tight lip twitch
22. *Extended use of a full-mouth speculum can damage a horse's:*
- pharynx
  - masseter muscles
  - facial nerve
  - incisor teeth
  - chin groove
23. *In dental treatment of horses, the palatine artery is most frequently traumatized during:*
- removal of caps
  - use of an elevator to remove wolf teeth
  - use of a full-mouth speculum
  - cutting caudal hooks on lower M3
  - incisor bite alignment
24. *Which type of horse most frequently exhibits abnormal dental development?*
- draft horse
  - hunter
  - miniature horse
  - reining horse
  - 3-day event horse
25. *In horses, a draining fistula of the mandible is best evaluated by:*
- culture and sensitivity
  - contrast radiography
  - curettage
  - administering antibiotics and nonsteroidal antiinflammatory drugs
  - visual appraisal

## Answers

1. **e** Both males and females may have wolf teeth. Wolf teeth have a single root approximately the same diameter as the crown. Wolf teeth are rarely found in the lower arcade. Wolf teeth make no occlusal contact.
2. **c** The nipples of sows may be damaged by the needle-sharp teeth of nursing piglets.
3. **d** All equine teeth are composed of pulp, dentine, enamel, and cementum.
4. **b** Sheep have 32 permanent teeth, with no upper incisors.
5. **e** Ameloblastomas are odontogenic tumors derived from remnants of dental epithelium. Their occurrence is unrelated to tooth extraction.
6. **d** The bar is the mandibular interdental space.
7. **b** Bridle teeth are the canine teeth, which appear at 4 to 5 years of age. Historically, horses were considered old enough to work or wear a bridle when these teeth erupted.
8. **e** The third premolar is the last mandibular tooth to erupt.
9. **d** The Arabian's unusually short head results in a high incidence of ramped jaw.
10. **c** Ramped jaw refers to angulation of mandibular M3.
11. **c** Floating of the occlusal surface of cheek teeth is contraindicated unless an abnormality is present.
12. **a** Recent studies have shown that aging a horse after all permanent teeth are present is highly inaccurate.
13. **d** The rostral surface of mandibular P2 is worn due to the rostral position of the opposing maxillary P2.
14. **e** The mouth and teeth of all horses should be thoroughly examined as part of any physical examination.
15. **c** At 3 years of age, the permanent P4 has not erupted sufficiently for it to be effectively floated.
16. **a** None of the other answer choices correctly describing the shaping of bit seats.
17. **b** Premature cap removal results in incomplete maturation of the incoming permanent molar.
18. **e** Cribbing is not related to dental disease but is considered a behavioral stereotypic activity.
19. **d** This is the definition of anisognathism.
20. **d** The equine tongue is not of much significance as a prehensile organ.
21. **e** A tight lip twitch reduces the examiner's ability to palpate and observe the buccal service, and increases the risk of being struck.
22. **b** Leaving a full-mouth speculum in the open position too long can result in severe masseter myositis.
23. **b** Use of a wolf tooth elevator is the most frequent cause of trauma to the palatine artery.
24. **c** Due to their small size and comparatively large teeth, dental abnormalities are common in miniature horses.
25. **b** Radiographs offer the best opportunity to determine the cause of a draining tract, which is usually a foreign body.

## NOTES

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# 3

## Dermatology

K.A. Moriello

### *Recommended Reading*

Scott DW: *Large animal dermatology*, Philadelphia, 1988, WB Saunders.

Practice answer sheet is on page 277.

### *Questions*

1. *A 10-day-old piglet is febrile, depressed, anorectic, and dehydrated. The skin and haircoat are matted. Closer examination of the skin shows marked cutaneous erythema and diffuse moist, greasy, odoriferous exudate. The skin is painful on palpation. Intact pustules are evident on the abdomen. Of 11 littermates, three are affected. What is the most likely cause of these findings?*
  - a. scabies, with a secondary bacterial infection
  - b. swine pox, with a secondary bacterial infection
  - c. erysipelas
  - d. exudative epidermitis
  - e. ulcerative spirochetosis
2. *A litter of intensely pruritic 10-week-old piglets is presented for evaluation. Their skin is erythematous and lichenified, and marked excoriations are present on the face, trunk, and legs. You inspect the pigs and find no grossly visible parasites. Also, you observe no mites in numerous skin scrapings obtained from the ears and chest. What is the most likely cause of pruritus in these pigs?*
  - a. lice infestation
  - b. swine pox
  - c. food allergy
  - d. reaction to an environmental irritant
  - e. scabies
3. *What is the drug of choice for treatment of scabies or lice infestations in a swine herd?*
  - a. ivermectin
  - b. lime sulfur
  - c. lindane
  - d. carbaryl
  - e. coumaphos



4. An 80-lb growing pig is presented to you for examination because of fever and discoloration of the skin. The skin is bluish, and close examination reveals patches of gangrene and sloughing of the skin on the extremities. The pig is very depressed. The owner reports that other animals in the group have been treated for scours. A review of the herd health information shows that all animals on the premises are current on vaccinations, and no new animals have been introduced into the herd. What is the most likely cause of this problem?
- spirochetosis
  - Erysipelothrix rhusiopathiae* infection
  - bacterial septicemia
  - skin necrosis
  - photosensitization
5. You examine a herd of swine in which numerous animals are lame and limping. Vesicles and erosions are present on the tongue, snout, lips, gingivae, and coronary bands. Two animals have sloughed their hooves. What is the most appropriate **initial** course of action?
- Isolate the herd.
  - Collect fluid from vesicles for virus isolation.
  - Contact governmental regulatory authorities before leaving the farm.
  - Collect serum samples for viral antibody screening.
  - Isolate affected animals.
6. Which of the following is **not** a reportable disease?
- Sarcoptes* infestation in swine
  - Psoroptes cuniculi* infestation in sheep
  - Sarcoptes* infestation in cattle
  - foot-and-mouth disease in sheep
  - Cochliomyia hominivorax* infestation in cattle
7. A 2-year-old ewe is presented to you for examination. The primary complaint is lumpy wool. Examination of the coat reveals diffuse areas of thick mats and crusts, with areas of erythema. What is the most likely cause of this condition?
- lice infestation
  - fleece rot
  - dermatophilosis
  - caseous lymphadenitis
  - dietary zinc deficiency
8. A herd of sheep has been grazing pasture in western New Mexico for the past 2 months. Some animals are photophobic and have erythema and irritation of the cornea, lips, eyelids, face, vulva, and coronary bands. The animals are pruritic, and secondary areas of excoriation are evident. Several ewes are dyspneic and anorectic. Complete physical examination reveals no other abnormalities. What is the most likely cause of these findings?
- photosensitization
  - dermatophilosis
  - fescue poisoning
  - scrapie
  - border disease
9. Which of the following is **not** a feature of sheep ked (*Melophagus ovinus*) infestation?
- permanent staining of the wool from fly fecal material
  - anemia in young or pregnant animals
  - intense pruritus and self-trauma that damages the wool
  - transmission by direct contact
  - greatest prevalence in spring and summer
10. Which of the following is **not** a feature of scrapie in sheep?
- trembling and nibbling reflex when rubbed on rump
  - wool nibbling and rubbing on fixed objects (pruritus)
  - clinical signs usually not seen before 2 to 4 years of age
  - exaggerated gait and incoordination
  - prevention by vaccination
11. Which bacterium is most commonly isolated from abscesses in goats?
- Streptococcus pyogenes*
  - Staphylococcus aureus*
  - Escherichia coli*
  - Corynebacterium pseudotuberculosis*
  - Corynebacterium pyogenes*

12. A kid goat is presented to you for examination. The owner reports that the goat began developing lesions on the muzzle and legs about 10 days ago. Physical examination reveals papules, vesicles, pustules, and scabs on the lip, muzzle, and interdigital region. What is the most likely cause of these lesions?
- contagious pustular dermatitis (orf)
  - folliculitis due to staphylococcal infection
  - photosensitization
  - dietary zinc deficiency
  - dermatophilosis
13. Nodules, pustules, and scabs on the udder of a milking goat doe are most likely caused by:
- Staphylococcus aureus*
  - Corynebacterium*
  - Trichophyton verrucosum*
  - Dermatophilus congolensis*
  - Streptococcus zooepidemicus*
14. What is the most common fungal organism affecting goats?
- Trichophyton verrucosum*
  - Microsporum gypseum*
  - Microsporum canis*
  - Trichophyton mentagrophytes*
  - Epidermophyton*
15. Which of the following is **not** a likely cause of tail rubbing in horses?
- behavioral problem (vice)
  - food allergy
  - Oxyuris equi* infection
  - Culicoides* hypersensitivity
  - straw itch mite infestation
16. A horse is presented to you with matting of the hair, exudation, crusting, and loss of clumps of hair. The lesions are primarily dorsal but affect the face and extend along the trunk and distally on the legs. The owner has not observed signs of pruritus. The horse is febrile and slightly depressed. What is the **least** likely cause of crusting dermatosis in this horse?
- pemphigus foliaceus
  - generalized seborrhea
  - dermatophilosis
  - generalized granulomatous dermatitis
  - leukoderma
17. What is the most common skin tumor in horses?
- squamous-cell carcinoma
  - viral papillomatosis
  - melanoma
  - sarcoid
  - basal-cell carcinoma
18. Concerning habronemiasis, which statement is **least** accurate?
- The house fly (*Musca domestica*) and the stable fly (*Stomoxys calcitrans*) are vectors in depositing infective larvae.
  - The larvae of *Habronema muscae*, *Habronema microstoma*, and *Draschia megastoma* are the causative agents.
  - Lesions of cutaneous habronemiasis develop in moist areas of the body, such as the penis, eye margins, prepuce, or wounds.
  - Differential diagnoses for the lesions include squamous-cell carcinoma, fibroblastic sarcoid, exuberant granulation tissue (proud flesh), phycomycosis, and dermatophytosis.
  - It can be definitively diagnosed by skin biopsy.

19. Concerning infestations of ectoparasites in horses, which statement is **least** accurate?
- a. Lice infestations most commonly involve the biting louse (*Damalinia equi*) and the sucking louse (*Haematopinus asini*). Infestations can occur at any time but tend to be most common in the winter.
  - b. Scabies in horses usually begins on the head, *Chorioptes* infestations begin on the legs, and *Psoroptes* infestations begin on the trunk.
  - c. *Culicoides* hypersensitivity is one of the most common fly-bite dermatoses of horses. In general, the head, tail, and ventrum are affected; pruritus may be generalized in severe cases.
  - d. Onchocerciasis can cause cutaneous and ocular lesions. Cutaneous lesions are represented by alopecia, ulcerations, depigmentation, and scaling. The face, neck, and ventral midline are most commonly infested. The filarial nematode is transmitted by *Musca domestica*.
  - e. The treatment of choice for equine mite and lice infestations is ivermectin.
20. A draft horse is presented to you for examination. The hairs of the pastern are matted with blood and serum, and the pastern area is swollen and painful to the touch. Closer examination of the skin reveals proliferations resembling bunches of grapes and an odoriferous purulent discharge. The horse is pruritic. You tell the client that the horse has what is commonly called "scratches" or "grease heel." Concerning pastern dermatitis, which statement is **least** accurate?
- a. Lice and *Chorioptes* infestations are common causes of scratches in draft horses.
  - b. Poor hygiene and stable management practices can be the primary causes of scratches or can aggravate existing cases.
  - c. Bacterial infections and dermatophyte infections can be primary causes.
  - d. Autoimmune diseases, such as pemphigus foliaceus and vasculitis, can be primary causes.
  - e. The front legs are more commonly affected than the back legs, and the disease is rarely bilateral.
21. What is the most common cause of mange in dairy cattle?
- a. *Sarcoptes*
  - b. *Psoroptes*
  - c. *Chorioptes*
  - d. *Demodex*
  - e. *Psorobia*
22. A 2-year-old cow is presented to you with multiple nodules on the dorsum. The lumps are painful upon palpation, and a small hole is present in each of the lumps. What is the most likely cause of these findings?
- a. bacterial abscess
  - b. warbles
  - c. collagen necrosis
  - d. granulomatous reaction to vaccination
  - e. cutaneous lymphosarcoma
23. Concerning dermatophytosis in cattle, which statement is **least** accurate?
- a. *Trichophyton mentagrophytes* and *Trichophyton verrucosum* are the most common fungi isolated from affected cattle.
  - b. Ringworm can affect cattle of any age, but calves are most commonly affected.
  - c. Lesions are most commonly found on the face, neck, and trunk, and sometimes on the legs.
  - d. The most consistent clinical appearance is a thick, gray, asbestos-like plaque that peels away from the skin.
  - e. Lesions resolve spontaneously and no treatment is necessary, as the disease is of little economic and zoonotic importance.

24. You examine an 8-month-old beef calf and note numerous hairless, proliferative masses on the head, lips, and trunk. You make a tentative diagnosis of viral papillomatosis. Concerning viral papillomatosis in cattle, which statement is **least** accurate?
- This disease tends to affect cattle less than 18 months of age.
  - The causative agent is a subtype of the bovine papillomavirus.
  - Infection occurs after contact with infected animals and/or contaminated fomites.
  - Infection is prevented by vaccination.
  - Severely affected animals should be culled.
25. Concerning viral diseases of the skin or udder of cows, which statement is **least** accurate?
- Cowpox is a common cause of vesicular lesions on the teats of cows.
  - Pseudocowpox is caused by a parapoxvirus. As compared with bovine vaccinia mammillitis and bovine herpes mammillitis, vesicle formation in pseudocowpox is rare.
  - Bovine herpes mammillitis may cause oral lesions, in addition to vesicular lesions on the teats and udder.
  - In foot-and-mouth disease, vesicular lesions on the teats tend to precede development of lesions in the mouth and on the feet.
  - Teat warts are a type of bovine papillomatosis.

## Answers

- d** Exudative epidermitis, also known as *greasy pig disease*, is a common bacterial skin disease of piglets 5 to 35 days of age. A toxin produced by *Staphylococcus hyicus* causes marked exudation on the epidermis. The toxin can also damage the kidneys.
- e** Scabies and lice infestation are the two most common causes of pruritus in juvenile and adult pigs. Lice are easily visible without magnification; therefore, scabies is the more likely cause of the pruritus. It is common not to find scabies mites on skin scrapings, as a significant portion of the pruritus in swine scabies is due to a hypersensitivity reaction.
- a** Ivermectin is licensed for treatment of scabies in swine. It is easily administered by injection and is the most effective drug available. Lindane is now illegal to use, though it is highly effective.
- c** Bacterial septicemia in swine, especially caused by *Salmonella*, *Clostridium*, *Escherichia coli*, and *Bacillus anthracis*, commonly causes discolored skin. Septicemia causes capillary dilatation and congestion. Secondary thrombosis results in gangrene and sloughing of the skin.
- c** Several vesicular diseases of swine are reportable. Swine vesicular disease, vesicular exanthema, and vesicular stomatitis are indistinguishable from foot-and-mouth disease, and the disease should be identified by trained individuals.
- a** Scabies in swine is enzootic in the United States. It is not a reportable disease.
- c** The most common cause of lumpy wool is skin infection with *Dermatophilus congolensis*.
- a** The condition is obviously a herd problem. Many pastures in the western United States are overgrazed and harbor plants that are primary causes of phototoxicity. Photophobia and erythema are early classic signs of phototoxicity.
- e** Sheep ked infestations are most common in the fall and winter, when animals tend to have increased contact with one another.
- e** Scrapie does not induce cellular or humoral immunity; therefore, vaccination is not possible.
- d** *Corynebacterium pseudotuberculosis* is the most common cause of caseous lymphadenitis in goats, though there are other causes.
- a** Orf is a contagious poxvirus infection of goats and sheep that most commonly affects young animals. This disease is prevented by yearly vaccination and is a zoonosis.
- a** Udder impetigo is common in does in milking goat herds. The most common cause is *Staphylococcus*.
- a** *Trichophyton verrucosum* is the most common dermatophyte affecting goats. It is also the dermatophyte most commonly isolated from cattle.

15. **e** Straw itch mites eat the larvae of grain insects. Horses become infested while eating contaminated hay from overhead racks. The lesions are nonpruritic and consist of crusted papules on the dorsum.
16. **e** *Leukoderma* refers to depigmentation of the skin. It is not a common crusting dermatosis.
17. **d** Sarcoids are the most common skin tumors of horses, donkeys, and mules. A virus is believed to be the cause. There are several clinical presentations: flat or occult, verrucous or wartlike, and fibroblastic (resembling proud flesh).
18. **d** Dermatophytosis does not cause lesions resembling those of habronemiasis. Dermatophytosis begins as a papular eruption that develops into a circular area of hair loss with crusting. Dermatophytosis in horses is not proliferative.
19. **d** The filarial nematode of onchocerciasis is spread primarily by *Stomoxys calcitrans* and *Culicoides*.
20. **e** Pastern dermatitis is common on the hind legs and is almost always bilateral. Unilateral lesions are very uncommon.
21. **c** *Sarcoptes* and *Psoroptes* infestations are rare and reportable. Demodicosis in cattle causes a nodular eruption and is also rare. *Psorobia*, the sheep itch mite, does not affect cattle.
22. **b** Warbles is the most likely cause of the lesion. The animal is too young for most cutaneous neoplasia. Abscesses and granulomatous reactions would not necessarily be multiple and would not have a small pore on the surface without some type of discharge. The hole is a breathing hole for the grub. It is best to allow the grub to complete its life cycle uninterrupted or to enlarge the hole and remove the grub without rupturing it.
23. **e** Dermatophytosis in cattle is of significant economic importance because it decreases production, predisposes the animal toward secondary infections, and causes significant damage to the hide that is not noticeable until the tanning process. The infection is also of zoonotic importance.
24. **d** Vaccination, as a preventive measure or as a therapeutic measure, is unsuccessful.
25. **a** Cowpox is extremely rare and is only seen sporadically in cattle in western Europe.

## NOTES

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# 4

## Equine Cardiology

G.F. Fregin

### *Recommended Reading*

Blissit K et al: Equine cardiovascular medicine, *Equine Vet J* 19(Suppl): 2-114, 1995.

Reef VB: Section 9, Cardiovascular disease. In Robinson NE: *Current therapy in equine medicine* 3, Philadelphia, 1992, WB Saunders.

Gaughan EM: Cardiovascular causes of exercise intolerance, *Vet Clin North Am Equine Pract* 12:473-94, 1996.

Practice answer sheet is on page 279.

### *Questions*

1. *Quinidine and digoxin are two of the most commonly used cardiovascular drugs in horses. When quinidine is administered to a horse with atrial fibrillation that has been pretreated with digoxin, what is the effect on the serum digoxin concentration?*

- a. Concentration decreases due to the reduced volume of distribution.
- b. Concentration remains unchanged due to increased renal clearance.
- c. Concentration increases due to reduced gastrointestinal absorption.
- d. Concentration increases by approximately double the baseline value.
- e. Concentration decreases, as in other species.

2. *Actions of quinidine include all of the following except:*

- a. interferes with transsarcolemmal flux of sodium
- b. slows conduction throughout the heart

- c. prolongs refractoriness
- d. depresses spontaneous automaticity of the sinus node
- e. increases vagal tone (activity)

**For Questions 3 through 7, select the correct answer from the five choices below.**

- a. mitral insufficiency
  - b. ventricular septal defect
  - c. systolic physiologic flow murmur
  - d. aortic insufficiency
  - e. pulmonary regurgitation
3. *Soft, blowing, low-intensity, localized systolic murmur with the point of maximum intensity over the aortic or pulmonic valve areas*
4. *Holosystolic or pansystolic murmur radiating dorsally and caudally from the left atrioventricular valve area*

5. *Coarse, band-shaped pansystolic murmur with the point of maximum intensity on the right side of the thorax*
6. *Murmur rarely detected on auscultation*
7. *Holodiastolic murmur with the point of maximum intensity over the left heart base and radiating toward the cardiac apex*
8. *Which cardiac valvular abnormality of horses is most likely to cause performance-related clinical signs?*
  - a. tricuspid regurgitation
  - b. pulmonic stenosis
  - c. mitral regurgitation
  - d. aortic stenosis
  - e. aortic insufficiency

**Questions 9 through 11**

*You examine a 2-year-old Thoroughbred filly with evidence of exercise-induced pulmonary hemorrhage. The filly had raced successfully without previous evidence of exercise intolerance or exercise-induced pulmonary hemorrhage. On auscultation of the heart immediately after a race, the rhythm is irregular and the heart sounds are of variable intensity. Although the initially elevated heart rate returns to a normal resting level within 3 hours after the race, the heart rhythm remains irregular. You hear a soft, blowing, early decrescendo systolic murmur at the heart base over the aortic/pulmonic valve areas.*

9. *What is the most likely cause of the clinical findings?*
  - a. aortic insufficiency
  - b. atrial fibrillation
  - c. second-degree atrioventricular block, with dropped beats
  - d. tricuspid regurgitation
  - e. ventricular premature depolarization
10. *What is the most appropriate management of this case?*
  - a. Retire the filly from racing and use it as a broodmare, if the pedigree is good.
  - b. Resume training and treat before each race with furosemide.

- c. Wait 24 hours and then record an electrocardiogram; if the arrhythmia persists, initiate therapy with quinidine sulfate.
  - d. Rest the filly at least 3 months and radiograph the thorax; if no abnormalities are detected, resume training.
  - e. Initiate therapy with digoxin.
11. *The prognosis for good response to treatment and return to racing is favorable in horses with:*
    - a. a resting heart rate of 68 to 80 beats per min
    - b. valvular regurgitation and mild atrial chamber enlargement
    - c. recent onset of arrhythmia without other reliable clinical signs of cardiac disease
    - d. arrhythmia that was detected as an incidental finding on routine examination
    - e. no signs of exercise intolerance
  12. *What is the most common congenital cardiac disorder in horses?*
    - a. patent ductus arteriosus
    - b. aortic stenosis
    - c. ventricular septal defect
    - d. pulmonic stenosis
    - e. tetralogy of Fallot
  13. *Two-dimensional and color-flow Doppler echocardiography are used to assess the hemodynamic significance of ventricular septal defects in horses. Which echocardiographic finding is **not** associated with a good prognosis for survival and possibly for race performance in standardbreds?*
    - a. membranous ventricular septal defect  $\leq 2.5$  cm in diameter
    - b. peak velocity of shunt flow through ventricular septal defect of  $\geq 4$  m/sec
    - c. muscular or perimembranous ventricular septal defect  $> 2.5$  cm in diameter
    - d. normal or near normal cardiac chamber dimension
    - e. mild aortic valvular regurgitation

14. Which clinical finding is **least** likely to be associated with acute inflammation/injury to the myocardium?
- fainting or collapse
  - supraventricular or ventricular cardiac arrhythmias
  - murmurs and gallop sounds
  - sudden death
  - normal ST segment and T wave on the electrocardiogram
15. Inflammatory lesions of the mitral valve or left ventricular mural endocardium are **least** likely to be accompanied by:
- thrombi or secondary emboli to the liver, kidney, and brain
  - anorexia and weight loss
  - cardiac murmurs
  - fever, anemia, and leukocytosis
  - pulmonary emboli
16. Which of the following is most characteristic of pericarditis with effusion in horses?
- variable clinical signs, depending on the amount and rate of pericardial fluid accumulated and the etiology of the disease
  - pneumonia and pleuritis
  - fever and lethargy
  - depression, anorexia, and weight loss
  - ventral edema and diminished or muffled heart sounds
17. Which of the following is most characteristic of pericarditis with effusion in horses?
- variable clinical signs, depending on the amount and rate of pericardial fluid accumulated and the etiology of the disease
  - pneumonia and pleuritis
  - fever and lethargy
  - depression, anorexia, and weight loss
  - ventral edema and diminished or muffled heart sounds
18. Which of the following would be most helpful in determining this filly's prognosis for racing?
- Record an electrocardiogram before and immediately after exercise.
  - Auscultate the thorax after exercise.
  - Radiograph the thorax to determine the degree of atrial chamber enlargement.
  - Perform echocardiography to detect any valvular abnormalities.
  - Perform flow mapping with pulsed-wave or color-flow Doppler echocardiography to determine the extent of the regurgitation jet.
19. Concerning the prognosis for use of this filly, which statement is most accurate?
- The prognosis is poor because valvular abnormalities are likely to progress rapidly.
  - The prognosis is uncertain because this problem is uncommon in horses.
  - The prognosis for survival is good, but the filly will not likely be able to continue racing.
  - The prognosis for racing is good if there is no evidence of atrial or ventricular volume overload (chamber enlargement) and if the regurgitant jet occupies one third or less of the atrial chamber.
  - The prognosis for survival is poor to grave.
20. Concerning the etiology of diastolic heart murmurs in horses, which statement is **least** accurate?
- Most horses do not develop aortic insufficiency until late in life (after 10 years of age).
  - Pulmonary insufficiency and mitral or tricuspid stenosis are rare in horses.
  - All diastolic heart murmurs in horses are associated with valvular abnormalities.
  - Aortic regurgitation usually progresses slowly and rarely results in congestive heart failure and/or death.
  - Pulmonary regurgitation usually has a poor to grave prognosis for survival because most affected horses have primary mitral insufficiency and advanced congestive heart failure.

### Questions 17 through 19

You auscultate the thorax of a 3-year-old standardbred filly with a history of normal exercise tolerance and find a grade 2/6, somewhat coarse holosystolic murmur radiating dorsally from the third to fourth right intercostal space at a level midway between the olecranon and the point of the shoulder. Arterial and venous pulsations are normal.

17. What is the most likely cause of these clinical findings?
- mitral regurgitation
  - aortic stenosis
  - tricuspid regurgitation



21. Results of digoxin therapy in horses with heart failure include all of the following **except**:
- a. decreased heart rate
  - b. decreased atrioventricular conduction
  - c. increased strength of ventricular contraction
  - d. inhibition of the myocardial cell membrane-bound enzyme associated with the sodium pump
  - e. negative inotropic effect on myocardial cells
22. What is the **least** reliable echocardiographic finding in formulating a prognosis for longevity and performance in horses with valvular regurgitation?
- a. presence or absence of abnormalities on the valve leaflets
  - b. degree of cardiac chamber enlargement
  - c. degree of resultant volume overload
  - d. size of the regurgitant jet
  - e. relative relationship of jet size to chamber size
23. What is the most common cause of sudden death in older mares around the time of parturition?
- a. left-sided congestive heart failure
  - b. myocardial infarction
  - c. rupture of the uterine or ovarian artery
  - d. cranial mesenteric arteritis, resulting in occlusive thrombotic disease
  - e. valvular endocarditis

**Questions 24 and 25**

A 10-year-old mixed-breed gelding has been hunting for several hours when the rider notices an increased respiratory rate and effort during an uphill gallop. The horse pulls up coughing and has evidence of a foamy nasal discharge. On auscultation of the heart, you hear a coarse or honking grade 4/6 pansystolic murmur over the fourth to fifth left intercostal spaces. The murmur radiates dorsally and caudally from its point of maximum intensity.

24. What is the most likely cause of these clinical findings?
- a. tricuspid regurgitation
  - b. chronic obstructive pulmonary disease
  - c. right-sided congestive heart failure
  - d. ruptured chordae tendineae, with mitral regurgitation and acute pulmonary edema
  - e. pulmonary regurgitation
25. Concerning the prognosis for use of this gelding, which statement is most accurate?
- a. The prognosis is poor to grave; the condition of most affected horses deteriorates rapidly.
  - b. The prognosis for survival is good if the gelding is retired, but the prognosis for continued exercise (hunting) is poor.
  - c. The prognosis is uncertain because this problem is uncommon in horses.
  - d. The prognosis is good once the horse has recovered from acute volume overload.
  - e. The prognosis is fair because clinical signs were not exhibited until the horse was galloped uphill.

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## Answers

- 1. **d** Quinidine administration increases the serum digoxin concentration to at least twice the steady-state serum concentration, in part by decreasing renal digoxin clearance and by displacement of digoxin from binding sites (reduced volume of distribution).
- 2. **e** Quinidine has vagolytic activity (decreases vagal tone).
- 3. **c** Systolic physiologic flow murmurs have these characteristics.
- 4. **a** This describes the murmur associated with mitral insufficiency.
- 5. **b** Ventricular septal defect produces this type of murmur.
- 6. **e** Pulmonary regurgitation is rarely detected on auscultation.
- 7. **d** This describes the murmur associated with aortic insufficiency.

8. **c** Mitral insufficiency causes increased left atrial pressure and pulmonary hypertension, and usually progresses more rapidly than do other valvular insufficiencies due to the higher-pressure circulation and back up of regurgitant blood into the lungs.
9. **b** Atrial fibrillation is the most common cardiovascular problem causing exercise intolerance in young horses. It is reported more frequently in standardbreds than in thoroughbreds.
10. **c** Because paroxysmal atrial fibrillation may occur, wait 24 hours. If the arrhythmia persists and no other reliable signs of heart disease are present, begin treatment. Quinidine sulfate is the drug of choice.
11. **c** Recent onset and no other signs of heart disease warrant a favorable prognosis.
12. **c** Other congenital abnormalities are uncommon or rare as isolated lesions.
13. **c** Horses with a membranous ventricular septal defect  $\leq 2.5$  cm in diameter, peak shunt flow velocity  $\geq 4$  m/sec, near-normal cardiac chamber dimensions, and mild to absent aortic valvular regurgitation have a good prognosis for survival and possibly for racing.
14. **e** Various clinical signs, ranging from mild changes in performance to collapse and sudden death, have been reported in horses with myocarditis. Electrocardiographic abnormalities are frequently evident, including changes in the ST segment and T wave.
15. **e** Pulmonary emboli are associated with right-sided lesions.
16. **a** Clinical signs vary with the cause and severity of the problem.
17. **c** Heart murmurs associated with the other abnormalities listed are best heard on the left side of the thorax. Tricuspid regurgitation is reportedly common in horses.
18. **e** Although use of jet dimensions to quantify regurgitant volume has many limitations, a regurgitant jet that occupies two thirds or more of the right atrial chamber is considered severe. Further studies are needed to determine the relationship between the severity of tricuspid regurgitation and the intensity of the associated murmur.
19. **d** Murmurs of tricuspid regurgitation are common. Most affected horses have mild tricuspid insufficiency and normal exercise tolerance.
20. **c** Physiologic diastolic heart murmurs are frequently auscultated in young race horses.
21. **e** Digoxin has a positive inotropic effect (increases the strength of ventricular contraction).
22. **a** The mere presence or absence of abnormalities on the valve leaflet is not as reliable in determining the prognosis for longevity and performance as the other choices listed.
23. **c** Rupture of the uterine or ovarian artery is the most common cause reported.
24. **d** Chordae tendineae rupture results in mitral regurgitation and subsequent pulmonary edema, which is commonly manifested as a foamy nasal discharge.
25. **a** Horses with chordae tendineae rupture normally have moderate to severe mitral regurgitation by the time this insufficiency is diagnosed. Most affected horses deteriorate rapidly.

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## NOTES

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# 5

## Hematology

M.H. Barton

### *Recommended Reading*

- Cowell RL, Tyler RD: *Cytology and hematology of the horse*, St. Louis, 1992, Mosby.
- Duncan JR et al: *Veterinary laboratory medicine*, ed 3, Ames, 1994, Iowa State University Press.
- Eades SC, Bounous DI: *Laboratory profiles of equine diseases*, St. Louis, 1997, Mosby.
- Jain NC: *Essentials of veterinary hematology*, Baltimore, 1993, Williams & Wilkins.
- Meyer DJ et al: *Veterinary laboratory medicine: interpretation and diagnosis*, Philadelphia, 1992, WB Saunders.
- Smith BP: *Large animal internal medicine*, ed 2, St. Louis, 1995, Mosby.

Practice answer sheet is on page 281.

### *Questions*

1. A 4-year-old pasture-fed Hereford cow, from the southeastern United States, is acutely weak, febrile, and icteric. Several other cows in the same herd are showing the same signs. The packed cell volume is 15%; the hemoglobin level, mean corpuscular hemoglobin concentration (MCHC), and mean corpuscular hemoglobin (MCH) are normal. The unconjugated serum bilirubin level is increased. Dipstick examination of urine is negative for blood. What is the **most** likely cause of these findings?
- a. anaplasmosis
  - b. red maple leaf toxicity
  - c. copper toxicity
  - d. leptospirosis
  - e. bracken fern toxicity

2. A 5-year-old pregnant Thoroughbred mare from Texas develops acute onset of icterus and a rectal temperature of 102° F. The mare is kept at a boarding stable with 15 other horses. The following laboratory results are available:

	Patient	Normal
Packed cell volume (PCV)	16%	35%
Hemoglobin	7 mg/dl	½ of patient's PCV
Total bilirubin	10 mg/dl	<2 mg/dl
Unconjugated bilirubin	8.5 mg/dl	<2 mg/dl
γ-Glutamyltransferase	15 U/L	<20 U/L
Sorbitol dehydrogenase	3 U/L	<5 U/L
Urine occult blood	Positive	Negative

What is the **most** appropriate course of action?

- determine the mare's blood type
  - determine the *Babesia caballi* titer
  - perform a Coggins' test
  - perform a bromsulfophthalein (BSP) clearance test to assess liver function
  - search the farm for possible sources of copper poisoning
3. You need to collect blood from a horse to use for transfusion. Which anticoagulant is best suited for collection of blood for transfusion?
- heparin
  - calcium ethylenediaminetetraacetic acid (EDTA)
  - acid-citrate-dextrose
  - oxalate
  - sodium EDTA

4. A 1-month-old Standardbred colt has epistaxis and hematomas. Results of laboratory tests are as follows:

	Patient	Normal
Packed cell volume	15%	35%
Platelet count	153,000 cells/μl	>100,000 cells/μl
Prothrombin time	17 sec	9 sec
Activated partial thromboplastin time (APTT)	110 sec	45 sec
Serum bile acid concentration	5 μmol/L	<20 μmol/L

What is the most likely cause of these findings?

- hemophilia A
  - warfarin toxicity
  - immune-mediated thrombocytopenia
  - disseminated intravascular coagulation (DIC)
  - liver failure
5. An 8-year-old quarter horse has mucosal petechiae, depression, and slight ventral edema. What is the **least** likely cause of these findings?
- immune-mediated thrombocytopenia
  - immune-mediated vasculitis
  - bracken fern toxicity
  - Ehrlichia equi* infection
  - equine viral arteritis
6. What is the most likely cause of Heinz-body anemia in an adult ewe?
- phenothiazine toxicity
  - red maple leaf toxicity
  - copper toxicity
  - leptospirosis
  - postparturient hemoglobinuria
7. As a percentage of the body weight in kilograms, what is the approximate normal blood volume of a horse?
- 16%
  - 8%
  - 4%
  - 2%
  - 1%
8. Concerning the Coggins test for equine infectious anemia, which statement is **least** accurate?
- It is an agar gel immunodiffusion test that detects antibodies to the causative agent.
  - It may be falsely positive in a foal nursing an infected dam.
  - Test results may be considered "valid" for interstate transport for up to 5 years.
  - It may be falsely negative in acutely infected horses.
  - It may be falsely negative in a small percentage of chronically infected horses.

9. Which blood type in a stallion is most commonly associated with neonatal isoerythrolysis in that sire's offspring?
- AQ
  - C
  - J
  - O
  - AB
10. Which disorder is **least** likely to cause icterus in a cow?
- external hemorrhage
  - liver disease
  - intravascular hemolysis
  - internal hemorrhage
  - extravascular hemolysis
11. Concerning regenerative anemia in horses, which statement is most accurate?
- Mean corpuscular volume (MCV) is increased.
  - Reticulocytes are seen on peripheral blood smears.
  - Basophilic stippling is seen on peripheral blood smears.
  - Signs of regeneration are not routinely seen in the peripheral blood.
  - Nucleated red blood cells are seen on peripheral blood smears.
12. Which of the following is most important in the decision to perform blood transfusion in large animal species?
- packed cell volume (PCV) less than 15% in chronic anemia
  - PCV less than 20% in acute anemia
  - clinical signs of hypoxia
  - all cases of intravascular hemolysis
  - all cases of extravascular hemolysis
13. All of the following are hematologic changes indicative of endotoxemia in horses **except**:
- left shift
  - basophilic cytoplasm in neutrophils

- neutropenia
- Döhle bodies in neutrophils
- Barr bodies in neutrophils

14. A 22-year-old Arabian mare has a history of weight loss and poor appetite of 1 month's duration. The owner says the mare seems to want to eat but shows mild colic during and immediately after eating. Today the owner noticed blood coming out of the mare's nostrils and a large, cool, nonpainful swelling over the left gluteal area, where she had bumped against a large branch in the pasture that morning. The mare is thin, weak, and depressed. Blood slowly drips from one nostril. The mucous membranes are pale and slightly icteric, with petechiae. The pulse rate is slightly increased but the heart rhythm is normal; no murmurs are audible. On rectal examination you feel numerous irregularities on the medial surface of the spleen. A blood sample collected from a vein, which produces a hematoma, yields the following results:

	Patient	Normal
Packed cell volume	13%	35%
Protein	5 g/dl	7 g/dl
Total serum bilirubin	6 mg/dl	<2 mg/dl
Direct serum bilirubin	0.4 mg/dl	<1 mg/dl
Platelet count	15,000 cells/ $\mu$ l	>100,000 cells/ $\mu$ l
Prothrombin time (PT)	19 sec	9 sec
Activated partial thromboplastin time (APTT)	80 sec	45 sec
Fibrinogen	500 mg/dl	200 to 400 mg/dl
Fibrin degradation products	32 $\mu$ g/ml	<8 $\mu$ g/ml

What is the most likely cause of these findings?

- chronic liver failure
- immune-mediated thrombocytopenia
- disseminated intravascular coagulation
- warfarin toxicosis
- sweet clover toxicity

15. Concerning hemolysis in large animal species, which statement is most accurate?
- Whether intravascular or extravascular, extensive hemolysis increases the total serum bilirubin level, most of which is conjugated (direct).
  - Leptospira interrogans* infects bovine erythrocytes, causing extravascular hemolysis.
  - Babesia caballi* infects equine erythrocytes, causing intravascular hemolysis.
  - Autoimmune hemolytic anemia most commonly results in intravascular hemolysis through production of antierythrocyte antibodies of the IgM class.
  - Cattle are the large animal species most susceptible to red maple leaf toxicity.
16. A 3-month-old Vietnamese pot-bellied pig has been anorectic and lethargic for several days. You notice that the mucous membranes are quite pale but not icteric. The packed cell volume is 14% (normal, 30%) and the total plasma protein level is 4.5 g/dl (normal, 7 g/dl). The red blood cell indexes are all normal. What is the most likely cause of these findings?
- leptospirosis
  - iron deficiency
  - acute external blood loss
  - eperythrozoonosis
  - bracken fern toxicity
17. Concerning equine infectious anemia (EIA), which statement is most accurate?
- A positive Coombs' test provides definitive diagnosis of EIA.
  - There is no known cure for EIA.
  - The retrovirus that causes EIA infects erythrocytes and causes anemia by intravascular hemolysis.
  - Icterus seen with EIA is caused primarily by an increased serum conjugated (direct) bilirubin level.
  - EIA is transmitted by mosquitoes.
18. All of the following are potential causes of icterus in cattle **except**:
- hepatocellular disease
  - intravascular hemolysis
  - anorexia
  - extravascular hemolysis
  - cholestasis
19. The owner of an adult Arabian gelding is concerned because for the past 2 days the gelding has not been eating well and seems depressed. The horse is used for pleasure riding and is kept at a large boarding facility with 25 other horses. No other horses in the stable are showing signs. On physical examination, the horse is mildly depressed. You note numerous petechial hemorrhages on the oral mucosa, but no other signs of hemorrhage. The rectal temperature, pulse rate, and respiratory rate are normal. You find no other abnormalities on physical examination. The packed cell volume is 35% (normal, 30% to 40%) and the total plasma protein level is 7.5 g/dl (normal, 5.5 to 7.8 g/dl). Which diagnostic test would be most helpful in narrowing the list of possible causes of petechiation?
- prothrombin time
  - differential white blood cell count
  - platelet count
  - equine viral arteritis titer
  - bromsulphthalein (BSP) clearance
20. You suspect that an icteric, anemic 3-day-old foal has neonatal isoerythrolysis. The foal's packed cell volume is 8%. The foal is in lateral recumbency and is too weak to stand. You want to give the foal a blood transfusion. Which horse would be the most appropriate erythrocyte donor for this transfusion?
- the foal's dam, after her erythrocytes have been thoroughly washed
  - the foal's sire
  - the foal's sire, after his erythrocytes have been thoroughly washed
  - an AQ-positive mare
  - another offspring from the same sire and dam
21. Which species has more lymphocytes than neutrophils in the peripheral blood?
- horses
  - cattle
  - pigs
  - sheep
  - goats

22. *Howell-Jolly bodies are most likely to normally be present in peripheral blood erythrocytes of:*
- pigs
  - sheep
  - horses
  - cattle
  - goats
23. *All of the following are likely hematologic or biochemical changes associated with chronic infection in horses **except**:*
- leftward shift
  - anemia
  - mature neutrophilia
  - monocytosis
  - hyperfibrinogenemia
24. *A healthy horse has a packed cell volume of 55% (normal, 40%) and a total plasma protein concentration of 6.5 g/dl (normal, 6.0 to 7.5 g/dl). What is the most likely cause of the polycythemia?*
- dehydration
  - bone marrow neoplasia
  - heart failure
  - anxiety
  - circulatory shock
25. *What is the most common cause of nonregenerative anemia in large animal species?*
- aplastic anemia
  - myelophthisis
  - renal failure
  - folic acid deficiency
  - chronic disease

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## Answers

- a** Anaplasmosis primarily causes extravascular hemolysis in cattle, as based on the presence of anemia and icterus with a normal MCHC and MCH and no hemoglobinuria.
- b** Babesiosis primarily causes intravascular hemolysis in horses, based on the presence of hematuria, hemoglobinuria, and icterus.
- c** The dextrose in acid-citrate-dextrose facilitates red blood cell survival *ex vivo*.
- b** Hemophilia A only affects the APTT. Immune-mediated thrombocytopenia or DIC is not likely to be involved because the platelet count is normal. Liver failure is unlikely because the bile acid concentration is normal.
- c** In horses, bracken fern toxicity does not cause petechiation from thrombocytopenia.
- c** Phenothiazine toxicity, red maple leaf toxicity, and postparturient hemoglobinuria cause Heinz-body anemia but have not been reported in sheep. Leptospirosis does not cause formation of Heinz bodies.
- b** Normal blood volume is approximately 7% to 10% of body weight in kilograms. Plasma volume is approximately 5% of body weight in kilograms.
- c** The results are valid for 1 year from the date that the blood sample was collected.
- a** When a broodmare that is AQ negative is bred to a stallion carrying the AQ antigen, the mare develops antibodies against the AQ antigen if retroplacental hemorrhage occurs during pregnancy. Anti-AQ antibodies are more likely to be produced with each subsequent pregnancy involving an AQ-positive fetus. Such foals are born normal but develop hemolytic anemia after consuming colostrum containing anti-AQ antibodies from the mare. Neonatal isoerythrolysis has not been reported to occur with inheritance of the C antigen. Horses do not have J, O, and AB antigens.
- a** If blood loss is external, hemoglobin is not released internally, and excessive bilirubin is not generated.
- d** In other species, increased MCV, increased reticulocyte numbers, and basophilic stippling are all signs of regenerative anemia. Horses do not typically show these signs of regeneration in the peripheral blood, despite a positive (regenerative) response of the bone marrow.

12. **c** Some animals may be severely anemic but have compensated for the hypoxemia; thus an immediate transfusion may not be warranted, despite a low PCV. Likewise, in some cases of anemia, the low PCV is not the only cause of hypoxemia (e.g., red maple leaf toxicity causes hemolytic anemia and methemoglobinemia). In such cases, a transfusion may be needed for the hypoxemia caused by the combination of hemolytic anemia and methemoglobinemia; the PCV alone may not accurately reflect this need.
13. **e** A Barr body is sex chromatin seen in nucleated cells of healthy mares. The other changes listed are not seen in healthy horses and are most consistently seen with endotoxemia.
14. **c** Liver failure, warfarin toxicity, and sweet clover toxicity do not affect the platelet count. Immune-mediated thrombocytopenia does not affect the PT and APTT.
15. **c** Hemolysis primarily increases the serum unconjugated bilirubin level. Leptospirosis produces hemolytic toxins, not hemolysis by infection of red blood cells. Autoimmune hemolytic anemia more commonly causes extravascular hemolysis from antibodies of the IgG class. Horses are most susceptible to red maple leaf toxicity.
16. **c** Leptospirosis and eperythrozoonosis cause hemolysis; the total plasma protein level would not be affected. Iron deficiency would not affect the total plasma protein level and typically causes microcytic hypochromic anemia. Bracken fern toxicity does not cause anemia in pigs.
17. **b** The Coggins test is used to diagnose EIA. The anemia is primarily of secondary autoimmune origin. The icterus is caused primarily by unconjugated bilirubin. EIA is transmitted by horse (tabanid) flies.
18. **c** Anorexia causes icterus in horses.
19. **c** By doing a platelet count first, you can determine whether the petechiae are the result of vasculitis (normal platelet count) or thrombocytopenia.
20. **a** Mares do not have AQ antigens on their red blood cells. The dam's red cells would not be destroyed by the anti-AQ antibodies in the foal's blood. However, because the mare may still have anti-AQ antibodies in her serum that may destroy the foal's red blood cells (the foal has AQ antigens on its red blood cells), the dam's red blood cells must be washed to remove any serum that may contain the anti-AQ antibody.
21. **b** Healthy mature cattle are likely to have more lymphocytes than neutrophils in their peripheral blood.
22. **c** In healthy horses, 1% to 2% of red blood cells may contain Howell-Jolly bodies, which are remnants of nuclear chromatin.
23. **a** A leftward shift is more common with acute diseases because the bone marrow has been "caught by surprise" and has not had time to respond to the sudden demand for mature neutrophils. Thus immature cells (bands) are released into the circulation until the disease condition improves or the demand is met (chronic disease).
24. **d** Anxiety causes splenic contraction in horses, subsequently increasing the circulating red blood cell mass by as much as one third. The other conditions listed are typically accompanied by an increased total plasma protein level (dehydration, shock) or clinical signs of disease.
25. **e** Chronic disease of any etiology, but especially infectious, inflammatory, or neoplastic disease, is the most common cause of suppressed erythropoiesis, resulting in nonregenerative anemia. After the chronic disease resolves, red cell regeneration ensues.

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## NOTES

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# 6

## Medical Diseases

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### *Recommended Reading*

- Colahan PT et al: *Equine medicine and surgery*, ed 5, St Louis, 1998, Mosby.
- Dyson SJ: *Self assessment picture tests in veterinary medicine equine practice*, St Louis, 1992, Mosby.
- Howard JL: *Current veterinary therapy: food animal practice 3*, Philadelphia, 1993, WB Saunders.
- Kimberling CV: *Jensen and Swift's diseases of sheep*, ed 3, Baltimore, 1988, Williams & Wilkins.
- Knottenbelt DC, Pascoe RR: *Color atlas of diseases and disorders of the horse*, St Louis, 1994, Mosby.
- Kobluk CN et al: *The horse: diseases and clinical management*, Philadelphia, 1995, WB Saunders.
- Leman AD et al: *Diseases of Swine*, ed 7, Ames, Iowa, 1992, Iowa State Univ Press.
- McKinnon A, Voss JL: *Equine reproduction*. Baltimore, 1992, Williams & Wilkins.
- Radostits OM et al: *Veterinary medicine*, ed 8, Philadelphia, 1994, WB Saunders.
- Rebhun WC: *Diseases of dairy cattle*, Baltimore, 1995, Williams & Wilkins.
- Robinson NE: *Current therapy in equine medicine 4*, Philadelphia, 1997, WB Saunders.
- Scott DW: *Large animal dermatology*, Philadelphia, 1988, WB Saunders.
- Smith BP: *Large animal internal medicine*, ed 2, St Louis, 1996, Mosby.
- Smith MC, Sherman DM: *Goat medicine*, Baltimore, 1994, Williams & Wilkins.
- Varner DD et al: *Manual of equine reproduction*, St Louis, 1998, Mosby.
- Youngquist RS: *Current therapy in large animal theriogenology*. Philadelphia, 1997, WB Saunders.

Practice answer sheets are on pages 283-288.

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# HORSES

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B.J. Darien

## Questions

- Which method is useful in differentiating regenerative anemia from nonregenerative anemia in horses?*
  - demonstration of reticulocytosis in the peripheral blood
  - demonstration of Howell-Jolly bodies in the peripheral blood
  - demonstration of Howell-Jolly bodies in the bone marrow
  - demonstration of adequate erythropoiesis in the bone marrow
  - demonstration of basophilic stippling in the bone marrow
- Which toxicant is a cause of Heinz-body hemolytic anemia in horses?*
  - red maple leaves
  - black walnut leaves
  - acorns
  - nitrates
  - bracken fern
- What is the most common age range during which horses develop lymphosarcoma?*
  - 4 to 9 years
  - 15 to 21 years
  - over 20 years
  - 10 to 15 years
  - 1 to 3 years
- Considering microbial sensitivity only, what is the first-choice antimicrobial against *Streptococcus equi*?*
  - gentamicin
  - oxacillin
  - penicillin
  - trimethoprim-sulfamethazine
  - amikacin
- Which antimicrobial is effective against  $\beta$ -lactamase-producing anaerobic bacteria?*
  - penicillin
  - cephalexin
  - ceftiofur
  - ticarcillin
  - metronidazole
- Which aspect of the inflammatory process is most affected by nonsteroidal antiinflammatory drugs?*
  - connective tissue remodeling
  - recruitment of leukocytes
  - pain response
  - synthesis and release of leukotrienes
  - antibody formation
- Concerning serum potassium concentration in horses, which statement is most accurate?*
  - Intravenous administration of alkalinizing solutions usually increases the serum potassium concentration.
  - Potassium is a major intracellular anion necessary for maintaining intracellular volume.
  - Hyperkalemia is frequently encountered in foals with diarrhea caused by enteric infection with rotavirus.
  - Plasma potassium concentrations are valuable for estimating the total body potassium deficit.
  - Potassium deficits are readily replaced once the horse resumes eating sufficient quantities of hay.
- Laminitis is an adverse effect associated with administration of:*
  - furosemide
  - phenylbutazone
  - dexamethasone
  - xylazine
  - acepromazine

9. A factor commonly leading to exertional myopathy in horses is:
- protein-deficient diet
  - hyperkalemic periodic paralysis
  - equine herpesvirus-1 infection
  - chronic phenylbutazone administration
  - changes in exercise patterns
10. Which of the following is involved in the pathogenesis of septic arthritis?
- relatively high rates of blood flow in synovial capillaries
  - articular cartilage destruction by enzymes produced by synovial and inflammatory cells
  - rapid chondrocyte proliferation and cartilage repair
  - localization of inoculated bacteria in synovial fluid
  - activation of most antimicrobial drugs in the purulent exudate associated with bacterial inflammation
11. Which of the following causes of appendicular bacterial cellulitis in horses commonly results in fatal systemic illness?
- Staphylococcus*
  - $\beta$ -hemolytic streptococci
  - Clostridium*
  - Pasteurella haemolytica*
  - Corynebacterium pseudotuberculosis*
12. Which of the following is **not** an acceptable therapy for removal of an esophageal feed impaction?
- administration of sedatives to reduce esophageal spasm
  - dislodging the impaction with pressure from a nasogastric tube
  - administration of sedatives and warm-water lavage via nasogastric tube
  - administration of sedatives and lavage using a cuffed nasogastric tube
  - lavage using a cuffed endotracheal tube and a cuffed nasogastric tube with general anesthesia
13. Which diet should be fed to a horse immediately after removal of an esophageal impaction that caused moderate mucosal damage?
- crimped oats
  - good-quality grass hay
  - alfalfa hay
  - slurry of pelleted feed
  - beet pulp
14. Foals with ulceration of the gastric squamous mucosa are most likely to show:
- acute depression or sudden death
  - abdominal distention and nasogastric reflux
  - abdominal pain with dorsal recumbency
  - bruxism and salivation
  - diarrhea, poor growth, and rough haircoat
15. Diarrhea in horses may be associated with any of the following **except**:
- colitis
  - sand impaction
  - feed impaction
  - esophageal impaction
  - large colon displacement
16. What is the most consistent clinical finding in horses with duodenitis-proximal jejunitis?
- severe, unrelenting abdominal pain
  - leukopenia and neutropenia
  - copious nasogastric reflux
  - normal rectal examination findings
  - fever
17. What is the most important therapy for horses with duodenitis-proximal jejunitis?
- analgesics to control pain
  - drugs to stimulate intestinal motility
  - dimethyl sulfoxide
  - gastric decompression
  - penicillin G

18. *What are the most common clinical findings in horses with peracute diffuse peritonitis resulting from intestinal perforation?*
- profound toxemia, weakness, tachycardia, circulatory failure, and rapid progression to death
  - chronic weight loss, intermittent abdominal pain, low-grade fever, partial anorexia, and slightly increased heart rate
  - depression, restlessness, hypophagia, and normal temperature, heart rate and respiratory rate
  - fever and slightly decreased appetite
  - ascites, limb edema, ventral abdominal edema, and chronic weight loss
19. *Which laboratory tests are best to evaluate horses with acute diarrhea and toxemia?*
- complete blood cell count, differential blood cell count, serum electrolyte concentrations, serum sorbitol dehydrogenase activity, serum aspartate transferase activity, serum bicarbonate or total carbon dioxide level, and fecal cultures for *Salmonella*
  - packed cell volume, complete blood cell count, differential blood cell count, serum electrolyte concentrations, serum creatinine concentration, serum bicarbonate or total carbon dioxide level, serum protein concentration, and fecal cultures for *Salmonella*
  - packed cell volume, serum electrolyte concentrations, serum creatinine concentration, serum sorbitol dehydrogenase activity, serum bicarbonate or total carbon dioxide level, serum protein concentration, and fecal cultures for *Salmonella*
  - packed cell volume, complete cell blood count, differential blood cell count, serum sorbitol dehydrogenase activity, serum  $\gamma$ -glutamyltransferase activity, and fecal cultures for *Salmonella*
  - packed cell volume, complete blood cell count, differential blood cell count, serum sorbitol dehydrogenase activity, serum  $\gamma$ -glutamyltransferase activity, serum creatinine concentration, serum protein concentration, and fecal cultures for *Salmonella*
20. *What is the most important treatment in horses with diarrhea and acute toxemia?*
- plasma
  - antiinflammatory agents
  - endotoxin antiserum
  - antimicrobial therapy
  - fluids
21. *Concerning Potomac horse fever (monocytic ehrlichiosis), which statement is most accurate?*
- Over 80% of the cases can be confirmed by serologic examination of paired serum samples collected 3 weeks apart.
  - Treatment with tetracycline inhibits antibody formation, thereby obscuring the diagnosis.
  - Over 80% of the cases can be confirmed by serologic examination of paired serum collected 7 days apart.
  - A marked decrease in titer ( $\geq$ four-fold decrease) is diagnostic.
  - Treatment with trimethoprim-sulfa inhibits antibody formation, thereby obscuring the diagnosis.
22. *Which drug is most effective against Potomac horse fever (monocytic ehrlichiosis)?*
- oxytetracycline
  - trimethoprim-sulfa
  - metronidazole
  - chloramphenicol
  - penicillin
23. *Elevated serum activity of which enzyme is specific for acute hepatocellular necrosis in horses?*
- alanine aminotransferase
  - lactate dehydrogenase
  - creatine phosphokinase
  - aspartate aminotransferase
  - sorbitol dehydrogenase

24. Which clinicopathologic abnormality is most common in horses with acute hepatic failure?
- hypoalbuminemia
  - hypoglobulinemia
  - prolonged prothrombin time
  - hypoglycemia
  - anemia
25. Common clinical signs in horses with hepatic failure caused by hepatocellular necrosis include:
- spontaneous epistaxis, colic, and icterus
  - head pressing, uncontrolled circling, and seizures
  - diarrhea, abdominal distention, and decreased gastrointestinal sounds
  - abdominal distention, nasogastric reflux, and icterus
  - abdominal distension, icterus, and diarrhea
26. Appropriate treatment of hepatic failure includes:
- oxytetracycline
  - dietary aromatic amino acids
  - intravenous glucose
  - vitamin C
  - erythromycin
27. What is the most consistent clinical manifestation of cholelithiasis in horses?
- dementia
  - profuse diarrhea
  - mild intermittent colic
  - severe unrelenting colic
  - spontaneous epistaxis
28. Which clinical sign frequently occurs in horses with guttural pouch mycosis?
- dysphagia
  - retropharyngeal swelling
  - ataxia
  - purulent nasal discharge
  - nasal petechiation
29. Which type of drug produces bronchodilation?
- parasympathomimetic
  - $\alpha$ -adrenergic receptor agonist
  - $\beta$ -adrenergic receptor antagonist
  - phosphodiesterase inhibitor
  - analeptic
30. Concerning pleuropneumonia in horses, which statement is most accurate?
- Mixed infections with gram-positive and gram-negative bacteria are common.
  - Most horses surviving pleuropneumonia do not return to athletic performance.
  - Aminoglycoside antibiotics are the treatment of choice for pleuropneumonia caused by anaerobic organisms.
  - Bacterial infection of the pleural space always precedes development of pleural effusion.
  - A putrid pleural effusion indicates gram-negative bacterial infection.
31. At therapeutic levels, digoxin causes:
- increased heart rate
  - accelerated atrioventricular conduction
  - supraventricular arrhythmias
  - peripheral vasoconstriction
  - increased cardiac contractility
32. Clostridium botulinum intoxication in horses is characterized by:
- ataxia, head tilt, facial paresis, and circling
  - weakness, tremors, reduced muscular tone, and dysphagia
  - dementia, head pressing, and seizures
  - depression, blindness, opisthotonos, and seizures
  - paraparesis, decreased tail tone, and perineal analgesia
33. Which of the following is a physiologic (nonpathologic) arrhythmia in horses?
- third-degree atrioventricular block
  - atrial fibrillation
  - ventricular premature depolarizations
  - supraventricular premature depolarizations
  - second-degree atrioventricular block

34. *Foals with a ventricular septal defect have a:*
- diastolic murmur at the right sternal border
  - systolic murmur at the left sternal border
  - diastolic murmur at the right sternal border and the pulmonic valve area
  - systolic murmur at the right sternal border and the pulmonic valve area
  - systolic murmur at the mitral valve area
35. *Which clinical sign can help differentiate foal-heat diarrhea from viral enteritis in a foal?*
- fetid odor of the feces
  - watery feces
  - hypophagia
  - normal body temperature
  - slight discomfort during passage of feces
36. *Which organism commonly causes diarrhea in foals?*
- coronavirus
  - enterotoxigenic *Escherichia coli*
  - Campylobacter jejuni*
  - rotavirus
  - Eimeria leukarti*
37. *Which organism is currently the most common cause of neonatal septicemia in foals in the United States?*
- Streptococcus zooepidemicus*
  - Escherichia coli*
  - Actinobacillus equuli*
  - Streptococcus equi*
  - Staphylococcus aureus*
38. *What is the most common early clinical sign of *Rhodococcus equi* infection?*
- fever
  - diarrhea
  - coughing
  - joint effusion
  - purulent nasal discharge
39. *Concerning acute toxic enteritis in foals, which statement is most accurate?*
- Definitive diagnosis is by demonstrating neutrophilia.
  - Definitive diagnosis is by demonstrating neutropenia.
  - Abdominal pain may precede diarrhea.
  - Hyperkalemia and hyponatremia are the most common electrolyte changes.
  - Abdominal pain results from peritonitis caused by intestinal inflammation.
40. *Which clinicopathologic findings allow definitive diagnosis of verminous arteritis?*
- hyperglobulinemia, hypoalbuminemia, and anemia
  - eosinophilia, hyperproteinemia, and anemia
  - hyper- $\beta$ -globulinemia, hypoalbuminemia, and anemia
  - demonstration of large strongyle ova in feces
  - no laboratory test for definitive diagnosis of verminous arteritis
41. *Concerning equine infectious anemia, which statement is most accurate?*
- Once infected, horses carry the virus for 1 to 2 years before eliminating it.
  - Neutralizing antibody is produced, which reduces the severity of clinical signs.
  - Neutralizing antibody is produced, which eliminates viral infection.
  - Natural transmission occurs via aerosol.
  - Over 50% of foals born to infected mares are infected for life.
42. *A diagnosis of insect allergy is based on:*
- the response to corticosteroid therapy
  - clinical signs and seasonality
  - demonstration of characteristic lesions on skin biopsy
  - absence of *Onchocerca cervicalis* microfilariae on skin biopsy
  - response to antimicrobial therapy

43. In May, you are called to examine a 5-year-old quarter horse with a skin problem. The mare had mild alopecia and crusting on the skin of the face, neck, and ventral midline. The mare rubs its neck and face on the walls of the stall. The owner first noticed the rubbing 3 weeks previously. The owner wants the mare treated so they can show the animal in a month. The most appropriate treatment plan is to:
- treat with procaine penicillin and bathe the mare with povidone-iodine shampoo
  - treat with dexamethasone for 2 weeks
  - treat with ivermectin and prednisone and initiate fly control
  - bathe the mare with povidone-iodine shampoo and apply coumaphos dip
  - bathe the mare with povidone-iodine shampoo, treat with procaine penicillin, and initiate fly control
44. Oxyuriasis may cause skin lesions and signs resembling those of:
- black fly dermatitis
  - chorioptic mange
  - onchocerciasis
  - myiasis
  - Culicoides* hypersensitivity
45. The most consistent early clinical finding in horses with granulomatous enteritis is:
- diarrhea
  - weight loss
  - peripheral lymphadenopathy
  - anorexia
  - fever
46. Concerning fecal examination for parasite ova in horses, which statement is most accurate?
- Fecal egg counts (eggs per gram of feces) correlate well with the severity of clinical signs.
  - Parasitism can be ruled out as a cause of chronic diarrhea in horses when fecal egg counts are less than 500 eggs/g feces.
  - Parasitism can be ruled out as a cause of chronic diarrhea in horses when fecal examination is negative for parasite ova.
  - Examination of feces from several horses in the same environment for parasite ova is useful for determining the efficacy of the parasite control program.
  - Parasitism can be ruled out as a cause of diarrhea in horses when fecal egg counts are less than 200 eggs/g feces.
47. You examine a 4-year-old thoroughbred mare that has had diarrhea for the past 3 months. The mare has a good attitude and appetite, and has not lost weight. Findings of your physical examination are normal, but the feces have a sloppy consistency. The soil in this area is not sandy. Packed cell volume is 38% (normal, 35% to 45%) and the total plasma protein level is 6.2 g/dl (normal, 6 to 7.5 g/dl). What is the most accurate assessment?
- Based on the mare's age, lymphosarcoma is unlikely.
  - The diarrhea is not severe enough to be associated with granulomatous enteritis.
  - Serum levels of creatine kinase, creatinine, and electrolytes should be evaluated initially.
  - Reasonable management at this time could include larvicidal anthelmintic therapy.
  - Parasitism is not a likely cause of the problem because the mare does not have anemia and hypoproteinemia.
48. You examine a 4-year-old quarter horse for acute depression and anorexia. The horse has a fever (104° F) and elevated heart rate (62 beats/min) and has not passed any feces in 12 hours. The mucous membranes are dry and hyperemic. Which statement is most accurate?
- Colitis should be included as a likely differential diagnosis.
  - Colitis is unlikely because the horse does not have diarrhea.
  - Antimicrobial therapy should be initiated immediately.
  - The mucous membranes are dry because of fever; therefore fluid therapy is not necessary.
  - Salmonellosis can be ruled out by the lack of diarrhea.

49. Which clinicopathologic findings are most likely in a horse with an abdominal abscess?
- neutrophilia, anemia, and hypoproteinemia
  - leukocytosis, hyperproteinemia, and lymphopenia
  - anemia, hypoproteinemia, and hyperfibrinogenemia
  - anemia, hyperproteinemia, and hyperfibrinogenemia
  - anemia and hypoproteinemia
50. You examine a 7-day-old thoroughbred filly for diarrhea. The foal is bright, alert, and nursing. The feces are watery, but the owner has only seen the foal have diarrhea twice in a day. Body temperature, heart rate, respiratory rate, and mucous membrane color are all normal. The foal is well hydrated. The other findings of physical examination are normal. What is the **most** appropriate course of action?
- The foal most likely has foal-heat diarrhea, but other differential diagnoses include nutritional diarrhea, parasitism, early rotaviral infection, or early salmonellosis. You should instruct the owner on how and when to monitor the foal.
  - You can rule out rotaviral infection and salmonellosis, but not parasitism. Therefore anthelmintics would be sufficient therapy.
  - You should evaluate a complete blood cell count and serum levels of electrolytes and glucose, and administer intravenous fluids.
  - The foal does not need intravenous fluids, but you should initiate antimicrobial therapy.
  - You should evaluate a complete blood cell count and serum levels of electrolytes and glucose, and administer intravenous fluids and antimicrobials.
51. Concerning diarrhea caused by ingestion of sand, which statement is most accurate?
- Sand-induced diarrhea only occurs in horses with a behavioral problem that causes them to eat large amounts of sand.
  - Sand-induced diarrhea resolves spontaneously after the horse is moved to a different environment.
  - Horses with sand-induced diarrhea almost always exhibit abdominal pain.
  - Horses with sand-induced diarrhea may have clinical signs of endotoxemia.
  - Mineral oil is the laxative of choice for treatment of diarrhea caused by sand accumulation.

**Questions 52 and 53**

An owner calls you to examine an 18-year-old thoroughbred gelding with a 4-month history of progressive exercise intolerance. The horse is ridden 3 to 4 times a week as a pleasure horse. At a cantor, the horse begins coughing and becomes dyspneic. The heart rate is 36 beats/min at rest. You auscultate the first, second, and third heart sounds and a grade 2/6 systolic murmur over the aortic valve.

52. Which statement is most accurate?
- The exercise intolerance is probably due to aortic valve insufficiency.
  - The audible third heart sound and murmur suggest mitral valve insufficiency.
  - The exercise intolerance is probably not due to cardiac disease.
  - Though the murmur is probably a functional murmur, the third heart sound suggests ventricular volume overload.
  - The exercise intolerance is due to left heart failure.
53. The most appropriate course of action is to:
- refer the horse to a teaching hospital for cardiac examination
  - submit blood for analysis of creatine kinase and lactate dehydrogenase activities
  - perform a respiratory examination
  - submit feed for monensin evaluation
  - perform an electrocardiographic examination



54. You are asked to do a prepurchase examination on a 12-year-old thoroughbred mare that is a Grand Prix jumper. The prospective buyer has been riding the animal strenuously for 3 weeks and has been pleased with the mare's performance. During cardiac examination, you auscultate the first, second, and third heart sounds. There is a grade 3/5 holosystolic murmur, with the point of maximal intensity over the tricuspid valve. Arterial pulses and jugular veins are normal. What is the most accurate assessment?

- a. The physical examination findings could be consistent with tricuspid insufficiency. Because there is no palpable thrill, the insufficiency will never progress to cause exercise intolerance.
- b. The physical examination findings are most consistent with ruptured mitral chordae tendineae. Because the arterial pulse is normal, it is unlikely to progress to cardiac failure.
- c. The physical examination findings are characteristic of pulmonic insufficiency.
- d. The physical examination findings could be consistent with tricuspid insufficiency. Because the horse is exercise tolerant, the prognosis is good, but echocardiographic examination is warranted.
- e. The physical examination findings could be consistent with tricuspid insufficiency. The horse will likely develop signs of congestive heart failure within a year.

55. You examine a 17-year-old thoroughbred gelding with ventral abdominal and limb edema. The rectal temperature is 100° F, the heart rate is 66 beats/min, and there is a jugular pulsation and distention. The cardiac rhythm is irregular. You hear a grade 4/6 systolic murmur over the tricuspid valve region. What is the most accurate assessment?

- a. The horse has heart failure caused by the arrhythmia.
- b. The gelding has pericarditis.
- c. The gelding has heart failure that could be due to valvular disease or myocardial disease.
- d. The horse consumed an excessive amount of monensin.
- e. The findings are most consistent with pleuropneumonia.

### Questions 56 and 57

You examine a 3-year-old thoroughbred racehorse that won a \$50,000 stakes race 2 weeks previously. The horse had a bad race a week later and has not been training well since. In the last race, the horse did well until the backstretch, when the jockey asked him to run at top speed. Your examination reveals an irregular heart rhythm, with a rate of 36 beats/minute. There is a grade 1/6 systolic murmur over the heart base. The jugular veins are normal. The arterial pulse is irregular but otherwise normal. An electrocardiogram reveals atrial fibrillation. Serum electrolyte levels and a complete blood count are normal.

56. The most likely cause of this problem is:

- a. septic pericarditis
- b. benign atrial fibrillation
- c. heart failure due to tricuspid insufficiency
- d. heart failure due to mitral insufficiency
- e. mitral insufficiency without heart failure

57. The most appropriate treatment for this horse is:

- a. digitalization to restore cardiac contractility
- b. conversion to normal cardiac rhythm with quinidine
- c. conversion to normal cardiac rhythm with lidocaine
- d. stall rest for 60 days
- e. digitalization followed by conversion with quinidine

58. A 2-month-old thoroughbred foal has not done well since birth. The foal has not been as vigorous as other foals and has only grown to the size of a 3-week-old foal. The heart rate is 150 beats/min and the pulse is weak. The foal has jugular distention and edema of all four limbs. There is a grade 4/6 systolic murmur, with the point of maximal intensity over the right sternal border. There is a grade 3/6 systolic murmur over the left side of the heart base. The mucous membranes are pink. The most likely cause of these findings is:

- a. ventricular septal defect
- b. aortic stenosis
- c. aortic atresia
- d. vascular ring anomaly
- e. tetralogy of Fallot

59. You examine a 2-month-old Arabian foal that has grown poorly and seems lethargic as compared with other foals on the farm. The foal seems to tire easily and has cyanotic mucous membranes.

There is a grade 4/6 harsh murmur that is loudest over the left side of the heart base but also audible on the right side of the chest. What is the most accurate assessment?

- a. The foal has an operable patent ductus arteriosus.
- b. The foal has a right-to-left shunt, most commonly associated with tetralogy of Fallot, and the prognosis for survival is grave.
- c. The foal has a ventricular septal defect that will probably never limit performance.
- d. The foal has benign atrial fibrillation and a good prognosis.
- e. The foal has aortic atresia and a good prognosis.

60. A 500-kg thoroughbred gelding has had profuse watery diarrhea for 2 days and is now 7% dehydrated. What volume of fluid is needed to correct this dehydration?

- a. 10 L
- b. 15 L
- c. 100 L
- d. 35 L
- e. 68 L

61. You examine a 5-year-old standardbred stallion with depression, anorexia, and fever (105° F). The heart rate is 60 beats/min and regular, and the respiratory rate is 12 breaths/min. There is mild jugular distention and pulsation. You carefully auscultate over the right fifth intercostal space and hear a very loud systolic murmur. There is a palpable thrill associated with this murmur. The most likely cause of these findings is:

- a. tricuspid insufficiency due to vegetative endocarditis
- b. pulmonic stenosis due to vegetative endocarditis
- c. septic pericarditis

- d. septic pleuritis
- e. septic pleuritis with cranial mediastinal abscessation

### Questions 62 and 63

You are testing a 5-month-old Arabian colt with severe watery diarrhea caused by salmonellosis. The heart rate is 56 beats/min and irregular. The mucous membranes are hyperemic. The colt is 5% dehydrated, anorexic, and depressed. An electrocardiogram reveals one ventricular premature depolarization for every six to eight normal sinus beats.

62. What is the most accurate assessment?

- a. There is probably myocardial damage due to electrolyte imbalances and endotoxemia.
- b. Equine influenza is the most likely cause of these problems.
- c. The arrhythmia is due to cardiac enlargement.
- d. The arrhythmia is due to high vagal tone.
- e. The arrhythmia is due to bacterial endocarditis.

63. The most appropriate treatment for this colt is:

- a. lidocaine
- b. digoxin
- c. resolution of the underlying disease
- d. euthanasia due to the grave prognosis
- e. quinidine

64. During cardiac examination of a 5-year-old thoroughbred mare, you hear the first, second, and third heart sounds in a regular rhythm. However, there are pauses after every 4 to 5 beats. What is the most appropriate management in this case?

- a. Perform echocardiography.
- b. Treat with quinidine sulfate.
- c. Place on stall rest for 30 days.
- d. Perform an electrocardiographic examination before and after exercise.
- e. Evaluate serum samples for creatine kinase and lactate dehydrogenase isoenzymes.

65. You examine a 25-year-old Appaloosa mare with edema along the ventral midline and in all four limbs. The edema has progressed over the last 3 weeks. There is a slight decrease in appetite. The heart rhythm is irregular, with pulse deficits. There is a grade 4/6 holosystolic murmur over the tricuspid valve. You note jugular pulsation. The most appropriate treatment is to administer:
- intravenous lidocaine
  - digoxin and quinidine sulfate
  - furosemide and digoxin
  - intravenous and oral potassium chloride
  - potassium chloride and quinidine gluconate
66. An 8-year-old quarter horse mare has a fever (104° F), elevated heart rate (52 beats/min), and edema in all four limbs and the muzzle. Icterus and petechial hemorrhages are not evident on the mucous membranes. What are the most appropriate sample and diagnostic test for definitive diagnosis?
- fecal sample for virus isolation
  - nasal swab for virus isolation
  - fecal sample for bacterial culture
  - urine for bacterial culture
  - nasal swab for bacterial culture
67. In examining a 6-year-old quarter horse mare with respiratory difficulty, you are trying to differentiate a pulmonary abnormality from upper respiratory tract obstruction. Which clinical finding is consistent with a pulmonary abnormality?
- rapid respiratory rate
  - coughing
  - expiratory abdominal lift
  - cyanotic mucous membranes
  - inspiratory stridor
68. Lyme disease (borreliosis) in horses can be diagnosed by:
- culturing the *Borrelia* organisms from blood
  - culturing the *Borrelia* organisms from synovial fluid
  - indirect fluorescent antibody testing for the *Borrelia* antigen in infected tissues
  - clinical signs and finding ticks on the animal
  - a positive serologic test
69. Which of the following can be effectively controlled by using fans in stalls?
- tabanid flies
  - Culicoides*
  - Haematopinus asini*
  - acarines
  - Musca autumnalis*
70. A common cause of urinary incontinence in horses is:
- equine herpesvirus-1 myeloencephalitis
  - toxoplasmosis
  - Sarcocystis neurona* infection
  - degenerative myelopathy
  - verminous myelopathy
71. Concerning atrial fibrillation in horses, which statement is most accurate?
- Atrial fibrillation in horses is usually secondary to gastrointestinal disorders. Because horses usually spontaneously convert from atrial fibrillation to sinus rhythm, quinidine therapy is rarely necessary.
  - Atrial fibrillation in horses without organic cardiac disease usually results from exercise. In most cases the atrial fibrillation will not spontaneously convert to normal sinus rhythm, and conversion with quinidine sulfate is necessary.
  - Because quinidine causes gastrointestinal side effects, lidocaine should be used to treat horses with atrial fibrillation and gastrointestinal disease.
  - Atrial fibrillation in horses usually results from exercise. In most cases after the primary disease resolves, the atrial fibrillation spontaneously converts to normal sinus rhythm.
  - Horses with atrial fibrillation not associated with organic cardiac disease respond best to treatment with digoxin.

72. Which antimicrobial is effective in treatment of diarrhea caused by *Salmonella*?
- gentamicin
  - chloramphenicol
  - antimicrobials are not effective for diarrhea caused by *Salmonella*
  - amikacin
  - trimethoprim-sulfadiazine
73. One week ago you treated a 10-year-old quarter horse mare for diarrhea and submitted five fecal samples for culture. The mare is now clinically normal. Two of the fecal samples were positive for *Salmonella*. The most appropriate course of action is to:
- isolate the mare
  - institute antimicrobial therapy
  - treat with oral fluids
  - treat with intravenous fluids
  - make no changes in the mare's management
74. A horse with no recent tetanus vaccination sustains multiple deep lacerations. Which of the following constitutes appropriate tetanus prophylaxis?
- intramuscular tetanus toxoid
  - intravenous tetanus toxoid
  - intramuscular tetanus antitoxin
  - topical antibiotic on the wounds
  - irrigation of the wounds
75. What is the most common clinical sign of hepatic failure in horses?
- depression
  - abdominal pain
  - diarrhea
  - trismus
  - epistaxis

### S.C. Eades

76. Pleural effusions are associated with various equine diseases or disorders. The most common cause of pleural effusion in horses is:
- pleuropneumonia or lung abscess
  - neoplasia
  - thoracic trauma
  - congestive heart failure
  - viral respiratory disease
77. Which diagnostic procedure is **not** commonly performed on equine pleural effusions?
- white blood cell count and differential cell count
  - Gram's stain
  - aerobic and anaerobic bacterial cultures
  - glucose determination
  - activated clotting time
78. In horses with pleural effusion, what pleural fluid glucose level suggests bacterial infection?
- 60 to 80 mg/dl
  - 90 to 100 mg/dl
  - 115 to 140 mg/dl
  - less than 40 mg/dl
  - greater than 150 mg/dl
79. If septic arthritis is diagnosed or suspected, the most appropriate initial therapeutic regimen should involve:
- bandaging any wound and monitoring the degree of lameness
  - broad-spectrum antimicrobial therapy and lavage of the joint with a balanced electrolyte solution
  - transection of the ligaments of the affected joint
  - application of a cast
  - lavage of the joint with 0.9% saline solution

80. Which clinicopathologic finding is **not** associated with septic synovial fluid?
- elevated white blood cell count (>30,000 nucleated cells/ $\mu$ l)
  - total protein concentration >3 g/dl
  - predominance (usually 80% to 90%) of neutrophils
  - bacteria in the synovial fluid
  - in chronic cases, neutrophils exhibiting degenerative changes
81. In addition to the history, physical examination findings, and clinical signs consistent with septic tenosynovitis, which of the following contributes most to definitive diagnosis of septic tenosynovitis?
- ultrasonography
  - contrast radiography
  - response to therapy
  - cytologic evaluation and bacterial culture of synovial fluid
  - radiography
82. The causative agent of equine protozoal myeloencephalitis is:
- Toxoplasma gondii*
  - Toxoplasma equi*
  - Sarcocystis falcatula*
  - Strongylus vulgaris*
  - Micronema deletrix*
83. Which drug is **not** commonly used to treat equine protozoal myeloencephalitis?
- pyrimethamine
  - trimethoprim-sulfadiazine
  - dimethyl sulfoxide
  - dexamethasone
  - penicillin
84. Concerning use of pyrimethamine and trimethoprim-sulfonamide combinations, which statement is **least** accurate?
- A possible side effect is thrombocytopenia.
  - A possible side effect is leukopenia.
  - The combination can result in a sequential blockade of folate metabolism.
  - When used together the drugs have synergistic activity against some protozoa.
  - Both pyrimethamine and trimethoprim inhibit dihydrofolate reductase and are effective against *Toxoplasma*.
85. One-stage prothrombin time is monitored in horses with navicular disease during treatment with:
- isoxsuprine
  - warfarin
  - hydralazine
  - phenylbutazone
  - reserpine
86. Concerning the role of false neurotransmitters in the pathophysiology of hepatoencephalopathy, which statement is **least** accurate?
- Levels of false neurotransmitters increase and levels of true neurotransmitters remain unchanged, but the effects of true neurotransmitters are competitively inhibited.
  - Hepatoencephalopathy is associated with increased serum aromatic amino acid levels.
  - Hepatoencephalopathy is associated with decreased serum levels of branched-chain amino acids.
  - Increased serum glucagon levels in hepatoencephalopathy lead to muscle catabolism and increased release of amino acids.
  - Hepatic metabolism of aromatic amino acids is reduced in horses with hepatoencephalopathy.
87. Concerning idiopathic laryngeal hemiplegia, or roaring, which statement is **least** accurate?
- It is the result of distal axonopathy of the recurrent laryngeal nerve.
  - The most definitive method for evaluation and diagnosis is endoscopy during treadmill exercise.
  - The slap (adductor reflex) test is a reliable way to diagnose and monitor horses with laryngeal hemiplegia.
  - A grading system (I to IV, with I being normal and IV being marked asymmetry of the larynx) can be used to categorize the clinical significance of endoscopic findings.
  - Laryngeal reinnervation involves restoration of abductor function of the dorsal cricoarytenoid muscle.

88. *A muscle-relaxing drug that works by blocking sodium and calcium channels in cell membranes and that is used to prevent chronic exertional rhabdomyolysis is:*
- dantrolene sodium
  - sodium bicarbonate
  - dimethylglycine
  - acepromazine
  - diphenylhydantoin (phenytoin)
89. *Concerning sarcoids, which statement is **least** accurate?*
- Sarcoids are usually malignant.
  - Sarcoids are fibroblastic skin tumors.
  - Sarcoids affect horses, donkeys, and mules.
  - Three clinical forms of sarcoids have been identified: hyperkeratotic fibropapilloma, fibrosarcoma or fibroblastic fibropapilloma, and a mixed form.
  - Sarcoids are characterized histologically by epidermal hyperplasia and dermal fibroplasia.
90. *Which treatment is recommended for periocular sarcoids?*
- bacille bilié de Calmette-Guérin (BCG)
  - autogenous vaccine
  - radiotherapy using radium
  - radiotherapy using cobalt
  - cryotherapy
91. *Cervical vertebral stenotic myelopathy (wobbler syndrome) results in progressive ataxia produced by spinal cord compression. Concerning this disease, which statement is **least** accurate?*
- Dynamic and static stenosis of the cervical vertebral canal are manifestations of the disease.
  - Dynamic stenosis is a cervical vertebral instability that occurs when the neck is flexed.
  - Dynamic lesions are usually found at interspaces C3-C4 and C4-C5 of horses 6 to 18 months of age.
  - Cervical static stenosis is a vertebral canal narrowing.
  - Static stenosis lesions occur in horses 6 to 18 months of age at interspaces C5-C6 and C6-C7.
92. *Concerning endotoxins, which statement is **least** accurate?*
- Endotoxin is the lipopolysaccharide cell-wall component of gram-negative bacteria.
  - Lipopolysaccharide is released continuously from gram-negative bacteria.
  - The endotoxin core structures (lipid A and core polysaccharide) are similar throughout a wide range of gram-negative bacteria.
  - Infection with pathogenic (smooth) gram-negative organisms results in production of O-polysaccharide-specific immunoglobulins.
  - Endotoxins can initiate shock, disseminated intravascular coagulation, and multisystemic organ dysfunction.
93. *Concerning larval cyathostomiasis, which statement is **least** accurate?*
- Larval cyathostomiasis is most common in young horses but can occur in horses of all ages.
  - Clinical signs of cyathostomiasis may include diarrhea, colic, weight loss, dependent edema, and delayed shedding of the winter haircoat.
  - The disease is seasonal and associated with emergence of larvae from the gut wall after hypobiosis.
  - Adult cyathostomiasis does not usually cause diarrhea but can contribute to protein-losing enteropathy.
  - Ivermectin and some benzimidazole dewormers are the only anthelmintics effective against third-stage larvae encysted in the gut wall.
94. *Myelography is **contraindicated** in horses with:*
- ataxia
  - bacteremia
  - cranial nerve deficits
  - cervical pain
  - rear limb paresis
95. *Neurotoxicity related to metrizamide myelography is associated with:*
- the glucosamide unit
  - hypertonicity
  - ionic subunits
  - the rate of administration
  - urokinase activity

96. Concerning pyometra, which statement is most accurate?
- In closed pyometra, concurrent endometritis leads to accumulation of purulent uterine debris.
  - Epithelial-cell damage caused by endometritis is not believed to alter the release of prostaglandins.
  - In open pyometra, uterine muscular contractions are usually normal.
  - In open pyometra, the vulvar discharge is never malodorous.
  - Both types of pyometra are associated with release of gonadotropin-releasing hormone.
97. Which clinical or ultrasonographic sign is **not** consistent with umbilical remnant infection in foals?
- enlargement of umbilical remnant structures
  - drainage of purulent material and a persistently patent urachus
  - persistent or intermittent fever
  - contraction of vessel walls, with obliteration of the lumen of the umbilical arteries
  - hyperechoic free-gas echoes in the lumen of umbilical remnant structures
98. Concerning ultrasonographic evaluation of foals with uroperitoneum, which statement is **least** accurate?
- Large quantities of sonolucent fluid in the abdomen indicate uroperitoneum.
  - Fibrin is commonly evident in the hypoechoic abdominal fluid of a foal with a ruptured bladder.
  - In cases of uroperitoneum associated with bladder rupture, the bladder is collapsed.
  - In cases of ureteral rupture a small, intact, fluid-filled bladder and anechoic abdominal fluid are evident.
  - The bladder wall can be evaluated; in some patients a tear in the wall is evident.
99. Which respiratory disease is **not** likely to produce abnormalities on thoracic ultrasonographic examination?
- interstitial pneumonia
  - pleuritis
  - pleuropneumonia
  - bronchopneumonia
  - Rhodococcus equi* pneumonia
100. Muscle damage resulting from prolonged recumbency is best assessed by monitoring:
- serum  $\gamma$ -glutamyltransferase and aspartate aminotransferase activities
  - the complete blood cell count
  - serum creatine kinase activity and urea nitrogen level
  - serum aspartate aminotransferase and creatine kinase activities
  - serum alkaline phosphatase and aspartate aminotransferase activities
101. Concerning corneal ulceration, which statement is **least** accurate?
- Photophobia, blepharospasm, and lacrimation are common clinical signs.
  - Corneal edema is evident around a crater lesion.
  - Corneal neovascularization develops rapidly from limbic vasculature at 1 to 2 mm/day.
  - Superficial neovascularization develops centrally from the area of ulceration.
  - Hypopyon results from microbial toxins affecting iris vasculature permeability.
102. Concerning keratoconjunctivitis, which statement is **least** accurate?
- Onchocerca cervicalis* is a common cause of parasitic keratitis.
  - Onchocerca* lesions are frequently bilateral.
  - Diagnosis is by conjunctival and corneal biopsies that exhibit eosinophilic inflammation and microfilariae.
  - Onchocerca* lesions usually begin in the central cornea and spread to the limbus.
  - Treatment of *Onchocerca* keratoconjunctivitis consists of topical or systemic larvicidal agents in conjunction with topical corticosteroids to control inflammation.

103. Which organisms are frequently cultured from the conjunctiva and cornea of horses with external eye disease?
- Streptococcus, Staphylococcus, Pseudomonas, and Aspergillus*
  - Staphylococcus, Pseudomonas, Aspergillus, and Trichophyton*
  - Staphylococcus, Pseudomonas, Clostridium, and Aspergillus*
  - Pseudomonas, Clostridium, Trichophyton, and Aspergillus*
  - Moraxella, Bacillus, Aspergillus, and Streptococcus*
104. Which organisms are commonly isolated from the eyes of normal horses?
- Bacillus, Corynebacterium, Staphylococcus, and Aspergillus*
  - Streptococcus, Staphylococcus, Bacillus, and Pseudomonas*
  - Streptococcus, Staphylococcus, Aspergillus, and Trichophyton*
  - Bacillus, Streptococcus, Aspergillus, and Enterobacter*
  - Bacillus, Streptococcus, Escherichia, and Trichophyton*
105. Where is most of the cerebrospinal fluid (CSF) produced in horses?
- ventricular choroid plexuses of the two lateral ventricles
  - ependymal lining of the ventricles
  - meningeal blood vessels
  - third and fourth ventricles
  - mesencephalic aqueduct
106. Which complication may occur during cerebrospinal fluid (CSF) collection from the atlantooccipital space when intracranial pressure is increased?
- brain-stem penetration by the needle
  - herniation of the cerebellum ventral to the foramen magnum
  - penetration of the blood-CSF-brain barrier
  - marked subarachnoid hemorrhage
  - marked extradural hemorrhage
107. Concerning cerebrospinal fluid (CSF) pressure, which statement is **least** accurate?
- CSF pressure can be determined after a spinal needle is inserted into the subarachnoid space.
  - Intracranial venous sinus pressure correlates directly with CSF pressure.
  - Jugular vein occlusion increases internal carotid artery pressure, which increases intracranial venous sinus pressure.
  - Intracranial venous sinus pressure depends on jugular and vertebral vein pressure.
  - Jugular vein occlusion increases CSF pressure by directly increasing intracranial venous sinus pressure.
108. Which statement best describes the cerebrospinal fluid (CSF)-brain barrier?
- The impermeability of the CSF-brain barrier is related to the unique microvasculature of the brain.
  - The CSF-brain barrier is formed from the central nervous system pia mater and the ependyma of the ventricles.
  - Astrocyte foot processes seal endothelial tight junctions.
  - The CSF-brain barrier is highly permeable to water.
  - The CSF-brain barrier can be penetrated by radiographic contrast agents.
109. Concerning management practices used in equine parasite control, which statement is **least** accurate?
- Frequent removal of feces from pastures and paddocks reduces the number of infective larvae.
  - Manure removed from a pasture should be composted for 3 months to kill cyathostome larvae before spreading the manure on a pasture to be grazed by horses.
  - Parasite transmission can be minimized by deworming all horses on a farm at one time.
  - Deworming horses and moving them to a pasture that has not been grazed for some time is an effective means of breaking the parasite life cycle.
  - Because third-stage larvae may persist in pastures for more than 20 weeks in northern temperate climates, pasture rotation may not be completely beneficial.



110. Concerning evaluation of the efficacy of parasite control programs, which statement is **least** accurate?
- At 1 to 2 weeks after anthelmintic therapy, 20% of the horses should be evaluated for nematode ova.
  - Tapeworm ova are best detected using the Wisconsin technique.
  - Fecal egg counts should be performed on all fecal samples that show eggs on fecal flotation.
  - Fecal egg counts cannot predict the number of parasites a horse harbors.
  - Pasture contamination can be considered low if fecal egg counts are below 50 eggs/g.
111. Concerning *Cryptosporidium* infection in foals, which statement is **least** accurate?
- Cryptosporidium* infection occurs only in immunodeficient Arabian foals.
  - Diarrhea caused by cryptosporidiosis is more likely to develop in orphaned foals fed a commercial milk replacer.
  - The site of infection is the epithelial brush border of the small intestine.
  - Diagnosis is difficult because of the small oocyst size (4 to 6  $\mu\text{m}$ ).
  - Effective treatment is not available.
112. Concerning tapeworm infection, which statement is **least** accurate?
- The common tapeworms of horses are *Anoplocephala magna* and *Anoplocephala perfoliata*.
  - The life cycle involves snails as intermediate hosts.
  - Tapeworms are more common in adult horses than in foals.
  - Clinical signs attributable to tapeworm infection include unthriftiness, intestinal ulceration, and intussusception.
  - Pyrantel pamoate is the treatment of choice against *Anoplocephala*.
113. Paraphimosis in horses is most commonly associated with:
- neoplasia of the penis
  - equine herpesvirus-1 myelitis
  - trauma
  - administration of a phenothiazine-derivative tranquilizer
  - debilitation
114. Which drug is **contraindicated** in horses with paraphimosis?
- chloral hydrate
  - acepromazine maleate
  - xylazine hydrochloride
  - pentazocine lactate
  - phenoxybenzamine
115. Which clinical sign is **not** commonly associated with hepatic encephalopathy?
- depression
  - seizures
  - head pressing
  - coma
  - aimless walking
116. Approximately what proportion of the hepatic parenchyma must be affected before clinical signs of hepatoencephalopathy are manifested?
- 15%
  - 25%
  - 45%
  - 75%
  - 100%
117. Leukoencephalomalacia is associated with ingestion of moldy corn contaminated with:
- Fusarium moniliforme*
  - Penicillium*
  - Fusarium proliferatum*
  - Listeria monocytogenes*
  - Aspergillus*

118. Concerning ammonia metabolism and hyperammonemia in hepatoencephalopathy, which statement is **least** accurate?
- Ammonia is transported to the liver, where it is converted to urea and glutamine.
  - Plasma ammonia levels correlate well with clinical signs of hepatoencephalopathy.
  - Hyperammonemia does not produce the typical electroencephalographic changes associated with hepatoencephalopathy.
  - Ammonia competes with potassium and thereby inhibits sodium-potassium-dependent adenosine triphosphatase.
  - Seizures are common in experimental hyperammonemia but uncommon in horses with hepatoencephalopathy.
119. Concerning warfarin therapy, which statement is **least** accurate?
- Warfarin therapy inhibits factor VII and prolongs the activated partial thromboplastin time.
  - Warfarin is a vitamin K antagonist.
  - Warfarin therapy results in a deficiency of vitamin K in the liver.
  - Warfarin therapy results in a deficiency of factors II, VII, IX, and X, and of protein C.
  - The effect of warfarin therapy on coagulation (prolongation of the prothrombin time) is due to inhibition of factor VII and protein C.
120. Serum levels of which amino acids are likely to be increased in horses with hepatoencephalopathy?
- phenylalanine, tyrosine, and tryptophan
  - valine, leucine, and isoleucine
  - norepinephrine and dopamine
  - dobutamine, taurine, and methionine
  - ammonia and short-chain amino acids
121. Which clinicopathologic finding is **least** specific for hepatoencephalopathy in horses?
- increased serum L-iditol 2-dehydrogenase activity
  - increased serum  $\gamma$ -glutamyltransferase activity
  - increased serum bile acid levels
  - increased serum unconjugated (indirect-reacting) bilirubin level
  - decreased serum levels of vitamin K-dependent coagulation factors (II, VII, IX, X, and protein C)
122. Which treatment for hepatoencephalopathy is most likely to result in an undesirable side effect?
- use of xylazine for sedation
  - use of oral neomycin to reduce production of ammonia
  - use of oral lactulose to reduce luminal pH
  - feeding a ration high in carbohydrates and low in protein
  - weekly parenteral administration of vitamins B<sub>1</sub> and K<sub>1</sub>
123. The primary determinant of permanent intraabdominal adhesion (fibrous) formation is:
- increased antithrombin III activity in peritoneal fluid
  - decreased plasma antithrombin III activity
  - impaired fibrinolysis secondary to ischemia, endotoxemia, infection, and serosal trauma
  - altered plasminogen activator activity in peritoneal fluid
  - increased serum levels of fibrinogen degradation products
124. Concerning tissue plasminogen activators, which statement is most accurate?
- Activators are released only by endothelial cells.
  - Activators are released by activated neutrophils.
  - Activators are inhibited by protein C.
  - Activators function by converting plasminogen to plasmin.
  - Fibrinolytic activity is balanced by the contact phase of the procoagulant pathway.

125. Concerning inhibition of the coagulation cascade, which statement is most accurate?
- Procoagulant released from activated macrophages inhibits the intrinsic pathway.
  - Antithrombin III and protein C are circulating anticoagulants.
  - Tissue thromboplastin inhibits the extrinsic coagulation pathway.
  - Inhibitors of coagulation include plasminogen activator inhibitor-1 and  $\alpha$ -antiplasmin.
  - Protein C can enhance fibrinolysis by inactivating plasminogen activator inhibitor-1.
126. Which condition is **not** a clinical problem associated with postoperative intraabdominal adhesions in horses?
- chronic intermittent colic
  - propensity toward large-colon displacement
  - propensity toward incarceration of a segment of small intestine
  - sharp convolutions of the intestine that require surgical correction
  - propensity toward volvulus of a segment of small intestine
127. Which mechanism is primarily responsible for upper airway injury in fire victims?
- carbon monoxide poisoning
  - inhalation of large particles (soot)
  - direct thermal injury caused by inhalation of hot ( $>302^{\circ}$  F) air
  - chemical injury caused by inhalation of noxious gases
  - inhalation of particles smaller than  $2.5 \mu\text{m}$
128. Acute pulmonary insufficiency following smoke inhalation injury and carbon monoxide poisoning is related to:
- pathologic changes of the upper respiratory tract
  - pathologic changes of type II alveolar epithelial cells
  - pathologic changes of type I alveolar epithelial cells
  - reduced oxygen-carrying capacity of hemoglobin
  - a shift in the oxyhemoglobin dissociation curve to the right
129. Which of the following best describes the pathologic change that occurs secondary to smoke inhalation?
- pulmonary hemorrhage
  - microvascular thrombosis
  - pulmonary atelectasis
  - pulmonary edema
  - pulmonary emphysema
130. Concerning bronchopneumonia associated with smoke inhalation injury, which statement is **least** accurate?
- Impaired mucociliary clearance and alveolar macrophage function predisposes toward bacterial infection.
  - The risk of bacterial bronchopneumonia is greatest during the 7 to 14 days following smoke inhalation injury.
  - The mucociliary (tracheobronchial) apparatus requires 30 days to recover.
  - Patients with concomitant burns are at greater risk of developing bacterial bronchopneumonia.
  - Pneumonia secondary to smoke inhalation injury usually involves gram-negative organisms.
131. In horses with smoke inhalation injury, the most important therapeutic agent to administer is:
- a diuretic
  - oxygen
  - a vasodilator
  - a broad-spectrum antimicrobial
  - a bronchodilator
132. In foals under 6 months of age, an umbilical hernia less than 3 cm wide should be:
- closed surgically to prevent intestinal incarceration
  - monitored weekly to ensure early closure
  - monitored daily, as spontaneous closure is likely between 6 and 12 months of age
  - opened to allow drainage from the hernial sac
  - treated with an external blister to promote closure

133. A high prevalence of umbilical hernias is seen in:
- quarter horse males
  - Shetland ponies
  - quarter horse females
  - Welsh ponies
  - thoroughbred females
134. Uncomplicated umbilical hernias are best diagnosed by:
- a complete blood cell count
  - ultrasonographic examination
  - barium contrast radiography
  - palpation
  - surgical exploration
135. Which diagnostic finding is **not** consistent with complicated (infected) umbilical hernias?
- painful response to palpation
  - hernia is not reducible
  - hyperechoic ultrasonographic findings
  - anechoic ultrasonographic findings
  - auscultation of intestinal peristalsis within the hernial sac
136. Which clinical sign is **not** commonly associated with renal disease in horses?
- hematuria
  - painful urination
  - anorexia
  - weight loss
  - fever
137. Which urinary tract structure is **not** normally visualized by ultrasonography in horses?
- renal cortex
  - renal medulla
  - renal pelvis
  - renal interlobar vessels
  - ureters
138. Which clinical condition does **not** support use of renal ultrasonography as a diagnostic procedure?
- abnormal renal function (increased serum creatinine level)
  - pyuria
  - client's complaint of a sore back
  - hematuria of renal origin
  - abnormal size or texture of the left kidney
139. Which of the following is **not** a common cause of chronic renal failure in horses?
- glomerulonephritis
  - cantharidin toxicosis
  - chronic interstitial nephritis
  - pyelonephritis
  - renal dysplasia
140. Ultrasonographic findings with a renal pelvic calculus may include any of the following **except**:
- intensely echogenic interfaces within the renal pelvis or parenchyma
  - an acoustic shadow usually associated with the calculi
  - obscuring of the renal parenchyma image deep to an acoustic shadow
  - hydronephrosis secondary to renal pelvic calculi
  - hydroureters secondary to renal pelvic calculi
141. Which mediator is responsible for release of a protease enzyme that degrades the joint cartilage matrix?
- histamine
  - interleukin-1
  - 5-hydroxytryptamine
  - leukotriene B<sub>4</sub>
  - thromboxane
142. Which mediator is a neurotransmitter of joint inflammation?
- histamine
  - substance P
  - prostaglandin E<sub>2</sub>
  - prostacyclin
  - complement C5a

143. Which endogenous substance is responsible for perpetuating synovitis and cartilage destruction?
- kininogen
  - serotonin
  - substance P
  - thromboxane
  - fibronectin
144. Concerning the function of hyaluronic acid, which statement is most accurate?
- It causes synovocytes to proliferate.
  - It is responsible for the greatest proportion of resistance to joint motion.
  - It is a boundary lubricant of the synovial membrane.
  - It stimulates fibroblast proliferation.
  - It is a lubricant of the articular cartilage.
145. Concerning dentigerous cysts, which statement is most accurate?
- They originate from the first branchial cleft.
  - They are benign but locally invasive.
  - They are malignant.
  - They can be malignant or benign.
  - They are benign in horses but malignant in sheep.
146. Dentigerous cysts have been reported in:
- horses and sheep only
  - dogs, cattle, sheep, and horses
  - horses and small ruminants only
  - horses and ruminants only
  - horses, cats, goats, pigs, and rabbits
147. Teeth found within dentigerous cysts most often resemble:
- canine teeth
  - incisors
  - premolars
  - molars
  - wolf teeth
148. The most common anatomic location of a dentigerous cyst in horses is the:
- forehead
  - maxillary sinus
  - frontal sinus
  - base of the ear
  - base of the mandible
149. Concerning dentigerous cysts, which statement is **least** accurate?
- They are most common in quarter horses.
  - They are a type of odontogenetic cyst.
  - They usually are evident as a firm swelling, often with a draining tract due to rupture of the cyst.
  - They are usually present at birth and enlarge during the first weeks of life.
  - They are usually diagnosed within the first 2 years of life.
150. Concerning *Parascaris equorum*, which statement is **least** accurate?
- It is a common nematode parasite of young horses.
  - Eggs become infective in less than 14 days if ambient temperatures are between 25° and 35° C.
  - Larvae die at temperatures less than 10° C.
  - Eggs die if temperatures exceed 39° C.
  - Eggs can remain viable for long periods at temperatures less than 10° C.
151. Concerning the parasitic portion of the life cycle of *Parascaris equorum*, which statement is **least** accurate?
- The life cycle begins with ingestion of infective eggs.
  - Third-stage larvae migrate via the mesenteric artery to the liver in the first week after infection.
  - Larvae migrate to the lungs about 10 days after infection.
  - Larvae migrate within the lungs for about 1 week before proceeding to the major airways.
  - Most larvae arrive in the small intestine 2 to 3 weeks after ingestion.

152. *The prepatent period for Parascaris equorum infection is:*
- 75 to 100 days
  - 65 to 120 days
  - 55 to 65 days
  - 35 to 50 days
  - 115 to 135 days
153. *Which of the following is **not** associated with Parascaris equorum infection?*
- weight loss
  - coughing and nasal discharge
  - lethargy
  - slow weight gain
  - protein-losing enteropathy
154. *Which of the following is **not** commonly associated with Parascaris equorum infection?*
- hepatic periportal necrosis following hepatic migration
  - pulmonary petechial hemorrhages associated with lung migration
  - mechanical obstruction of the small bowel
  - elevated serum activities of liver-derived enzymes during hepatic migration
  - colic or peritonitis
155. *Immunity to Parascaris equorum infection:*
- develops in foals by the time they reach 6 months of age
  - develops in the absence of previous exposure
  - arrests larval migration in the liver and lungs
  - is partly responsible for spontaneous elimination of worms from the gastrointestinal tract
  - is paralleled by increased serum pepsinogen concentrations
156. *Anthelmintic treatment for Parascaris equorum infection:*
- is most important with respect to the patient's parasite burden
  - should consist of a benzimidazole if a rapid kill is desired
  - should consist of an avermectin if a rapid kill is desired
  - should consist of an organophosphate if a slow kill is desired
  - should consist of piperazine if a slow kill is desired
157. *Benzimidazole anthelmintics (e.g., thiabendazole) act by:*
- neuromuscular hyperpolarization
  - ganglionic stimulation
  - inhibition of cholinesterase
  - potentiation of  $\gamma$ -aminobutyric acid
  - inhibition of fumarate reductase
158. *Simple heterocyclic anthelmintics (e.g., piperazine) act by:*
- inhibition of fumarate reductase
  - neuromuscular hyperpolarization
  - ganglionic stimulation
  - inhibition of cholinesterase
  - potentiation of  $\gamma$ -aminobutyric acid
159. *Imidazole anthelmintics (e.g., levamisole) act by:*
- cholinergic stimulation
  - inhibition of fumarate reductase
  - ganglionic stimulation
  - cholinergic agonism
  - potentiation of  $\gamma$ -aminobutyric acid
160. *Tetrahydropyrimidine anthelmintics (e.g., pyrantel pamoate) act by:*
- cholinergic agonism
  - inhibition of fumarate reductase
  - neuromuscular hyperpolarization
  - inhibition of cholinesterase
  - ganglionic stimulation
161. *Organophosphate anthelmintics (e.g., dischlorvos) act by:*
- cholinergic agonism
  - ganglionic stimulation
  - inhibition of cholinesterase
  - neuromuscular hyperpolarization
  - potentiation of  $\gamma$ -aminobutyric acid

162. *Avermectin anthelmintics (e.g., ivermectin) act by:*
- a. inhibition of glucose transport
  - b. inhibition of false neurotransmitters
  - c. ganglionic stimulation
  - d. potentiation of  $\gamma$ -aminobutyric acid
  - e. serotonergic agonism
163. *The most common type of acquired cataract in horses is:*
- a. juvenile-onset cataract
  - b. senile cataract
  - c. nuclear lenticular sclerosis
  - d. anterior subcapsular cortical cataract
  - e. associated with recurrent uveitis or trauma
164. *Cataract surgery is most likely to be successful in:*
- a. foals under 6 months of age
  - b. horses under 2 years of age
  - c. horses of any age because age does not influence the outcome of cataract surgery
  - d. horses over 3 years of age
  - e. horses 6 to 18 months of age
165. *Which condition is **least** likely to be associated with jugular vein thrombophlebitis in horses?*
- a. acute toxic colitis
  - b. proximal enteritis
  - c. intestinal strangulation
  - d. cantharidin toxicosis
  - e. chronic renal failure
166. *Clinical signs commonly associated with jugular vein thrombophlebitis in horses include all of the following **except**:*
- a. edema of the head
  - b. pharyngeal and laryngeal edema
  - c. dysphagia and dyspnea
  - d. fever and a stiff neck
  - e. serous ocular discharge
167. *Which of the following is **not** involved in the pathogenesis of thrombophlebitis?*
- a. venous stasis
  - b. vascular endothelial injury
  - c. collateral circulation
  - d. platelet activation
  - e. thromboplastin generation
168. *Hemostasis is best described as a balance between:*
- a. stimulation and inhibition of coagulation
  - b. stimulation and inhibition of fibrinolysis
  - c. stimulation and inhibition of coagulation and fibrinolysis
  - d. coagulation and fibrinolysis
  - e. a procoagulant drive and its associated inhibitors
169. *Which congenital cardiac anomaly is most common in horses?*
- a. tetralogy of Fallot
  - b. ventricular septal defect
  - c. tricuspid atresia
  - d. patent foramen ovale
  - e. atrial septal defect
170. *Disruption of endothelial integrity results in all the following **except**:*
- a. exposure of subendothelial collagen
  - b. activation of factor VIII (von Willebrand factor)
  - c. activation of factor XII (Hageman factor)
  - d. adherence of platelets to von Willebrand factor
  - e. adherence of platelets to Hageman factor
171. *Which physiologic process is **not** related to the basic platelet reaction?*
- a. release of platelet-derived prostacyclin
  - b. release of platelet-derived thromboxane
  - c. release of platelet-derived adenosine diphosphate
  - d. release of platelet factor 3
  - e. release of platelet-derived serotonin

172. Which physiologic mechanism is **not** related to platelet plug (clot) formation and localization?
- endogenous proteoglycans (heparan) on the intact vascular endothelium
  - circulating antithrombin III
  - protein C
  - the fibrinolytic system
  - tissue thromboplastin
173. In horses, disseminated intravascular coagulation is most frequently associated with:
- gram-negative septicemia
  - neoplasia
  - immune system disorders
  - trauma
  - hemolytic disorders
174. The organism most likely to cause septicemia in a foal less than 3 days of age, unrelated to uterine disease in the dam, is:
- Actinobacillus equuli*
  - Escherichia coli*
  - Streptococcus faecalis*
  - Klebsiella pneumoniae*
  - Salmonella dublin*
175. Which parasite is **not** effectively controlled with ivermectin?
- Hypoderma*
  - Gasterophilus*
  - biting louse (e.g., *Damalina*)
  - sucking louse (e.g., *Hematopinus*)
  - Habronema*
176. The sites most favored by black flies (*Simulium*) are the:
- pinnae and medial thigh
  - ventral midline and pectoral region
  - withers and fetlocks
  - base of the tail and lateral thigh
  - face and neck
177. Which of the following best describes *Culicoides* hypersensitivity in horses?
- seasonal ventral and pectoral dermatitis, with areas of depigmentation
  - seasonal pruritus involving the base of the tail and mane
  - a bull's-eye lesion in the middle of the face
  - ventral midline dermatitis with ulcers and crusting
  - ulcerative nodular dermatitis
178. The primary impact of mosquitoes on equine husbandry and disease is:
- anemia from blood loss
  - cutaneous nodular hypersensitivity
  - transmission of blood parasites
  - transmission of viruses
  - weight loss from annoyance
179. Which procedure is required to control house flies and stable flies?
- frequent spraying of insecticides around barns
  - applying repellents and insecticidal sprays to horses
  - installing electric light traps around barns
  - proper disposal of hay and manure
  - administering oral insecticides
180. Cutaneous habronemiasis (summer sores) is a:
- disease of the lymphatics of the extremities
  - skin disease of the ventral midline, transmitted by midges
  - seasonal granulomatous skin disease transmitted by house flies and stable flies
  - seasonal granulomatous skin disease transmitted by *Culicoides* gnats
  - skin disease of the face, transmitted by *Culicoides* gnats



181. Concerning onchocerciasis, which statement is **least** accurate?
- Cutaneous onchocerciasis is characterized by alopecia and depigmentation.
  - Adult *Onchocerca cervicalis* worms live in the nuchal ligament.
  - Culicoides* gnats ingest the microfilariae of *Onchocerca* in the dermis.
  - Ivermectin therapy kills both microfilariae and adult *O. cervicalis* worms.
  - Lesions can appear on the face, chest, withers and ventral midline.
182. Which clinical sign is **not** consistent with dental disease?
- selective appetite
  - quidding and halitosis
  - mucopurulent nasal discharge
  - poor performance or altered temperament
  - rapid onset of severe osseous facial deformity
183. Which of the following is **not** associated with wolf teeth?
- behavioral problems in young horses
  - abnormal head carriage
  - head shaking
  - refusing to take a bit
  - snorting while working with a bit
184. Concerning retained deciduous teeth, which statement is **least** accurate?
- Dental caps are deciduous teeth that remain attached to newly erupted teeth.
  - The fourth premolar is the most frequently involved deciduous tooth.
  - The upper incisors frequently become impacted as deciduous teeth.
  - The fourth premolar tooth is the last tooth to erupt, and its emergence may be compromised by adjacent teeth.
  - Wolf teeth usually cause no problems with respect to deciduous teeth.
185. Concerning the teeth of horses, which statement is **least** accurate?
- Sharp enamel edges normally develop along the buccal aspect of the lower arcade.
  - Sharp enamel edges usually develop along the lingual aspect of the lower arcade.
  - Sharp enamel edges normally develop along the buccal surface of the upper arcade.
  - Shear mouth is most common in older horses.
  - Dental extraction results in a step mouth.
186. Concerning nutritional muscular dystrophy, which statement is **least** accurate?
- The synonym for nutritional muscular dystrophy is *white muscle disease*.
  - It is a noninflammatory degenerative disease of skeletal and cardiac muscles.
  - It is an inflammatory degenerative disease of skeletal and cardiac muscles.
  - It occurs more frequently in areas with low or deficient soil selenium concentrations (Pacific Northwest, Great Lakes region).
  - It is associated with dietary selenium and vitamin E deficiencies.
187. Which of the following is **not** consistent or associated with nutritional muscular dystrophy in foals?
- stiffness and muscular weakness
  - dysphagia and myalgia
  - depression and anorexia without evidence of infectious disease
  - cough, nasal discharge, and fever
  - poor suckle reflex
188. Other than dietary selenium deficiency, which factor is **not** associated with nutritional muscular dystrophy in foals?
- high dietary levels of polyunsaturated fats
  - exercise
  - low dietary levels of vitamin E
  - stress
  - low dietary levels of zinc

189. Which clinicopathologic assay best assesses the selenium status in a horse?
- selenium concentration in red blood cells
  - selenium concentration in whole blood
  - serum creatine kinase and aspartate aminotransferase activities
  - selenium concentration in liver
  - vitamin E concentration in liver
190. Serum activity of which enzyme increases in proportion to the severity of muscle damage?
- lactate dehydrogenase isoenzyme 1
  - aspartate aminotransferase
  - lactate dehydrogenase isoenzyme 5
  - creatine kinase
  - $\gamma$ -glutamyltransferase
191. Which clinical sign is **not** associated with disorders of prehension or mastication?
- difficulty eating
  - quidding
  - halitosis
  - chewing on one side of the mouth
  - head tilt
192. Nigropallidal encephalomalacia occurs following ingestion of:
- yellow star thistle (*Centaurea solstitialis*)
  - white snakeroot (*Eupatorium rugosum*)
  - alsike clover (*Trifolium hybridum*)
  - Saint John's wort (*Hypericum*)
  - hound's tongue (*Cynoglossum officinale*)
193. Drugs in which class are **not** considered photosensitizing agents?
- phenothiazines
  - tetracyclines
  - chlorthiazides
  - sulfonamides
  - aminoglycosides
194. In examining horses with dysphagia, the examiner should take precautions because of the risk of:
- displacing fracture fragments
  - contracting rabies
  - contracting clostridial myositis
  - suffocating the animal
  - contracting herpesvirus infection
195. Dysphagia from a snakebite is associated with:
- direct nerve damage
  - pharyngeal paralysis
  - pharyngeal edema
  - systemic toxemia
  - necrotizing glossitis
196. Which of the following is **not** used in medical management of priapism?
- supporting sling
  - phenothiazine tranquilizers
  - diuretics
  - ganglionic blockers
  - penile massage
197. What is the most common tumor of the equine penis and prepuce?
- hemangiosarcoma
  - squamous-cell carcinoma
  - papilloma
  - sarcoid
  - melanoma
198. Uterine torsion accounts for what percentage of dystocia in mares?
- less than 2%
  - 5% to 10%
  - 25% to 50%
  - 65% to 75%
  - 15% to 25%

199. *The most common clinical sign of uterine torsion in mares is:*
- colic
  - hemorrhagic vulvar discharge
  - vaginal prolapse
  - hematuria
  - abdominal distention
200. *As viewed from the rear, the direction of uterine torsion in a mare is:*
- usually clockwise
  - usually counterclockwise
  - equally likely to be clockwise or counterclockwise
  - usually clockwise
  - usually counterclockwise
- M. R. Paradis**
201. *Failure of passive transfer of maternal antibodies in foals is indicated by serum immunoglobulin G (IgG) levels of:*
- <800 mg/dl
  - <1500 mg/dl
  - 800 to 1000 mg/dl
  - <2000 mg/dl
  - <3 g/dl
202. *Moderately severe meconium impaction should be treated with:*
- castor oil per os twice daily
  - a soapy water enema, and mineral oil given by nasogastric tube
  - muzzling so the newborn foal cannot nurse
  - flunixin meglumine three times daily for pain relief
  - exploratory laparotomy and enterotomy
203. *You are presented with a 4-day-old colt that is weak and shocky. The foal's abdomen is distended and the owner has not seen it urinate. You suspect a ruptured bladder. When you obtain the results of serum chemistry analysis, what abnormalities would you expect?*
- increased serum calcium level, decreased serum potassium and chloride levels
  - decreased serum potassium, sodium, and chloride levels
  - increased serum potassium level, decreased serum sodium and chloride levels
  - decreased serum calcium, sodium, and chloride levels
  - increased serum sodium level, decreased serum potassium and chloride levels
204. *An owner calls you at 10 AM in panic. His mare foaled yesterday at noon and the foal has not yet stood to nurse. You examine the foal. It is severely depressed and may be going into septicemic shock. What organisms are most likely to be involved?*
- Proteus* and *Escherichia coli*
  - Serratia* and *Salmonella*
  - Streptococcus* and *Pseudomonas*
  - Actinobacillus* and *Proteus*
  - E. coli* and *Klebsiella*
205. *A client has a pregnant Arabian mare that is at risk for producing a foal with combined immunodeficiency. Which tests would aid diagnosis of this condition in the mare's newborn foal?*
- presuckle serum immunoglobulin (Ig)M levels, total lymphocyte count
  - serum IgG levels at 24 hours of age, total lymphocyte count
  - serum chemistry profile, complete blood cell count
  - postsuckle serum IgA levels, neutrophil count
  - presuckle serum IgG levels, lymphocyte count

206. *The most common causes of icterus in horses are:*
- hemolysis, liver disease, and anorexia
  - phototoxins, lymphosarcoma, and hyperbilirubinemia
  - hyperlipidemia, aflatoxicosis, and salmonellosis
  - septicemia, hyperammonemia, and ferrous fumarate toxicity
  - disseminated intravascular coagulation, blood loss anemia, and increased red blood cell fragility
207. *Neonatal isoerythrolysis is an immune-mediated hemolytic anemia of newborn foals. Concerning this disease, which statement is most accurate?*
- The mare's antibodies cross the placenta and damage the foal's red blood cells in utero.
  - It only occurs with a mare's first pregnancy.
  - It occurs in foals that have absorbed colostral antibodies against their own red blood cells.
  - Blood groups Ba and Tb are the most antigenic blood types.
  - The best therapy involves a whole-blood transfusion from the mare to the foal.
208. *You go out to your barn and discover that your horse's legs and belly are edematous. The horse recovered from an episode of strangles last week. Further examination reveals petechial hemorrhages on the gingivae. You diagnose purpura hemorrhagica. What is the most appropriate treatment for this animal?*
- vitamin E and selenium
  - alternating warm-water and cold-water hydrotherapy
  - penicillin and dexamethasone
  - methocarbamol (muscle relaxant)
  - blood transfusion for platelets
209. *A 9-year-old gelding with acute onset of a bilateral nasal discharge and a cough is stabled at a show horse barn. On physical examination, the horse has a rectal temperature of 105° F and slight swelling of the mandibular lymph nodes. The lung sounds are normal. The most likely causes of these signs include:*
- chronic airway disease, equine influenza, and mycoplasmal pneumonia
  - equine influenza, *Streptococcus equi* infection, and equine herpesvirus-1 infection
  - equine influenza, lungworm infection, and viral arteritis
  - pleuritis, *Rhodococcus equi* infection, and equine herpesvirus-1 infection
  - laryngeal hemiplegia, ethmoidal cyst, and lungworm infection
210. *Which drug is **contraindicated** in treatment of laminitis in otherwise healthy horses?*
- heparin
  - phenylbutazone
  - isoxsuprine
  - dexamethasone
  - aspirin
211. *A 3-month-old foal has a rectal temperature of 104° F, a cough, and dyspnea. A complete blood cell count reveals leukocytosis with neutrophilia and monocytosis. Culture of transtracheal aspirates yields *Rhodococcus equi*. What is the most appropriate treatment for this horse?*
- erythromycin and rifampin
  - penicillin and gentamicin
  - trimethoprim-sulfa
  - chloramphenicol
  - metronidazole and kanamycin
212. *The most important factor in managing horses with chronic obstructive pulmonary disease is:*
- use of an appropriate antibiotic for an appropriate period
  - intermittent use of a bronchodilator
  - environmental management
  - use of expectorants
  - judicious use of corticosteroids

213. In Massachusetts, you are asked to examine a horse that just arrived after a 48-hour trailer ride from Florida. The horse has a rectal temperature of 105° F and is depressed. You detect no airway sounds in the ventral thorax and percuss dullness on the thorax from the level of the shoulder to the elbow. The most likely cause of these findings is:
- parasitic pneumonitis
  - pneumothorax
  - chronic obstructive pulmonary disease
  - pleuropneumonia
  - exercise-induced pulmonary hemorrhage
214. The most common congenital cardiac defect in foals (and calves) is:
- ventricular septal defect
  - tetralogy of Fallot
  - common truncus arteriosus
  - patent ductus arteriosus
  - aortic stenosis
215. On electrocardiograms, atrial fibrillation is characterized by:
- irregular R-R interval, absence of P waves, and presence of F waves
  - regular P-P interval and regular R-R interval, but no consistent relationship between the P wave and QRS complex
  - P wave of variable configuration and minor changes in the P-R interval
  - P wave occasionally not followed by a QRS complex, with a variable R-R interval
  - bizarre QRS complex that is slightly longer in duration
216. Overzealous use of vitamin D<sub>3</sub> can result in mineralization of soft tissues, especially of the endocardium and walls of the great vessels. Which electrolyte abnormalities are associated with this problem?
- hypercalcemia and hypophosphatemia
  - hyperphosphatemia, normocalcemia, or hypercalcemia
  - hyponatremia and hypocalcemia
  - hypercalcemia and hypochloremia
  - hypophosphatemia and hypocalcemia
217. Thoracic auscultation of a horse in respiratory distress reveals moist wheezes and crackles over the entire lung field and a loud grade-5/6 pansystolic heart murmur, with a point of maximal intensity at the mitral valve. A foamy white discharge is exiting both nostrils. The onset of the problem was acute. The most likely cause of these signs is:
- atrial fibrillation
  - acute exacerbation of chronic obstructive pulmonary disease
  - ruptured chordae tendineae
  - caudal vena caval thrombosis
  - anaphylactic reaction to an environmental antigen
218. In a 24-hour-old foal, a loud grade-4/6 holosystolic murmur at the third left intercostal space is most likely associated with:
- a ventricular septal defect, the most common cardiac defect in horses
  - a closing ductus arteriosus, a normal finding in equine neonates
  - severe anemia caused by neonatal isoerythrolysis
  - multiple congenital cardiac anomalies, such as tetralogy of Fallot
  - vegetative endocarditis of the aortic valve, secondary to sepsis
219. Nutritional support is very important in management of neonatal foals. Each day, a normal 40-kg foal requires approximately how much mare's milk?
- 1 L
  - 2 L
  - 4 L
  - 6 L
  - 8 L

220. *The nature of respiratory disease in sick neonatal foals is most accurately assessed by:*
- careful auscultation and percussion of the thorax
  - thoracic radiographs and arterial blood gas analyses
  - ultrasonographic examination for atelectasis
  - transtracheal wash for cytologic evaluation and culture
  - bronchoalveolar wash for surfactant analysis
221. *Generalized seizures should be controlled in neonates. Which drug is the first choice for seizure control because of its rapid effect?*
- diazepam
  - acepromazine
  - xylazine
  - butorphanol
  - detomidine
222. *The fluid of choice for treatment of foals in shock is:*
- 0.45% saline solution
  - 0.9% saline solution plus 20% dextrose
  - lactated Ringer's solution plus 5% dextrose
  - 5% dextrose solution
  - 50% dextrose solution plus amino acid
223. *A 5-year-old mare slips on ice and strikes its head. On physical examination the mare appears normal, except that the right ear and eyelid droop and the muzzle appears to be pulled to the left. These signs indicate damage to the:*
- facial nerve
  - oculomotor nerve
  - trochlear nerve
  - vestibular nerve
  - trigeminal nerve
224. *A 10-month-old Arabian colt has developed fine tremors of the head and neck in the past 5 months. The colt also has a high-stepping gait in the front limbs. The most likely cause of these signs is:*
- cervical vertebral malformation
  - degenerative myelitis
  - cerebellar arbiotrophy
  - trauma to the cervical spinal cord
  - protozoal myelitis
225. *An 18-month-old colt has symmetric ataxia that is worse in the rear legs than in the front legs. The most likely causes of these signs include:*
- herpesviral myelitis, protozoal myelitis, or cervical vertebral malformation
  - cervical vertebral malformation, degenerative myelopathy, or trauma
  - degenerative myelopathy, spinal abscess, or spastic syndrome
  - trauma, protozoal myelitis, or atlantoaxial malformation
  - myotonia congenita, parasite migration, or herpesviral myelitis
226. *A 7-year-old gelding has a temperature of 103° F, depression, ataxia, tetraparesis, and urinary incontinence. The most likely cause of these signs is:*
- degenerative myelopathy
  - polioencephalomalacia
  - equine influenza A
  - herpesviral myeloencephalitis
  - vitamin A deficiency
227. *The drugs of choice for treatment of protozoal encephalomyelitis are:*
- trimethoprim-sulfadiazine and pyrimethamine
  - penicillin and gentamicin
  - cloxacillin and streptomycin
  - tetracycline and sulfisoxazole
  - cephalothin and ampicillin
228. *Nigropallidal encephalomalacia is associated with ingestion of:*
- deadly nightshade
  - silvery lupine
  - bracken fern
  - yellow star thistle
  - western choke cherry

229. After vaccinating her horse with several different vaccines, an owner calls you to report that her horse is depressed and febrile, and has a large fluctuant swelling over the vaccine injection site. You try to aspirate the swelling and obtain a large amount of gas before you aspirate a dark red, serous fluid. The most likely cause of these findings is:
- sterile injection abscess
  - hematoma from injection
  - clostridial myonecrosis
  - rhabdomyolysis
  - streptococcal abscess
230. *Escherichia coli* is the most common gram-negative organism involved in neonatal septicemia. What is the drug of choice for treatment of neonatal septicemia?
- trimethprim-sulfa
  - chloramphenicol
  - tetracycline
  - amikacin
  - ampicillin
231. Acute onset of ataxia, a head tilt, and facial nerve paresis suggests:
- a pathologic fracture of the petrous temporal bone
  - cerebellar neoplasia
  - degenerative myelitis
  - nigropallidal encephalomalacia
  - Horner's syndrome
232. Eastern and western equine encephalomyelitis are transmitted by:
- direct contact with infective animals
  - mosquitos
  - ticks
  - ingestion of moldy grains
  - ingestion of infected bird excreta
233. Equine herpesvirus-1 encephalomyelitis is characterized by:
- neuronal vacuolation
  - hypomyelination of oligodendroglial cells
  - perivascular cuffing of mononuclear cells
  - microabscessation in the cerebrum
  - vasculitis, ischemia, and hemorrhagic infarcts
234. Leukoencephalomalacia is caused by:
- ingestion of corn infested with *Fusarium moniliforme*
  - ethylene glycol intoxication
  - thiamin deficiency
  - vitamin A deficiency
  - ingestion of high levels of lead
235. How does the blood of horses differ from that of other mammalian species?
- it shows no peripheral signs of regeneration, such as reticulocyte production
  - the hematocrit is generally lower and more constant
  - erythrocytes tend to stay in suspension unless centrifuged
  - Heinz bodies are a normal finding
  - the serum is clear and colorless
236. The only way to verify erythrocyte regeneration in horses is by:
- an increased mean corpuscular volume
  - bone marrow evaluation
  - presence of polychromasia
  - presence of anisocytosis
  - increased autoagglutination
237. Hematologic evidence of anemia associated with external blood loss includes a decreased hematocrit and:
- decreased total plasma protein
  - normal plasma protein level
  - hemolyzed plasma
  - hemoglobinuria
  - icteric serum
238. Intravascular hemolysis is characterized by:
- bone marrow suppression
  - intense icterus and hemoglobinuria
  - Howell-Jolly bodies
  - decreased total plasma protein levels
  - decreased red blood cell fragility

239. *Equine infectious anemia is diagnosed by:*

- a. mouse inoculation
- b. the Coombs' test
- c. the presence of Heinz bodies
- d. the Coggins' test
- e. cytologic examination of bone marrow aspirates

240. *In horses, the life span of transfused red blood cells is:*

- a. 2 to 4 days
- b. 7 to 10 days
- c. 15 to 20 days
- d. 20 to 25 days
- e. over 25 days

241. *A whole-blood transfusion should be considered in a horse showing:*

- a. a steady decrease in packed cell volume to 12% in 24 to 48 hours
- b. a rapid decrease in packed cell volume from 45% to 30% in 12 hours
- c. a packed cell volume remaining at 12% for more than 48 hours
- d. a packed cell volume remaining between 15% and 20% for more than 1 week
- e. bone marrow with no regenerative response after 48 hours

242. *A cause of Heinz-body hemolytic anemia in horses is:*

- a. ingestion of red maple leaves
- b. copper toxicity
- c. selenium deficiency
- d. anaplasmosis
- e. equine infectious anemia

243. *Heinz bodies are formed by:*

- a. chronic hypoxia
- b. precipitation of denatured hemoglobin
- c. autoantibodies against red blood cells
- d. parasitism of red blood cells
- e. viremia

244. *The most common hematopoietic neoplasm of horses is:*

- a. lymphosarcoma
- b. hemangiosarcoma
- c. fibrosarcoma
- d. granulocytic leukemia
- e. eosinophilic leukemia

**Questions 245 through 247**

*A horse has acute intravascular hemolysis, with a packed cell volume of 10% and hemoglobinuria.*

245. *The most likely causes of these findings include:*

- a. anaplasmosis, onion poisoning, and equine infectious anemia
- b. equine infectious anemia, red maple toxicity, and ehrlichiosis
- c. ehrlichiosis, anaplasmosis, and babesiosis
- d. babesiosis, autoimmune hemolytic anemia, and leptospirosis
- e. red maple toxicity, leptospirosis, and phenothiazine toxicity

246. *The most appropriate treatment for this horse is:*

- a. diuresis with intravenous fluids given at twice the volume required for daily maintenance
- b. dietary iron supplementation
- c. intravenous infusion of blood and lactated Ringer's solution
- d. intravenous infusion of 3% to 5% dimethyl sulfoxide
- e. aminoglycoside antibiotic therapy

247. *If this horse survives the original problem, what is a possible sequela?*

- a. hemoglobinuric nephrosis
- b. hypoproliferative bone marrow
- c. chronic carrier state
- d. diffuse thrombosis
- e. hemophilia A



248. In a horse with a pleural effusion, thoracentesis yields a yellow, flocculent fluid with a foul smell. A malodorous effusion usually indicates:
- Escherichia coli* infection
  - bastard strangles
  - anaerobic infection
  - neoplasia
  - Mycoplasma* infection
249. Culture of a sample of a pleural effusion yields the anaerobe *Bacteroides fragilis*. The antimicrobial of choice to treat this horse is:
- gentamicin
  - penicillin
  - ampicillin
  - erythromycin
  - metronidazole
250. A 2-year-old filly has a temperature of 105° F, a mucopurulent nasal discharge, respiratory stridor, and a large hard swelling in the throatlatch area (caudal to the ramus of the mandible). The owner bought the filly at an auction the previous week. The most likely cause of these findings is:
- Streptococcus equi* infection
  - Streptococcus zooepidemicus* infection
  - Corynebacterium* infection
  - pharyngeal foreign body
  - salivary neoplasia
251. You are asked to investigate a widespread outbreak of upper respiratory tract disease at the local race track. Affected horses have a high fever for 2 days, a serous nasal discharge, cough, and lethargy. You suspect equine influenza. Which test would confirm your tentative diagnosis?
- anaerobic culture of a transtracheal aspirate
  - fourfold increases in influenza antibody titers over a 2-week period
  - an interstitial lung pattern on thoracic radiographs
  - response to acyclovir, an antiviral drug
  - endoscopic evidence of tracheitis and pharyngitis
252. Strangles, or *Streptococcus equi* infection, is a highly contagious disease transmitted by:
- direct contact with purulent discharges
  - fecal-oral route
  - bird excrement
  - insect vectors
  - contaminated needles
253. Adenoviral infection is a significant problem in:
- Arabian foals with combined immunodeficiency
  - geriatric horses with chronic obstructive pulmonary disease
  - neonatal foals with septicemia
  - racehorses with pulmonary hemorrhage
  - unvaccinated horses on overpopulated farms
254. Guttural pouch empyema usually results from:
- rupture of retropharyngeal abscesses into the guttural pouch
  - influenza infections of the upper respiratory tract
  - trauma secondary to improper use of a balling gun
  - a congenital defect in the guttural pouch openings
  - severe pharyngitis secondary to rhinoviral infection
255. An 18-year-old retired racehorse has intermittent bouts of epistaxis. The most likely causes of this problem include:
- ethmoid hematoma and guttural pouch mycosis
  - Oestrus ovis* infection and nasal ulceration
  - exercise-induced pulmonary hemorrhage and pulmonary carcinoma
  - coagulation defect and strangle abscess
  - pharyngitis/laryngitis complex and choke

256. *In horses with idiopathic laryngeal hemiplegia:*
- a. the arytenepiglottic fold is stretched tightly over the epiglottis
  - b. the soft palate is elevated over the epiglottis during exercise
  - c. the epiglottis appears smaller and flaccid
  - d. the arytenoid cartilage and vocal fold are drawn into the airway
  - e. the palatopharyngeal arch is displaced rostrally
257. *The first permanent tooth to erupt in a horse is the:*
- a. second premolar
  - b. third premolar
  - c. fourth premolar
  - d. first molar
  - e. second molar
258. *A 3-year-old gelding develops a hard, nonpainful, symmetric enlargement on the ramus of the mandible. The most likely cause of this lesion in a horse of this age is:*
- a. retained deciduous premolars
  - b. dental cysts on the permanent tooth roots
  - c. osteosarcoma
  - d. periodontal disease
  - e. paranasal sinusitis
259. *Dentigerous cysts originate from tooth germ tissue. They are usually located in the:*
- a. interdental space
  - b. area of the first premolar
  - c. area of the ear or temporal region
  - d. ethmoid turbinates
  - e. paranasal sinuses
260. *After eating, a 14-year-old pony suddenly becomes anxious and shows neck-stretching and salivation, with food-tinged fluid exiting the nares. You suspect an esophageal obstruction/choke. The most appropriate initial diagnostic test to perform is:*
- a. radiography of the head and neck
  - b. a barium swallow
  - c. passage of a nasogastric tube
  - d. offering the animal water to see if it can drink
  - e. complete blood cell count and serum chemistry profile
261. *A common sequela of esophageal obstruction is:*
- a. aspiration pneumonia
  - b. esophageal rupture
  - c. megaesophagus
  - d. esophageal cysts
  - e. esophageal achalasia
262. *Gastric ulceration is a fairly common finding on gastroscopy of horses and foals. Most animals are subclinically affected. Gastric ulcers are most commonly located at the:*
- a. lesser curvature of the stomach
  - b. squamous portion of the margo plicatus
  - c. glandular portion of the stomach
  - d. pyloric antrum
  - e. esophageal sphincter
263. *A horse shows an increasing level of abdominal pain during a 12-hour period. On physical examination you detect a heart rate of 60 beats/min, dark pink mucosae, decreased intestinal sounds, and no abnormalities on rectal examination. Passage of a nasogastric tube produces 20 L of gastric reflux. The horse appears much more comfortable after removal of the gastric fluid. On abdominocentesis the peritoneal fluid has a normal white blood cell count and a slightly elevated protein content. The most likely cause of these findings is:*
- a. small-intestinal volvulus
  - b. impacted pelvic flexure
  - c. ileocecal intussusception
  - d. proximal enteritis/duodenitis
  - e. enterolith

264. In a horse with prolonged esophageal obstruction and excessive salivation, which electrolyte and acid-base abnormalities are most likely to occur?
- hyponatremia, hypochloremia, metabolic alkalosis
  - hypernatremia, hypochloremia, metabolic acidosis
  - hyperkalemia, hyperchloremia, metabolic alkalosis
  - hypokalemia, hyperchloremia, respiratory alkalosis
  - hyponatremia, hyperchloremia, metabolic acidosis
265. The agent that causes Potomac horse fever is:
- Ehrlichia risticii*
  - Clostridium perfringens*
  - Salmonella typhimurium*
  - coronavirus
  - Escherichia coli*
266. A 5-year-old, 450-kg crossbred mare develops acute, profuse diarrhea. You estimate the mare to be 7% dehydrated. What quantity of intravenous fluids is needed to replace fluid losses?
- 15.5 L
  - 22.6 L
  - 31.5 L
  - 36.0 L
  - 40.5 L
267. What is the daily maintenance fluid requirement for a horse?
- 10 to 20 ml/kg
  - 20 to 40 ml/kg
  - 40 to 80 ml/kg
  - 80 to 100 ml/kg
  - 125 to 150 ml/kg
268. Proximal enteritis/duodenitis is treated with:
- continuous nasogastric decompression and supportive intravenous fluids
  - surgical drainage of the small intestine
  - oral metoclopramide
  - large doses of phenylbutazone
  - resection and anastomosis
269. Use of nonsteroidal antiinflammatory drugs can lead to gastric ulceration. This undesirable side effect is thought to be related to:
- increased prostaglandin production in the gastric mucosa
  - inhibition of the mucosal protective effects of prostaglandin E<sub>1</sub> and prostaglandin E<sub>2</sub>
  - decreased secretion of gastric acid
  - direct disruption of the mucosal barrier
  - increased serum levels of arachidonic acid
270. Endotoxin is:
- produced by the intestinal epithelial cells
  - produced by anaerobic bacteria when incubated at 40° C
  - located in the endoplasmic reticulum of gram-positive bacteria
  - a lipopolysaccharide found in the cell wall of gram-negative bacteria
  - a protein moiety found in the nucleus of gram-negative bacteria
271. Which drug inhibits endotoxin-induced generation of thromboxane A<sub>2</sub>?
- dexamethasone
  - heparin
  - cimetidine
  - flunixin meglumine
  - dopamine
272. On rectal examination of a horse, you palpate a segment of distended bowel that is devoid of teniae. The segment of bowel you are palpating is most likely:
- small colon or small intestine
  - pelvic flexure or small intestine
  - pelvic flexure or right dorsal colon
  - sternal flexure or small colon
  - base of cecum or right dorsal colon
273. Elevated serum activity of which enzyme is specific for liver damage in horses?
- alkaline phosphatase
  - sorbitol dehydrogenase
  - aspartate aminotransferase
  - alanine aminotransferase
  - lactate dehydrogenase

274. Tyzzer's disease is an acute focal bacterial hepatitis affecting foals between 7 and 40 days of age. It is caused by:
- Streptococcus equi*
  - Bacteroides fragilis*
  - Bacillus piliformis*
  - Clostridium hemolyticum*
  - Corynebacterium pyogenes*
275. Hyperlipemia occurs mainly in ponies and is a result of:
- a sudden decrease in caloric intake
  - increased fat in the diet
  - Fasciola hepatica* infection
  - biliary obstruction
  - grazing of lush pasture
276. Pyrrolizidine alkaloid toxicity results in illness with signs of:
- renal failure
  - hepatic failure
  - chronic diarrhea
  - proximal enteritis
  - laminitis
277. A serum chemistry profile in a horse with colic shows an elevated serum creatinine level. You attribute the elevation to dehydration. What other clinicopathologic finding would confirm this assumption?
- protein in the urine
  - elevated blood urea nitrogen level
  - high urine specific gravity
  - calcium carbonate crystals in the urine
  - low serum sodium and chloride levels
278. Renal failure in horses is most commonly associated with:
- acute tubular necrosis
  - acute glomerulonephritis
  - interstitial nephritis
  - pyelonephritis
  - amyloidosis
279. Proliferative glomerulonephritis is the most common glomerular disease in horses. It is thought to be related to:
- deposition of amyloid in the glomeruli
  - focal glomerulosclerosis
  - congenital lack of a coenzyme
  - oxalate toxicity
  - deposition of antigen-antibody complexes
280. Which drug has been associated with acute renal failure in horses?
- vitamin K<sub>3</sub>
  - penicillin
  - vitamin E
  - erythromycin
  - dexamethasone
281. What is the first clinicopathologic indication of aminoglycoside toxicity?
- elevated blood urea nitrogen level
  - elevated serum creatinine level
  - proteinuria
  - enzymuria
  - isothermuria
282. The most common cause of renal tubular necrosis is:
- infection with gram-negative bacteria
  - deposition of antigen-antibody complexes
  - aminoglycoside toxicity
  - deposition of oxalate crystals
  - pyrrolizidine alkaloid toxicity
283. Pyrrolizidine alkaloid toxicity causes:
- necrosis of the distal tubules of the kidney
  - an antimitotic effect that results in hepatic megalocytosis
  - atrophy of the villi of the large colon
  - denervation of the muscularis layer of the jejunum
  - necrosis of the sensitive laminae of the hoof

284. The most common bacterial cause of renal failure in septicemic foals is:

- a. *Actinobacillus*
- b. *Streptococcus*
- c. *Escherichia coli*
- d. *Salmonella*
- e. *Klebsiella*

285. Horses can develop acute renal failure from ingestion of:

- a. *Senecio*
- b. acorns of oaks
- c. tansy ragwort
- d. *Crotalaria*
- e. Sudan grass

**Questions 286 and 287**

On examination of a 20-year-old mare with polydipsia and polyuria, you notice that the mare has retained her winter haircoat, even though it is midsummer.

286. The most likely cause of these signs is:

- a. acute renal failure
- b. chronic interstitial nephritis
- c. pituitary adenoma
- d. *Dermatophilus* infection
- e. hypothyroidism

287. Analyses of blood from this mare would most likely reveal:

- a. elevated blood glucose level
- b. neutropenia
- c. elevated serum creatine kinase activity
- d. elevated serum alkaline phosphatase activity
- e. elevated blood urea nitrogen level

288. Nutritional hyperparathyroidism occurs secondary to:

- a. excessive dietary calcium
- b. excessive dietary phosphorus
- c. vitamin A toxicosis
- d. deficient dietary sodium
- e. deficient dietary phosphorus

289. Which clinicopathologic tests are used to assess muscular disease in horses?

- a. serum creatine kinase activity, serum aspartate aminotransferase activity, serum lactate dehydrogenase activity
- b. serum potassium level, serum alanine aminotransferase activity, serum creatinine level
- c. red blood cell potassium level, red blood cell fragility, acid-base status
- d. serum  $\gamma$ -glutamyltransferase activity, serum alkaline phosphatase activity, serum chloride level
- e. serum sorbitol dehydrogenase activity, serum creatine kinase activity, serum alkaline phosphatase activity

290. Serum activity of creatine kinase is a good indicator of myonecrosis. After an insult to muscle fibers, serum activity of creatine kinase peaks in approximately:

- a. 2 hours
- b. 6 hours
- c. 12 hours
- d. 24 hours
- e. 48 hours

291. A 14-month-old quarter horse filly has had intermittent episodes of sweating, muscle weakness, and fasciculations, ending in recumbency. These episodes last approximately 30 minutes. Blood obtained during an episode shows an elevated serum potassium level (8.7 mg/dl). The most likely cause of these signs is:

- a. hypoadrenocorticism
- b. hyperadrenocorticism
- c. hyperkalemic periodic paralysis
- d. hypothyroidism
- e. epilepsy

292. *At a checkpoint on a 50-mile endurance race, you examine a horse with a twitch in the flank area that is synchronous with the heart beat. You diagnose synchronous diaphragmatic flutter. The most common metabolic derangements associated with this problem are:*
- hypercalcemia, hypokalemia, and hypernatremia
  - hypocalcemia, hypokalemia, and hypomagnesemia
  - hyponatremia, hyperkalemia, and hypermagnesemia
  - hypochloremia, hypernatremia, and hyperphosphatemia
  - hypophosphatemia, hypocalcemia, and hyperkalemia
293. *Most horses with synchronous diaphragmatic flutter respond rapidly to intravenous infusion of:*
- calcium solution
  - potassium chloride solution
  - sodium chloride solution
  - sodium bicarbonate solution
  - lactated Ringer's solution
294. *Treatment of severe exertional rhabdomyolysis involves:*
- intravenous infusion of potassium solution
  - intravenous infusion of calcium solution
  - deep massage of affected muscles
  - absolute stall rest
  - controlled light exercise
295. *Nutritional myodegeneration is a peracute degenerative disease of cardiac and skeletal muscle. It is related to:*
- dietary deficiency of selenium and vitamin E
  - excessive dietary vitamin A
  - ingestion of ionophore antimicrobials
  - dietary deficiency of calcium
  - excessive dietary phosphorus
296. *In early spring you are asked to examine a maiden mare with erratic and prolonged periods of estrus. On rectal examination, you find small ovarian follicles and a uterus that lacks tone. These findings are most likely related to:*
- a granulosa-cell tumor
  - a normal transitional phase
  - nymphomania
  - a chromosomal abnormality
  - excessive estrogen secretion
297. *Mares are generally considered to be seasonal breeders. The onset of normal estrous cycles corresponds to:*
- increasing environmental temperatures
  - increasing day length
  - decreasing day length
  - decreasing environmental temperatures
  - decreasing serum progesterone levels
298. *After a mare has foaled, the placenta is normally passed within:*
- 3 hours
  - 6 hours
  - 9 hours
  - 12 hours
  - 24 hours
299. *What is the most common sequela of retained placenta in mares?*
- abdominal cramps
  - diarrhea
  - cystitis
  - laminitis
  - uterine adhesions
300. *Pneumovagina in mares is commonly treated by:*
- suturing the dorsal commissure of the labia
  - surgical extension of the urethra
  - vaginal infusion of antibiotics
  - intrauterine infusion of plasma
  - subcutaneous injection of dilute iodine solution perivaginally

301. *The most common cause of late-term abortion in mares is:*
- Aspergillus* infection
  - herpesviral infection
  - congenital anomaly in the foal
  - Brucella abortus* infection
  - Trichomonas foetus* infection
302. *Paraphimosis in stallions is defined as:*
- failure to ejaculate
  - inability to extend the penis
  - atrophy of the testicles
  - inability to retract the penis back into the prepuce
  - inflammation of the penis and prepuce
303. *You are asked for a second opinion on a horse with severe generalized exfoliative dermatitis. The animal has been unresponsive to various topical treatments and bathing. Biopsy of the affected skin reveals intragranular to subcorneal cleft and vesicle formation associated with acantholysis. The most likely cause of these findings is:*
- urticaria
  - drug eruption
  - contact allergy
  - pemphigus foliaceus
  - Dermatophilus* infection
304. *Dermatophilosis is a superficial bacterial dermatitis of horses. It is treated with:*
- regular grooming and bathing
  - parenteral corticosteroids
  - oral potassium iodide
  - topical amphotericin B
  - oral ivermectin
305. *Therapy for pemphigus foliaceus includes:*
- large doses of parenteral penicillin
  - parenteral corticosteroids plus chrysotherapy
  - intravenous ketoconazole
  - intravenous mitotane
  - topical 5% lime sulfur
306. *Cutaneous onchocerciasis is a filarial dermatitis of horses. The treatment of choice is:*
- oral ivermectin
  - parenteral corticosteroids
  - topical antifungals
  - iodine baths
  - large intramuscular doses of penicillin
307. *An owner reports that his draft horse is constantly rubbing and biting its distal legs. On physical examination the horse is extremely pruritic in the area of the long hairs of the pastern. You obtain a skin scraping and easily find mites. The mite most likely to be causing this horse's pruritus is:*
- Psoroptes equi*
  - Chorioptes equi*
  - Sarcoptes scabiei*
  - Demodex caballi*
  - Psoroptes equi*
308. *Culicoides hypersensitivity is an intensely pruritic dermatitis of horses. The lesions of Culicoides hypersensitivity are located:*
- dorsally over the head, neck, back, and rump
  - along the ventral midline
  - in the perianal and tailhead area
  - along lymph channels of the limbs
  - over the entire body
309. *Nodular necrobiosis is a common skin disease of horses. The typical lesions consist of:*
- one or more firm dermal nodules on the neck or back
  - moist dermatitis on the plantar surface of the pastern
  - painful crusts on the dorsal midline of mature horses
  - pruritic papules or nodules in the pectoral region
  - benign gray, protruding, wartlike masses in the nose and face region

310. *Mares with which type of blood are considered at high risk for producing neonatal isoerythrolysis in their foal?*
- a. Aa, Qa positive
  - b. Ca positive
  - c. Aa, Qa negative
  - d. Ca negative
  - e. Aa positive, Ca negative
311. *Monensin is an ionophore feed additive used in feedlot cattle. It is highly toxic to horses. Postmortem findings in horses with monensin toxicity usually include:*
- a. cerebral edema, with neuropil vacuolation
  - b. pale myocardial fibers, with mitochondrial vacuolation
  - c. hemorrhagic gastroenteritis, with villus atrophy
  - d. pulmonary congestion, with atelectasis
  - e. pulpy kidneys, with tubular necrosis
314. *A common side effect of xylazine in horses is:*
- a. second-degree atrioventricular heart block
  - b. tachycardia
  - c. increased gut motility
  - d. increased cardiac output
  - e. decreased urine output
315. *Shivers is a progressive neuromuscular disease of draft breeds. Clinically it is characterized by:*
- a. severe muscle wasting and weight loss
  - b. holding a hind limb in flexion and abduction
  - c. generalized trembling and weakness
  - d. myoglobinuria and generalized muscle stiffness
  - e. intention tremors of the head and neck
316. *Nutritional secondary hyperparathyroidism results from:*
- a. chronic dietary deficiency of phosphorus and excess of calcium
  - b. chronic dietary deficiency of phosphorus and calcium
  - c. chronic dietary deficiency of calcium and excess of phosphorus
  - d. dietary excess of vitamin D
  - e. dietary deficiency of vitamin D

**Questions 312 and 313**

*In a 400-kg horse with severe diarrhea, venous blood has a pH of 7.12, carbon dioxide tension (PCO<sub>2</sub>) of 45 mm Hg, oxygen tension of 40 mm Hg, and serum bicarbonate level of 10 mEq/L.*

312. *The most likely cause of these findings is:*
- a. respiratory acidosis with metabolic compensation
  - b. metabolic acidosis with respiratory compensation
  - c. metabolic acidosis with hypoventilation
  - d. pure respiratory acidosis
  - e. metabolic acidosis with no respiratory compensation
313. *How much bicarbonate is needed to correct the bicarbonate deficit in this horse?*
- a. 560 mEq
  - b. 1020 mEq
  - c. 2240 mEq
  - d. 4080 mEq
  - e. 5150 mEq
317. *White muscle disease in young horses is the result of a dietary:*
- a. excess of vitamin D
  - b. excess of vitamin E
  - c. deficiency of phosphorus
  - d. deficiency of selenium
  - e. excess of magnesium
318. *Excessive vitamin D, through parenteral administration or through ingestion of plants containing vitamin D analogs, can result in toxicity. Clinicopathologic abnormalities associated with vitamin D toxicity include:*
- a. hypercalcemia and hypophosphatemia
  - b. hyperkalemia and hypernatremia
  - c. hyperphosphatemia and hypercalcemia
  - d. hypernatremia and hypochloremia
  - e. hyponatremia and hypochloremia



319. *Gross pathologic findings in horses with vitamin D toxicosis include:*
- black-mottled dental enamel
  - brittle bones
  - soft-tissue calcification
  - osteodystrophia fibrosa
  - coagulative muscle necrosis
320. *Which part of a horse's limb is desensitized when the medial and lateral branches of the caudal digital nerves are anesthetized?*
- caudal one third of the hoof
  - cranial one third of the hoof
  - caudal aspect of the pastern
  - cranial aspect of the pastern
  - cranial aspect of the fetlock
321. *The most specific nerve block to confirm navicular disease is the:*
- caudal digital nerve block
  - low volar nerve block
  - high volar nerve block
  - basal sesamoid nerve block
  - pastern ring block
322. *The most specific nerve block to confirm laminitis is the:*
- caudal digital nerve block
  - low volar nerve block
  - high volar nerve block
  - basal sesamoid nerve block
  - coffin joint block
323. *The stifle joint can be anesthetized by infusing a local anesthetic. Which statement most accurately describes the relationship between the different joints of the stifle?*
- Injection of lidocaine into the femoropatellar pouch anesthetizes that joint and the medial femorotibial joint, but not necessarily the lateral femorotibial joint.
  - Injection into the lateral femorotibial joint anesthetizes the medial femorotibial joint, but not necessarily the femoropatellar joint.
  - All three parts of the stifle joint freely interconnect, and injection of local anesthetic into one compartment anesthetizes all three.
  - Each of the three parts of the stifle joint is a separate joint compartment and must be anesthetized individually.
  - The medial and lateral femorotibial joints are connected, but they do not connect with the femoropatellar joint.
324. *Sweeny, or atrophy of the supraspinatus and infraspinatus muscles, is generally the result of:*
- inflammation of the bicipital bursa
  - arthritis of the shoulder joint
  - injury to the suprascapular nerve
  - paralysis of the radial nerve
  - compartmental syndrome of the supraspinatus and infraspinatus muscles
325. *The radial nerve innervates the:*
- supraspinatus muscle
  - flexors of the shoulder and elbow
  - flexors of the carpus and digit
  - extensors of the elbow, carpal, and digital joints
  - flexors of the elbow and extensors of the carpus

J.A. Robinson

326. *Which organism causes strangles in horses?*
- Streptococcus zooepidemicus*
  - Staphylococcus aureus*
  - Parascaris equorum*
  - Streptococcus equi*
  - Rhodococcus equi*

327. Which organism causes equine protozoal myelitis?
- a. *Proteus vulgaris*
  - b. *Sarcocystis falcatula*
  - c. *Pseudomonas mallei*
  - d. *Strongylus edentatus*
  - e. *Fusarium moniliforme*
328. What is an effective treatment for equine protozoal myelitis?
- a. tetracycline
  - b. penicillin and gentamicin
  - c. ceftiofur
  - d. metronidazole and penicillin
  - e. trimethoprim-sulfa and pyrimethamine
329. What is the most common **nonpathologic** arrhythmia in horses?
- a. atrial fibrillation
  - b. first-degree atrioventricular block
  - c. second-degree atrioventricular block
  - d. third-degree atrioventricular block
  - e. premature atrial contractions
330. What is the most common **pathologic** arrhythmia in horses?
- a. atrial fibrillation
  - b. first-degree atrioventricular block
  - c. second-degree atrioventricular block
  - d. third-degree atrioventricular block
  - e. premature atrial contractions
331. Common causes of chronic weight loss in horses include all the following **except**:
- a. dental problems
  - b. inadequate diet
  - c. equine infectious anemia
  - d. equine influenza
  - e. intestinal parasitism
332. Treatment of hyperlipemia in horses and ponies includes all the following **except**:
- a. glucagon
  - b. insulin
  - c. glucose
  - d. dextrose
  - e. heparin
333. What type of disease is equine hyperkalemic periodic paralysis?
- a. neoplastic
  - b. dysplastic
  - c. nutritional
  - d. genetic
  - e. neonatal
334. Warts in horses are caused by viruses in the family:
- a. Papovaviridae
  - b. Poxviridae
  - c. Parvoviridae
  - d. Papillomaviridae
  - e. Picornaviridae
335. Which equine herpesvirus (EHV) is associated with respiratory disease in horses?
- a. EHV-1
  - b. EHV-2
  - c. EHV-3
  - d. EHV-4
  - e. EHV-5
336. In the absence of compatibility testing, which type of transfusion would be certain **not** to react with offending antibodies in the serum of a foal with neonatal isoerythrolysis?
- a. washed red blood cells from the sire
  - b. washed red blood cells from the dam
  - c. washed red blood cells from an unrelated gelding on the farm
  - d. washed red blood cells from a horse that is negative for Aa and Qa antigens
  - e. washed red blood cells from a donkey
337. *Rhodococcus equi* causes pneumonia in foals and can also cause:
- a. diarrhea
  - b. dyspepsia
  - c. dysplasia
  - d. renal disease
  - e. hepatic disease

338. *Equine hyperkalemic periodic paralysis is inherited by what mode?*
- autosomal recessive
  - autosomal dominant
  - sex-linked recessive
  - sex-linked dominant
  - codominant
339. *What is the primary causative agent, but not necessarily the most common cause, of acute diarrhea in adult horses?*
- Ehrlichia risticii*
  - Salmonella* spp.
  - Rhodococcus equi*
  - Ehrlichia equi*
  - Clostridium difficile*
340. *Sand ingestion by horses may result in all the following except:*
- diarrhea
  - weight loss
  - malabsorption
  - impaction
  - gastric ulcers
341. *Administration of which biologic has historically been associated with serum hepatitis (Theiler's disease)?*
- tetanus toxoid
  - tetanus antitoxin
  - endotoxin antiserum
  - botulism vaccine
  - botulism antiserum
342. *Which of the following best describes the lesion of pyrrolizidine alkaloid toxicity in horses?*
- bile duct cirrhosis and nodular regeneration
  - bile duct inflammation and hyperplasia
  - acute centrilobular to total hepatic necrosis
  - periportal inflammation and fibrosis
  - megalocytic hepatopathy
343. *In horses, squamous-cell carcinoma is commonly found in all the following sites except the:*
- stomach
  - perineum
  - ear
  - prepuce
  - eye
344. *All the following can be manifested as epistaxis except:*
- guttural pouch empyema
  - exercise-induced pulmonary hemorrhage
  - laryngeal paralysis with dorsal displacement of the soft palate
  - nasal granuloma
  - foreign body in the nasal passages
345. *Cushing's syndrome (hyperadrenocorticism) and diabetes mellitus in horses are most often the result of:*
- hypophyseal adenoma
  - thyroid adenoma
  - pancreatic aplasia
  - adrenocortical atrophy
  - euthyroidism
346. *Which of the following is not a mechanism of ventral edema in horses?*
- mediastinal mass compressing vessels
  - hypoproteinemia
  - hypoalbuminemia
  - congestive heart failure
  - anemia
347. *Which of the following is not a mechanism of diarrhea in horses?*
- malocclusion
  - malabsorption
  - osmotic overload
  - abnormal intestinal motility
  - increased blood-to-lumen hydraulic pressure

348. Which equine herpesvirus (EHV) is associated with neurologic disease?
- a. EHV-1 subtype 1
  - b. EHV-2 subtype A
  - c. EHV-3 subtype 1
  - d. EHV-4 subtype B
  - e. EHV-1 subtype 2
349. Endotoxin is found primarily in the cell walls of:
- a. gram-positive bacteria
  - b. gram-negative bacteria
  - c. viruses
  - d. protozoa
  - e. gastrointestinal cells
350. All of the following can result in pleuropneumonia **except**:
- a. long-distance transport
  - b. pneumonia
  - c. nasal insufflation of oxygen
  - d. esophageal obstruction
  - e. aspiration

## CATTLE

R.G. Elmore

351. A well-circumscribed ping on simultaneous auscultation-percussion of the left paralumbar fossa of a postparturient dairy cow is most suggestive of:
- a. cecal torsion
  - b. abomasal displacement
  - c. rumen gas
  - d. pneumoperitoneum
  - e. abomasal volvulus
352. The most likely diagnosis for paresis immediately following calving in a pluriparous Jersey cow is:
- a. ketosis
  - b. hypomagnesemia
  - c. fat cow syndrome
  - d. milk fever
  - e. endotoxemia
353. What percentage of freemartin calves are sterile?
- a. 10%
  - b. 30%
  - c. 50%
  - d. 70%
  - e. 90%
354. The syndrome of milk fever in cows is usually associated with:
- a. hypocalcemia
  - b. hyperphosphatemia
  - c. hypomagnesemia
  - d. hypoglycemia
  - e. endotoxemia
355. The cause of infectious bovine rhinotracheitis is:
- a. bovine adenovirus
  - b. bovine reovirus
  - c. bovine rhinovirus
  - d. herpesvirus type 1
  - e. bovine coronavirus
356. Primary ruminal contractions normally occur at the rate of:
- a. 0.5 to 1 per minute
  - b. 1 to 1.5 per minute
  - c. 1.5 to 3 per minute
  - d. 4 to 5 per minute
  - e. 5 to 6 per minute

357. *The clinical sign seen most often in cows with cystic ovarian disease is:*
- nymphomania
  - anestrus
  - vulvar hemorrhage
  - estrus
  - vulvar mucous discharge
358. *A well-circumscribed, softball-sized swelling located midway between the preputial orifice and the neck of the scrotum in a bull is most likely:*
- an abscess
  - a hematoma
  - a ruptured penis
  - a fibropapilloma
  - an everted prepuce
359. *A normal dairy cow's uterus should be grossly involuted by:*
- 15 days postpartum
  - 20 days postpartum
  - 25 days postpartum
  - 30 days postpartum
  - 35 days postpartum
360. *The first postpartum ovulation in a normal dairy cow usually occurs at:*
- 10 to 13 days postpartum
  - 14 to 17 days postpartum
  - 15 to 21 days postpartum
  - 22 to 25 days postpartum
  - 26 to 30 days postpartum
361. *Which of the following occurs at the end of the first stage of labor in cows?*
- dilatation of the cervix
  - expulsion of the fetus
  - release of oxytocin from the posterior pituitary
  - rupture of the allantoic chorion
  - rupture of the amniotic membrane
362. *After parturition, most cows expel the placenta within:*
- 8 hours
  - 8 to 16 hours
  - 16 to 24 hours
  - 24 to 48 hours
  - 48 to 72 hours
363. *How long is the normal bovine estrous cycle?*
- 12 to 18 days
  - 18 to 24 days
  - 24 to 30 days
  - 30 to 36 days
  - 36 to 42 days
364. *You are called to assist delivery in a cow with dystocia. On vaginal examination you palpate three fetal limbs in the vaginal canal. The most likely explanation of this finding is:*
- schistosomas reflexus
  - twins
  - transverse presentation
  - perosomus elumbus
  - amorphus globosa
365. *In grazing cattle, lameness characterized by cold feet and pasterns, reddened and swollen coronary bands, and necrotic ears and tail is usually due to:*
- grazing on fescue pastures
  - selenium toxicosis
  - footrot
  - laminitis
  - frostbite
366. *The most common cause of lameness in adult dairy cows is:*
- selenium toxicosis
  - warts
  - laminitis
  - fescue foot
  - subsolar abscess

367. *Infectious bovine keratoconjunctivitis is usually caused by:*
- a. *Moraxella bovis*
  - b. *Mycoplasma*
  - c. *Listeria*
  - d. adenovirus
  - e. infectious bovine rhinotracheitis virus
368. *A common cause of postcoital pyometra in cows bred naturally is:*
- a. vibriosis (campylobacteriosis)
  - b. leptospirosis
  - c. brucellosis
  - d. trichomoniasis
  - e. infectious bovine rhinotracheitis
369. *The first permanent incisor erupts in cattle at what age?*
- a. 6 months
  - b. 12 months
  - c. 18 months
  - d. 24 months
  - e. 30 months
370. *The average normal resting heart rate for an adult cow is:*
- a. 20 beats/min
  - b. 30 beats/min
  - c. 40 beats/min
  - d. 50 beats/min
  - e. 60 beats/min
371. *The average normal resting respiratory rate in an adult cow is:*
- a. 18 breaths/min
  - b. 24 breaths/min
  - c. 30 breaths/min
  - d. 36 breaths/min
  - e. 40 breaths/min
372. *The average scrotal circumference of a normal 18-month-old Angus bull is:*
- a. 28 cm
  - b. 30 cm
  - c. 32 cm
  - d. 34 cm
  - e. 36 cm
373. *The progesterone level in a milk sample from a cow with a mature, functional corpus luteum should be:*
- a. less than 1 ng/ml
  - b. 1 to 2 ng/ml
  - c. 2 to 3 ng/ml
  - d. 3 to 4 ng/ml
  - e. over 5 ng/ml
374. *A mature corpus luteum should be present during which part of the bovine estrous cycle?*
- a. estrus
  - b. metestrus
  - c. diestrus
  - d. proestrus
  - e. anestrus
375. *Vulvar bleeding is normal during which part of the bovine estrous cycle?*
- a. estrus
  - b. metestrus
  - c. diestrus
  - d. proestrus
  - e. anestrus
376. *During which part of the bovine estrous cycle should a regressing corpus luteum and a developing follicle be present?*
- a. estrus
  - b. metestrus
  - c. diestrus
  - d. proestrus
  - e. anestrus
377. *During which part of the bovine estrous cycle would you expect the uterus to be turgid with good tone?*
- a. estrus
  - b. metestrus
  - c. diestrus
  - d. proestrus
  - e. anestrus

378. *The Christie-Atkins-Munch-Petersen (CAMP) test is used to identify which mammary gland pathogen?*
- a. *Klebsiella pneumoniae*
  - b. *Escherichia coli*
  - c. *Staphylococcus aureus*
  - d. *Streptococcus agalactiae*
  - e. *Nocardia farcinica*
379. *The pH of a sample of ruminal fluid from a cow on a roughage diet should be:*
- a. 4 to 5
  - b. 5 to 6
  - c. 6 to 7
  - d. 7 to 8
  - e. 8 to 9
380. *The gross structure of the bovine placenta is best described as:*
- a. diffuse
  - b. zonary
  - c. discoidal
  - d. cotyledonary
  - e. linear
381. *The microscopic structure of the bovine placenta is best described as:*
- a. hemochorial
  - b. endotheliochorial
  - c. epitheliochorial
  - d. deciduate
  - e. syndesmochorial
382. *The bovine diploid chromosome number is:*
- a. 60
  - b. 64
  - c. 62
  - d. 38
  - e. 54
383. *Which of the following bovine conditions is most common?*
- a. hydramnios
  - b. hydrallantois
  - c. fetal anasarca
  - d. fetal ascites
  - e. edema of the allantoic chorion
384. *A 30-day bovine amniotic vesicle is approximately how large?*
- a. 1 cm (pea sized)
  - b. 2.5 to 3.0 cm (plum sized)
  - c. 3.5 to 5.0 cm
  - d. 6 to 7.5 cm
  - e. 9 to 10 cm
385. *A 60-day bovine fetus is about the size of a?*
- a. mouse
  - b. rat
  - c. small cat
  - d. large cat
  - e. large dog
386. *A placentome the size of a quarter (2.5 cm) located next to the cervix in a dairy cow would indicate that the cow was how far along in gestation?*
- a. 30 days
  - b. 60 days
  - c. 90 days
  - d. 120 days
  - e. 150 days
387. *When do the bovine testicles normally descend into the scrotum?*
- a. third month of gestation
  - b. fourth month of gestation
  - c. fifth month of gestation
  - d. sixth month of gestation
  - e. within 1 month after birth
388. *On rectal examination of a cow, the fetal membrane slip can usually first be palpated at what time during gestation?*
- a. 25 to 30 days
  - b. 30 to 35 days
  - c. 35 to 40 days
  - d. 40 to 45 days
  - e. 45 to 50 days

389. *When can the bovine amniotic vesicle first be palpated during gestation?*
- a. 25 to 30 days
  - b. 30 to 35 days
  - c. 35 to 40 days
  - d. 40 to 45 days
  - e. 45 to 50 days
390. *Which of the following is **not** a positive sign of bovine pregnancy?*
- a. palpating the amniotic vesicle
  - b. palpating the fetal "membrane slip"
  - c. palpating the fetus
  - d. palpating placentomes
  - e. palpating fremitus in the uterine artery
391. *Which drug causes release of luteinizing hormone (LH) from the adenohypophysis in cows?*
- a. prostaglandin
  - b. estrogen
  - c. progesterone
  - d. oxytocin
  - e. gonadotropin-releasing hormone
392. *The best treatment for a cow with a follicular cyst is:*
- a. anterior pituitary extract
  - b. human chorionic gonadotropin
  - c. gonadotropin-releasing hormone
  - d. prostaglandin
  - e. progesterone
393. *Which condition is considered to be hereditary in cattle?*
- a. postpartum uterine prolapse
  - b. prepartum vaginal prolapse
  - c. uterine torsion
  - d. hydrallantois
  - e. fetal maceration
394. *In a 2-year-old heifer, the site of injection for epidural anesthesia is at the:*
- a. sacrococcygeal articulation
  - b. first intercoccygeal articulation
  - c. second intercoccygeal articulation
  - d. third intercoccygeal articulation
  - e. lumbosacral articulation
395. *Which of the following is **least** likely to cause abortion late in gestation?*
- a. brucellosis
  - b. leptospirosis
  - c. trichomoniasis
  - d. infectious bovine rhinotracheitis
  - e. epizootic bovine abortion
396. *Your client tells you that the abdomen of his Angus cow, now in the third trimester of gestation, has greatly enlarged over the past month. The cow is still eating normally. However, it is difficult for the cow to walk because of her extremely large abdomen. The farmer is concerned that the cow may not be able to stand much longer. The most likely cause of the marked abdominal enlargement in this cow is:*
- a. bloat
  - b. twins
  - c. hydramnios
  - d. hydrallantois
  - e. uterine torsion
397. *How long does it usually take for the fertilized bovine ovum to reach the uterus?*
- a. 1 to 3 days
  - b. 3 to 5 days
  - c. 5 to 7 days
  - d. 7 to 9 days
  - e. 9 to 11 days
398. *The half-life of oxytocin following injection is approximately:*
- a. 30 seconds
  - b. 1 to 2 minutes
  - c. 3 to 4 minutes
  - d. 5 to 10 minutes
  - e. 30 to 60 minutes



399. *The primary physiologic effect following injection of prostaglandin  $F_{2\alpha}$  is:*
- uterine contraction
  - oviductal contraction
  - ovulation
  - cervical dilatation
  - luteal regression
400. *In a herd of randomly cycling cows, if you injected each animal with prostaglandin  $F_{2\alpha}$ , what percentage of cows would respond?*
- 0%
  - 25%
  - 50%
  - 75%
  - 100%
401. *When would you expect a cow with a mature, functional corpus luteum to be in estrus following injection of prostaglandin  $F_{2\alpha}$ ?*
- 12 to 24 hours after injection
  - 24 to 48 hours after injection
  - 48 to 72 hours after injection
  - 72 to 96 hours after injection
  - 96 to 120 hours after injection
402. *When does ovulation occur in cows?*
- 10 to 14 hours after the end of estrus
  - 10 to 12 hours after the beginning of estrus
  - 12 to 24 hours after the beginning of estrus
  - 10 to 14 hours before the end of estrus
  - very near the end of estrus
403. *When should a milk sample be obtained from a cow for progesterone assay to make a presumptive diagnosis of pregnancy?*
- at the time of breeding
  - 15 days after breeding
  - 18 days after breeding
  - 21 days after breeding
  - 24 days after breeding
404. *On most dairy farms, the primary cause of apparent anestrus is:*
- ovarian cysts
  - uterine infections
  - failure to detect estrus
  - silent estrus
  - high milk production
405. *Which of the following is most likely to cause abortions during the first half of gestation in cows?*
- Aspergillus* infection
  - infectious bovine rhinotracheitis
  - bovine virus diarrhea
  - epizootic bovine abortion
  - leptospirosis
406. *The cause of hydrallantois in cows is:*
- uterine torsion
  - umbilical cord torsion
  - fetal kidney disease
  - anomalous fetus
  - placental dysfunction
407. *The best treatment for advanced hydrallantois is:*
- induced abortion
  - trocarization of the uterus through the abdominal wall
  - cesarean section
  - slaughter
  - transcervical rupture of the placenta with a pipette
408. *The normal presentation of a bovine fetus at parturition is:*
- transverse dorsal
  - transverse ventral
  - cranial longitudinal
  - caudal longitudinal
  - dorsal sacral

409. *The normal position of a bovine fetus at parturition is:*
- a. right dorsal ilial
  - b. left dorsal ilial
  - c. dorsal pubic
  - d. dorsal sacral
  - e. right cephalo ilial
410. *On rectal palpation of a normal bull, you cannot palpate the:*
- a. seminal vesicles
  - b. prostate gland
  - c. ampullae of the vas deferens
  - d. pelvic urethra
  - e. bulbourethral glands
411. *Which of the following is a primary bovine sperm abnormality?*
- a. tightly coiled tail
  - b. distally bent tail
  - c. reverse tail
  - d. normally shaped, detached head
  - e. distal protoplasmic droplet
412. *Which of the following is a secondary bovine sperm abnormality?*
- a. proximal protoplasmic droplet
  - b. distal protoplasmic droplet
  - c. tightly coiled tail
  - d. abaxial midpiece
  - e. spheroids
413. *The most encompassing measurement of reproductive performance is:*
- a. days to first service
  - b. calving interval
  - c. average days open
  - d. services per conception
  - e. services per cow
414. *Glucocorticoids are not effective in inducing abortion in a cow with:*
- a. a normal, term calf
  - b. a mummified fetus
  - c. hydrallantois
  - d. hydramnios
  - e. a fetus with schistosomus reflexus
415. *Acute enterotoxigenic colibacillosis usually occurs in calves of what age?*
- a. under 5 days
  - b. 5 to 10 days
  - c. 10 to 15 days
  - d. 15 to 20 days
  - e. 20 to 25 days
416. *Enteric salmonellosis usually occurs in calves of what age?*
- a. birth to 2 weeks
  - b. 2 to 6 weeks
  - c. 6 to 10 weeks
  - d. 10 to 15 weeks
  - e. 15 to 20 weeks
417. *Diarrhea caused by rotavirus infection usually occurs in calves of what age?*
- a. birth to 1 week
  - b. 1 to 2 weeks
  - c. 2 to 3 weeks
  - d. 3 to 4 weeks
  - e. 4 to 5 weeks
418. *A major problem associated with induced calving is:*
- a. postpartum uterine infection
  - b. ovarian cysts
  - c. postpartum anestrus
  - d. weak calves at birth
  - e. retained placenta
419. *The protein content of milk replacers for calves should be at least:*
- a. 12%
  - b. 14%
  - c. 16%
  - d. 18%
  - e. 20%

420. *The fat content of milk replacers for calves should be at least:*
- 5%
  - 10%
  - 15%
  - 20%
  - 25%
421. *A deficiency of which vitamin results in white muscle disease?*
- vitamin A
  - vitamin B
  - vitamin C
  - vitamin D
  - vitamin E
422. *What is the recommended calcium to phosphorus ratio in the diet of dry cows?*
- 1:1
  - 1.5:1
  - 1:1.5
  - 2:1
  - 1:2
423. *Which of the following is **least** likely to be confused with zinc deficiency in cattle?*
- mange
  - ringworm
  - selenium deficiency
  - photosensitization
  - vitamin A deficiency
424. *Which vitamin is vital to coagulation of blood?*
- vitamin A
  - vitamin C
  - vitamin D
  - vitamin E
  - vitamin K
425. *Parturient paresis usually occurs:*
- before calving
  - at calving
  - within 24 hours after calving
  - 24 to 48 hours after calving
  - more than 48 hours after calving
426. *Most acetonemic cows:*
- refuse to eat
  - refuse grain and then silage
  - refuse silage and then grain
  - refuse hay
  - eat normally
427. *Which of the following is usually **not** a cause of the downer cow syndrome?*
- forced fetal extraction
  - parturient paresis
  - excessive fat
  - sepsis (mastitis, metritis, pericarditis, etc.)
  - malnutrition
428. *Grass tetany is characterized by:*
- low serum magnesium levels
  - low serum calcium levels
  - low serum phosphorus levels
  - low serum potassium levels
  - low serum sodium levels
429. *Depression, anorexia, ketonemia, progressive debilitation, weakness, and an enlarged liver in a 1500-lb periparturient dairy cow are most consistent with:*
- parturient paresis
  - grass tetany
  - postparturient hemoglobinuria
  - fat cow syndrome
  - acetonemia
430. *Excessive salivation results from consumption of:*
- parasitized coastal bermuda grass
  - parasitized fescue hay
  - parasitized red clover
  - wet timothy hay
  - Johnson grass

431. *Such clinical signs as staggering, muscle tremors, snapping of the eyelids, head bobbing, champing of the jaws, excessive salivation, bellowing, rolling of the eyes, apparent blindness, and clonic convulsions are characteristic of:*
- rabies
  - listeriosis
  - acetonemia
  - hypocalcemia
  - lead poisoning
432. *The most reliable way to determine whether a cow died from lightning strike is by:*
- a thorough history (storms, etc.)
  - carcass position (near a tree, fence, etc.)
  - number of animals killed
  - necropsy findings
  - finding singe marks on the hide
433. *Which of the following is **not** a common form of infectious bovine rhinotracheitis?*
- respiratory disease
  - ocular disease
  - renal disease
  - central nervous system disease
  - reproductive disease
434. *Such clinical signs as vesicles on the lips, gingivae, dental pad, tongue, nares, muzzle, interdigital spaces, and teats; reluctance to eat; and reluctance to rise or walk are common in cattle with:*
- foot-and-mouth disease
  - bovine virus diarrhea (BVD)
  - infectious bovine rhinotracheitis (IBR)
  - leptospirosis
  - campylobacteriosis
435. *Which of the following is **not** high on the list of differential diagnoses when considering a cow that may have rabies?*
- esophageal foreign body
  - nervous acetonemia
  - hypomagnesemia
  - brucellosis
  - listeriosis
436. *What percentage of cattle infected with bovine leukemia virus develop clinical lymphosarcoma?*
- 5% to 10%
  - 10% to 15%
  - 15% to 20%
  - 20% to 25%
  - 25% to 30%
437. *Thick-walled abscesses of the soft tissues of the head, particularly the tongue and cervical lymph nodes, are most likely associated with:*
- actinomycosis
  - tuberculosis
  - actinobacillosis
  - caseous lymphadenitis
  - ulcerative lymphangitis
438. *Listeriosis is definitively diagnosed by:*
- a history of silage consumption
  - pathognomonic clinical signs
  - serologic tests
  - isolation of the causative organism
  - necropsy findings
439. *A complete necropsy of the animal is **contraindicated** if which of the following diseases is strongly suspected?*
- brucellosis
  - anthrax
  - rabies
  - listeriosis
  - blackleg
440. *The primary source of reinfection of a herd with blackleg is:*
- animals dying of blackleg
  - contaminated feed
  - contaminated water
  - carrier animals
  - wildlife

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441. *Extreme inspiratory dyspnea accompanied by loud stertor is most likely to indicate:*
- upper airway disease
  - lower airway disease
  - pulmonary interstitial disease
  - pulmonary emphysema
  - terminal pneumonia
442. *Extreme inspiratory dyspnea accompanied by loud stertor and extremely malodorous breath in an 8-month-old feeder steer is most likely to indicate:*
- bovine respiratory syncytial virus infection
  - necrotic laryngitis
  - Pasteurella pneumonia*
  - Haemophilus somnus pneumonia*
  - atypical interstitial pneumonia
443. *Conjunctivitis with ocular discharge and occasional corneal opacity can occur in cattle infected with:*
- bovine virus diarrhea virus
  - bovine respiratory syncytial virus
  - bovine coronavirus
  - bovine herpesvirus type 1 (infectious bovine rhinotracheitis virus)
  - bovine adenovirus
444. *Which of the following best describes the pattern of infectious bovine rhinotracheitis infection?*
- low morbidity, low mortality
  - high morbidity, low mortality
  - high morbidity, high mortality
  - low morbidity, high mortality
  - the response depends on the virus biotype
445. *Which of the following is **least** likely to aid in management and prevention of enzootic pneumonia in housed calves?*
- increasing the ventilation rate
  - maintaining the barn temperature between 55° and 70° F
  - reducing animal density
  - minimizing ammonia odors in the barn
  - increasing the humidity in the barn to over 70%
446. *Shipping fever bronchopneumonia most commonly occurs:*
- immediately upon arrival of calves at the feedlot
  - 10 to 14 days after shipment of calves
  - 30 to 60 days after shipment of calves
  - during shipment of calves
  - 70 to 120 days after shipment of calves
447. *A common sequela that adversely affects the response to treatment of shipping fever bronchopneumonia in calves is:*
- meningitis
  - chronic obstructive pulmonary disease
  - pulmonary abscesses
  - atypical interstitial pneumonia
  - chronic emphysema
448. *Illness and debilitation usually:*
- increase the rate of clearance of antimicrobial drugs from milk, but decrease their clearance from other tissues
  - decrease the rate of clearance of antimicrobial drugs from the body
  - decrease the rate of clearance of antimicrobial drugs from milk, but increase their clearance from other tissues
  - increase the rate of clearance of antimicrobial drugs from the body
  - cause urine tests for antimicrobial drugs to be falsely negative
449. *Which of the following does **not** appear to be associated with stress and development of bronchopneumonia in cattle?*
- squamous metaplasia of the tracheal epithelium
  - accumulation of bacteria in the nasal passages
  - lung bacterial challenge
  - impaired clearance of bacteria from the lungs
  - elevated endogenous corticosteroid levels

450. When auscultating the lung fields of a calf, from which area are abnormal sounds apt to be detected earliest in a case of bronchopneumonia?
- dorsal and caudal on the left side
  - ventral and caudal on the right side
  - dorsal and cranial on the right side
  - ventral and cranial on the right side
  - dorsal and caudal on the right side
451. Signs of immediate (type I) hypersensitivity in cattle include all the following **except**:
- acute dyspnea
  - intravascular hemolysis and hematuria
  - urticaria
  - shivering
  - collapse
452. Esophageal obstruction (choke) in cattle causes copious loss of saliva and subsequently results in:
- acidosis and hemodilution
  - alkalosis and hemoconcentration
  - alkalosis and hemodilution
  - acidosis and hemoconcentration
  - alkalosis, with increased blood total carbon dioxide concentrations
453. A 3-month-old calf with a well-circumscribed, soft, fluctuant, easily movable swelling over the horizontal ramus of the mandible is most likely to have:
- actinomycosis
  - actinobacillosis
  - a subcutaneous abscess
  - a retropharyngeal abscess
  - a dentigerous cyst
454. The most common manifestation of bluetongue in cattle is:
- subclinical infection with no apparent clinical signs
  - hyperemia of the oral mucosa
  - edema of the face, lips, and muzzle
  - mucopurulent nasal discharge
  - keratitis with neovascularization
455. The most common manifestation of bovine virus diarrhea in cattle is:
- intractable, bloody diarrhea
  - subclinical infection with no apparent clinical signs
  - pneumonia
  - esophageal stricture
  - infertility necessitating repeated breeding
456. Mucosal disease appears to result from:
- simultaneous infection with malignant catarrhal fever virus and bovine virus diarrhea virus
  - simultaneous infection with both the cytopathic and noncytopathic biotypes of bovine virus diarrhea virus
  - vaccination with a noncytopathic biotype and infection with a cytopathic biotype of bovine virus diarrhea virus
  - infection of a nonvaccinated calf with bovine virus diarrhea virus
  - infection of a colostrum-deprived calf with bovine virus diarrhea virus
457. The characteristic white blood cell pattern seen in cattle acutely infected with bovine virus diarrhea virus is:
- neutrophilia with lymphopenia
  - panleukocytosis
  - neutropenia with lymphocytosis
  - neutropenia with eosinophilia
  - panleukopenia
458. Which of the following is **not** characteristic of grain overload in cattle?
- decreased packed cell volume
  - rumen pH below 5.0
  - systemic acidosis
  - pooling of water in the rumen as a result of osmotic forces
  - chemical damage to the rumen epithelium

459. Which solution is most appropriate for initial intravenous fluid therapy for grain overload in a steer?
- isotonic saline solution
  - isotonic sodium bicarbonate solution
  - lactated Ringer's solution
  - isotonic saline solution with added potassium chloride
  - Ringer's solution without lactate
460. In a 300-kg (661-lb) steer with severe grain overload, what volume of electrolyte solution should be infused intravenously during the first hours of therapy?
- 2 to 5 L
  - 6 to 12 L
  - 30 to 35 L
  - 50 to 100 L
  - 1 L
461. Which of the following is **not** a clinical sign of severe dehydration in cattle?
- urine specific gravity of 1.009
  - eyes sunken into the orbits
  - sticky, viscous saliva
  - skin over neck and eyelids remaining tented after being lifted with the fingers
  - cold ears and tail
462. Which statement most accurately describes vagal indigestion in cattle?
- a chronic debilitating disease with excessively rapid passage of digesta through the rumen
  - a chronic debilitating disease in which the rumen atrophies to a very small size
  - an acute disease characterized by rumen tympany
  - a chronic debilitating disease with impaired passage of ingesta out of the rumen
  - an acute disease characterized by fluid distention of the abdomen
463. At what age are calves most susceptible to infection with enterotoxigenic *Escherichia coli*?
- birth to 3 days
  - 5 to 10 days
  - birth to 3 weeks
  - 1 to 4 weeks
  - older than 6 weeks
464. Which ingredients in addition to water are critically important components of oral rehydration solutions for calves with neonatal diarrhea?
- fructose and calcium
  - sodium and glucose
  - sodium and chloride
  - lactose and casein
  - starch and protein
465. What percentage of passively acquired antibodies in calves are transferred via colostrum?
- over 95%
  - 70% to 80%
  - 40% to 60%
  - 10% to 30%
  - less than 10%
466. Which electrolyte solution is most appropriate for treatment of a calf with severe dehydration caused by diarrhea?
- physiologic saline solution
  - Ringer's solution without lactate or bicarbonate
  - balanced electrolyte solution plus sodium bicarbonate
  - 5% dextrose solution
  - hypotonic saline solution

467. *Antibiotic treatment of calves with neonatal diarrhea:*
- a. should be administered before initiation of fluid therapy
  - b. should be in the form of oral solutions, rather than tablets
  - c. should be administered parenterally
  - d. should be followed by oral administration of yogurt (*Lactobacillus* cultures) to reestablish intestinal flora
  - e. is not essential
468. *Which anthelmintic is most effective in eliminating arrested larval forms of Ostertagia ostertagi?*
- a. phenothiazine
  - b. ivermectin
  - c. thibendazole
  - d. morantel tartrate
  - e. coumaphos
469. *Cattle with liver abscesses usually have:*
- a. a high fever that is nonresponsive to antibiotics
  - b. profound icterus
  - c. no apparent clinical signs
  - d. photosensitization
  - e. ventral edema due to hypoproteinemia
470. *Liver abscesses in cattle occur most commonly as a sequela of:*
- a. diarrhea caused by enterotoxigenic *Escherichia coli*
  - b. pneumonia caused by *Pasteurella*
  - c. mastitis caused by *Staphylococcus*
  - d. grain overload with rumen acidosis
  - e. metritis
471. *Which of the following is **not** characteristic of traumatic reticuloperitonitis (hardware disease) accompanied by localized peritonitis?*
- a. profuse diarrhea
  - b. reduced appetite
  - c. reduced milk production
  - d. mild fever
  - e. reduced rumen motility
472. *Bloat associated with pasture consumption of legumes is usually caused by:*
- a. reduced flow of rumen gas into the abomasum
  - b. excessive gas production in the rumen
  - c. impaired eructation caused by partial paralysis of the esophagus
  - d. too few rumen contractions
  - e. gas trapped in a stable foam in the rumen
473. *A meaty growth originating at the corneoscleral junction of an 8-year-old Hereford cow is most likely:*
- a. infectious bovine keratoconjunctivitis
  - b. lymphosarcoma
  - c. a squamous-cell carcinoma
  - d. chlamydial conjunctivitis
  - e. a dermoid
474. *Unilateral exophthalmos that has developed over a 2-month period in a 4-year-old cow with no other obvious signs of disease is probably related to:*
- a. lymphosarcoma
  - b. squamous-cell carcinoma
  - c. infectious bovine keratoconjunctivitis
  - d. retrobulbar cellulitis
  - e. a congenital problem
475. *A group of 6-month-old feeder calves has been on feed for 6 weeks. They have little shelter and the weather has been very cold. Many of the calves are now exhibiting diarrhea. What is the most likely cause of the diarrhea?*
- a. enterotoxigenic *Escherichia coli*
  - b. *Clostridium perfringens* type D
  - c. *Eimeria*
  - d. tapeworms
  - e. *Cooperia*



476. *In mid-December a herd of dairy cows in Vermont is experiencing an explosive outbreak of diarrhea, with 30% of the animals affected within 2 days. Feces of affected animals are very foul smelling and occasionally blood stained. Affected cows have mild fever and decreased milk production, but they are not severely depressed or seriously ill. What is the most likely cause of the diarrhea?*
- coccidiosis
  - rotavirus infection
  - bovine virus diarrhea
  - salmonellosis
  - winter dysentery
477. *Q fever in cattle typically causes:*
- fulminant pneumonia, with rapid death
  - progressive hepatitis, with loss of weight
  - no apparent clinical signs
  - shifting-leg lameness
  - mastitis that is unresponsive to antibiotic therapy
478. *At which site are you **least** likely to find a palpable lymph node in a normal cow?*
- just cranial to the middle portion of the scapula
  - just dorsal to the fold of the flank and cranial to the femur
  - on the cranial surface of the shaft of the ileum, at a point about one third of the distance from the pubis to the tuber coxae (palpable per rectum)
  - at the thoracic inlet, on either side of the xiphoid process
  - ventral to the vulva and dorsal to the base of the udder
479. *Which clinical sign is **not** consistent with heart failure in a cow?*
- rapid breathing, with the neck extended and mouth open
  - diarrhea
  - distention of the jugular veins at rest
  - edema of the brisket
  - tachycardia
480. *Which type of sound on thoracic auscultation is consistent with traumatic pericarditis in a cow?*
- splashing fluid sounds
  - normal heart sounds of high amplitude that are projected over the entire thorax
  - systolic murmur of grade 3 intensity or greater
  - diastolic murmur that radiates from the base of the heart
  - normal heart sounds, with extreme tachycardia
481. *An aged cow has caudal ataxia, several palpable masses in the intermandibular and parotid area, and an irregular heart rate. The most likely cause of these findings is:*
- tuberculosis
  - lymphosarcoma
  - listeriosis
  - parotid-gland carcinoma with metastasis
  - endocarditis, with disseminated abscesses
482. *Clinical signs of acute mastitis caused by a gram-negative organism include all of the following **except**:*
- complete anorexia
  - rumen stasis
  - bradycardia
  - swollen mammary gland
  - fever of 40.5° C (105° F)
483. *A plasma fibrinogen concentration of 1000 mg/dl in a cow is most indicative of:*
- multiple myeloma
  - lymphosarcoma
  - chronic liver disease
  - peracute inflammation
  - chronic inflammatory disease

484. *The correct needle insertion point for percutaneous liver biopsy in an adult cow by the transpleural approach is:*
- through the right 10th intercostal space at the level of the greater trochanter
  - through the left 11th intercostal space at the level of the elbow
  - 6 cm ventral to the right transverse process of the second lumbar vertebra
  - just caudal to the right 13th rib at the level of the stifle
  - 6 cm caudal to the xiphoid process and 4 cm to the right of the midline
485. *The most successful approach to achieving a bacteriologic cure in a case of subclinical mastitis caused by Staphylococcus aureus is to:*
- infuse an effective antimicrobial drug into the mammary gland just after milking
  - infuse an effective antimicrobial drug into the gland during the dry period
  - milk the cow at 2-hour intervals for 3 days
  - dip the teats in an effective germicide before each milking
  - dip the teats in an effective germicide after each milking
486. *Which clinical signs are most consistent with amyloidosis in cattle?*
- abdominal distention, shifting-leg lameness, and hair loss
  - abomasal distention that can be palpated per rectum and chronic weight loss
  - rapid heart rate, poor exercise tolerance, and occasional dyspnea
  - submandibular edema, diarrhea, hypoproteinemia, and frequent urination
  - wide stance with a stargazing posture
487. *Which disease is most likely to induce cortical blindness?*
- listeriosis
  - polioencephalomalacia
  - thromboembolic meningoencephalitis
  - rabies
  - malignant catarrhal fever
488. *Bracken fern poisoning in cattle is most commonly manifested by:*
- convulsions
  - circling and head pressing
  - caudal ataxia
  - petechial hemorrhages on mucous membranes
  - peripheral neuropathy
489. *Blindness, staggering, depression, and total anorexia are common signs of:*
- lead poisoning
  - organophosphate poisoning
  - petroleum distillate poisoning
  - aflatoxicosis
  - arsenic poisoning
490. *Acute anaphylaxis in cattle is most effectively treated with:*
- antihistamines given intravenously
  - dexamethasone given intravenously
  - epinephrine (1:1000 solution) given intravenously at 1 ml/45 kg
  - prednisone given intravenously
  - dopamine (1:10,000 solution) given intravenously at 1 ml/45 kg
491. *Which clinicopathologic assay is **not** helpful in confirming suspected liver disease in cattle?*
- serum bilirubin concentration
  - serum sorbitol dehydrogenase activity
  - serum aspartate aminotransferase activity
  - serum  $\gamma$ -glutamyltransferase activity
  - serum alanine aminotransferase activity
492. *A calf in excellent body condition shows fever, acute lameness, swelling with gas crepitus over the left semimembranosus-semitendinosus muscle group, cool skin over the swollen area, extreme depression, and complete anorexia. The most likely cause of these findings is:*
- exertional myositis
  - blackleg
  - fractured femur
  - white muscle disease
  - ergot toxicity

493. Which anthelmintic is most effective against all forms of liver fluke infection in cattle?
- levamasole hydrochloride
  - thiabendazole
  - albendazole
  - morantel pamoate
  - ivermectin
494. A feedlot steer shows signs of mild colic, straining with an elevated tail, and palpable pulsations of the urethra just ventral to the anus. The most likely cause of these signs is:
- pyelonephritis and cystitis
  - urethral blockage caused by urolithiasis
  - small intestinal volvulus
  - torsion of the spiral colon
  - omasal impaction
495. The California mastitis test is based on the presence of what constituent in the tested milk?
- nucleated cells
  - fibrin
  - fibrinogen
  - globulin
  - bacteria
496. Which blood chemistry profile is most consistent with abomasal volvulus in a dairy cow?
- pH 7.1, total carbon dioxide (CO<sub>2</sub>) 21 mmol/L, sodium (Na) 135 mEq/L, chloride (Cl) 72 mEq/L, potassium (K) 2.3 mEq/L
  - pH 7.6, total CO<sub>2</sub> 32 mmol/L, Na 135 mEq/L, Cl 100 mEq/L, K 2.3 mEq/L
  - pH 7.6, total CO<sub>2</sub> 32 mmol/L, Na 135 mEq/L, Cl 72 mEq/L, K 2.3 mEq/L
  - pH 7.6, total CO<sub>2</sub> 32 mmol/L, Na 150 mEq/L, Cl 100 mEq/L, K 6.3 mEq/L
  - pH 7.1, total CO<sub>2</sub> 21 mmol/L, Na 150 mEq/L, Cl 100 mEq/L, K 6.3 mEq/L
497. What is the most likely result of injection of 20 mg dexamethasone in a cow?
- persistent hypoadrenocorticism
  - persistent hyperadrenocorticism
  - pneumonia resulting from immunosuppression
  - abortion of a late-term pregnancy
  - diuresis, with subsequent dehydration
498. Nitrate intoxication is most likely to occur in cattle fed:
- freshly cut corn silage
  - moldy hay from large-package bales
  - lush alfalfa pasture in the spring
  - concentrates with supplemental urea
  - water from shallow wells
499. Beef cattle that have been exposed to frequent rain without shelter have developed skin lesions over their back. The lesions are characterized by areas of matted hair that coalesce to form easily removable scabs. Removal of the scabs exposes moist areas of red granulation tissue. The most likely cause of this skin problem is:
- Hypoderma infection
  - Trichophyton verrucosum infection (ringworm)
  - cutaneous papillomatosis (warts)
  - dermatophilosis
  - squamous-cell carcinoma
500. Which antimicrobial is most suitable for treatment of pyelonephritis in a cow?
- chloramphenicol
  - neomycin
  - gentamicin
  - penicillin
  - sulfathiazole
501. In cattle, pruritic lesions, characterized by scabs and thickened skin around the base of the tail are most likely to be caused by:
- Psoroptes ovis infection
  - Stephanofilaria stilesi infection
  - Chorioptes bovis infestation
  - Trichophyton verrucosum infection
  - Dermatophilus congolensis infection

502. Which of the following is **not** associated with liver disease in cattle?
- hyperglycemia
  - icterus
  - photosensitization
  - low blood urea nitrogen concentration
  - hypoproteinemia
503. In ruminants, therapeutic blood concentrations can be reached following oral administration of:
- penicillin
  - sulfadimethoxine
  - neomycin
  - amoxicillin
  - streptomycin
504. A calf is recumbent and cannot rise. All four legs are held in extension but can be flexed by the examiner. The animal withdraws the legs in response to a painful stimulus near the foot but shows no evidence of conscious pain perception. All cranial nerve reflexes are intact, and there is anal continence. The lesion in this animal is most likely located in the:
- thoracic spinal cord
  - cervical spinal cord
  - brain stem
  - lumbar spinal cord
  - cerebellum
505. A few hours after several calves have gained access to a shed where farm chemicals and supplies are stored, they begin showing signs of trembling, diarrhea, and profuse salivation. One calf collapses and dies. The class of chemicals most likely causing signs in these calves is:
- mercury-treated seed corn
  - arsenic-based herbicides
  - lead storage batteries
  - organophosphates
  - nitrate fertilizer

506. A cow is placed in left lateral recumbency on a tilt table for 1 hour for treatment of a foot lesion. When the cow is taken off the table, she cannot use her left forelimb properly. The left elbow appears lower than the right and the cow "knuckles" over on the left front fetlock. The most likely cause of these signs is:
- dislocated elbow
  - unilateral cervical spinal cord lesion
  - compression myopathy
  - brainstem damage from improper head restraint
  - radial nerve paralysis
507. Which dietary deficiency is most likely to cause papillary edema accompanied by signs of central nervous system dysfunction in a feedlot steer?
- hypovitaminosis A
  - hypovitaminosis E
  - cobalt deficiency
  - selenium deficiency
  - ascorbic acid deficiency
508. An appropriate treatment for suspected polioencephalomalacia is:
- oxytetracycline given intravenously at 10 mg/kg
  - penicillin given intravenously at 10,000 IU/kg
  - erythromycin given intravenously at 10 mg/kg
  - pantothenic acid given intravenously at 10,000 IU
  - thiamin given intravenously at 10 mg/kg
509. Abomasal volvulus in a dairy cow usually results in a "ping" on percussion-auscultation over the area:
- from the right ninth or 10th intercostal space, extending to the cranial portion of the paralumbar fossa
  - of the right paralumbar fossa, extending no farther cranially than the 13th rib
  - of the left paralumbar fossa, caudal to the last rib
  - of the right flank, caudal to the last rib and 10 to 20 cm ventral to the dorsal midline
  - just caudal to the xiphoid process and somewhat to the right of the midline

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510. Shortly after you give a cow 500 ml 50% dextrose solution intravenously, you detect glucose in the urine. This finding indicates:
- diabetes mellitus
  - severe fatty liver
  - pancreatic abscesses
  - primary insulinoma
  - a normal physiologic response
511. A group of cattle grazing in the western United States shows clinical signs of dullness, with occasional periods of excitability and frenzy. Some animals have a staggering gait and drag their feet. Others walk in circles and show diarrhea and tenesmus. The most likely cause of these signs is:
- hypovitaminosis E
  - dietary zinc deficiency
  - strychnine toxicity
  - pyrrolizidine alkaloid toxicity
  - thromboembolic meningoencephalitis
512. Lesions resembling "tufts of cotton" in the ocular fundus of a steer with central nervous system signs are highly suggestive of:
- listeriosis
  - thromboembolic meningoencephalitis
  - lead poisoning
  - rabies
  - intracranial abscess
513. An appropriate prophylactic dose of selenium for a newborn calf is:
- 10 to 20 mg
  - 25 to 30 mg
  - 0.5 to 1 g
  - 2 to 3 mg
  - 50 to 75 mg
514. An adult dairy cow has a fever (41° C, 105.8° F), profuse bloody diarrhea, progressive dehydration, and signs of colic. The most likely cause of these signs is:
- enterotoxigenic *Escherichia coli* infection
  - rotavirus infection

- coccidiosis
  - type II ostertagiasis
  - salmonellosis
515. Which clinical sign is **not** consistent with milk fever?
- cold extremities
  - heart rate greater than 110 beats/min
  - paralysis
  - hypothermia
  - sluggish or incomplete pupillary light response
516. Which condition is most likely to be confused with milk fever?
- mastitis caused by endotoxin-producing organisms
  - traumatic reticuloperitonitis with localized peritonitis
  - pyelonephritis
  - endocarditis
  - listeriosis
517. Cattle with grain overload are likely to have an anion gap that is greater than normal. Which metabolite is most likely to be responsible for this observation?
- D-lactate
  - sulfate
  - phosphate
  - D-betahydroxybutyrate
  - L-lactate
518. An appropriate dose of calcium for intravenous infusion in an average-sized Holstein cow with milk fever is:
- 80 to 90 g
  - 112 to 122 g
  - 9 to 18 g
  - 0.6 to 0.75 mg
  - 66 to 75 g

519. Which finding is **not** consistent with complete or partial abomasal obstruction?

- firm, easily palpable mass of ingesta in the dorsal rumen
- urine pH below 7
- defecation of small amounts of loose feces
- moderate to severe dehydration
- serum chloride concentrations below 90 mEq/L

520. Which disease of calves could most consistently be prevented by consumption of colostrum from unvaccinated dams?

- enterotoxigenic colibacillosis
- septicemic colibacillosis
- cryptosporidiosis
- rotaviral diarrhea
- pneumonia caused by bovine respiratory syncytial virus

#### D.R. Nelson

521. A cow recovering from surgery for abomasal displacement develops a rapid, highly irregular heart beat with no apparent change in clinical condition. This arrhythmia is most likely associated with:

- atrial fibrillation
- ventricular fibrillation
- second-degree atrioventricular block
- endocarditis
- hypercalcemia

522. The acid-base status of dairy cows with abomasal problems, such as left displacement of the abomasum or abomasal volvulus, is:

- unaffected
- metabolic acidosis
- metabolic alkalosis
- respiratory acidosis
- respiratory alkalosis

523. Which of the following is **not** associated with white muscle disease (nutritional myodegeneration)?

- sudden death
- cardiomyopathy
- weakness and paralysis
- tetanic spasms
- hypercapnia and dyspnea

524. The upper limit of chloride concentration in rumen fluid of healthy adult cattle is:

- 30 mmol/L
- 0.5 mmol/L

- 100 mmol/L
- 300 mmol/L
- 100 mEq/L

525. Left displacement of the abomasum is diagnosed by the history and clinical signs. Usually a "ping" can be heard by auscultation and percussion of the:

- left paralumbar fossa
- right paralumbar fossa
- area over the last three ribs on the right side
- area over the last three ribs on the left side
- left flank

526. Caudal vena caval thrombosis occurs sporadically in cattle with:

- endocarditis
- mastitis
- hepatitis
- rumenitis
- enteritis

527. Abomasal volvulus can be detected by hearing a "ping" on auscultation and percussion and by fluid sounds on succussion. The area to auscultate and percuss is the area over the:

- last two to three ribs on the right side
- right paralumbar fossa
- left paralumbar fossa
- last two to three ribs on the left side
- thorax, near the elbow

528. During rectal palpation of an anorectic dairy cow, you detect a gas-distended tubular structure with a blind end at the pelvic inlet. The most likely cause of this finding is:

- colonic intussusception
- abomasal volvulus
- abomasal dilatation
- cecal torsion
- cecal dilatation

529. What is the most common location for noninfectious foot lesions in cattle?

- lateral claw of the rear feet
- medial claw of the rear feet
- medial claw of the front feet
- lateral claw of the front feet
- either claw of the rear feet

530. Sudden onset and rapid fatal progression of severe signs of colic, such as kicking at the abdomen with the rear legs, lying in lateral recumbency with the limbs extended, and alternately lying down and getting up, are most likely to be associated with:

- cecal dilatation
- colonic intussusception
- impaction of the spiral colon
- torsion of the distal jejunum
- torsion of the intestines at the root of the mesentery

531. Left displacement of the abomasum occurs most often during:

- the dry period
- the first 72 hours postpartum
- late lactation
- the first 4 to 6 weeks postpartum
- the first 6 months postpartum

532. A "ping" associated with cecal dilatation and torsion is heard on simultaneous auscultation and percussion of the area:

- over the last two to three ribs on the right side
- over the last two to three ribs on the left side

- in the right paralumbar fossa
- in the left paralumbar fossa
- over the right flank

533. The preferred antibiotic for treatment of peritonitis associated with traumatic reticulitis is:

- penicillin
- chlortetracycline
- chloramphenicol
- streptomycin
- gentamicin

534. Which of the following is **not** observed in cattle with traumatic reticulitis (hardware disease)?

- rectal temperature of 39.5° C (103° to 103.5° F)
- dry, firm feces
- weak or absent rumen contractions
- positive withers and/or xiphoid reflex
- positive Liptak test

535. Gaseous distention of the rumen and subsequent distention of the left paralumbar fossa occur in all the following **except**:

- esophageal obstruction
- frothy bloat
- parturient hypocalcemia
- left displacement of the abomasum
- tetanus

536. The xiphoid reflex is a physical test to aid diagnosis of:

- left displacement of the abomasum
- ketosis
- traumatic reticulitis
- fatty liver
- torsion of the intestines at the root of the mesentery

537. Bleeding abomasal ulcers in older cows (more than 5 years old) are most likely to be associated with:

- bovine virus diarrhea
- salmonellosis
- Campylobacter* infection (vibriosis)
- winter dysentery
- lymphosarcoma

538. Concerning abomasal ulcers in cattle, which statement is **least** accurate?
- Abomasal ulcers are common in calves.
  - Lymphosarcoma is the most common cause of bleeding ulcers in cows over 5 years of age.
  - Perforation of abomasal ulcers can result in diffuse peritonitis and septic shock.
  - Most benign bleeding ulcers occur during the first postpartum month.
  - Lymphosarcoma is the most common cause of bleeding abomasal ulcers in cattle of all ages.
539. Hemoptysis is:
- vomiting of blood
  - coughing up of blood or blood-stained sputum
  - bright red discoloration of feces by fresh blood
  - dark red or black discoloration of feces by digested blood
  - hemorrhage from the nose
540. Hypochloremia is characteristic of many abomasal diseases. A normal serum chloride level in adult cattle is:
- 103 mEq/L
  - 4.0 mEq/L
  - 154 mEq/L
  - 154 mg/L
  - 86 mEq/L
541. An important consideration in management of an outbreak of cryptosporidiosis in a group of dairy calves is that:
- the disease is zoonotic
  - the disease responds well to coccidiostats
  - the disease only affects colostrum-deprived calves
  - the disease does not affect calves under 3 weeks of age
  - the causal agent requires an intermediate host, such as cats and dogs
542. The treatment of choice for cryptosporidiosis in calves is:
- sulfonamides
  - ionophores
  - intravenous fluids
  - amprolium
  - decoquinate
543. With respect to transmission, an important difference between coccidiosis and cryptosporidiosis is that:
- Cryptosporidium* requires an intermediate host
  - coccidia affect calves as young as 1 week of age
  - Cryptosporidium* affects calves as young as 1 week of age
  - Cryptosporidium* does not infect calves under 3 weeks of age
  - coccidia do not infect calves over 3 weeks of age
544. Coccidiosis is a common disease of calves and is diagnosed by:
- clinical signs
  - observing tarry feces
  - observing bloody diarrhea in a calf less than 1 week old
  - observing pasty yellow feces
  - finding oocysts in a fecal flotation
545. Which drug is **not** suitable for treating coccidiosis in calves?
- ionophores
  - sulfonamides
  - decoquinate
  - amprolium
  - furazolidone
546. A 3-day-old Holstein calf has watery yellow feces streaked with blood. The most likely cause of this sign is:
- Eimeria*
  - Salmonella typhimurium*
  - Escherichia coli*
  - coronavirus
  - Clostridium perfringens* type D

547. The diarrhea associated with enteric virus infection, such as rotavirus, is the result of:
- hypersecretion
  - hypermotility
  - malabsorption
  - hypomotility
  - hypertrophy
548. Neonatal calves with severe diarrhea have an acid-base status characterized as:
- metabolic alkalosis
  - metabolic acidosis
  - respiratory alkalosis
  - respiratory acidosis
  - not altered
549. Intravenous fluids used to treat severely diarrheic, dehydrated calves should include:
- ammonium chloride
  - glucose
  - sodium bicarbonate
  - sodium chloride
  - calcium borogluconate
550. The most important and immediate concern in treatment of this calf is to:
- correct the dehydration, electrolyte imbalance, and acid-base imbalance with intravenous fluid therapy
  - correct the dehydration, electrolyte imbalance, and acid-base imbalance with oral fluid therapy
  - euthanize the calf because treatment is likely to be unrewarding
  - give parenteral antibiotics to control infection
  - give oral antibiotics to control infection
551. How much fluid must be given intravenously to replace the estimated fluid deficit in this 44-kg calf?
- 5.3 L
  - 530 ml
  - 4.4 L
  - 10 L
  - 30 ml/kg
552. In addition to replacement requirements, how much fluid must be given to this calf over the next 24 hours to meet maintenance requirements?
- 5.3 L
  - 10 L
  - 530 ml
  - 2.2 L
  - 1 L
553. What are the total bicarbonate requirements for rehydration of this calf?
- 44 mmol
  - 4400 mmol
  - 440 mmol
  - 880 mmol
  - 88 mmol
554. Failure of passive transfer of colostral immunoglobulins in neonatal calves:
- requires serum electrophoresis for diagnosis
  - is usually asymptomatic
  - can only be detected if the calf has infectious disease
  - is diagnosed by the sodium sulfide test, zinc sulfate test, or refractometric measurement
  - is diagnosed by the fibrinogen test or Liptak test
555. Colostral antibodies are absorbed from the intestine of neonatal calves **only** during the:
- first 72 hours of life
  - first 6 hours of life
  - first month of life
  - last 3 months of gestation
  - first 24 hours of life

556. As a primary agent, enterotoxigenic strains of *Escherichia coli* usually infect calves during the first 5 days of life. Infection may occur in older calves secondary to viral infections. What limits the primary pathogenicity of *E. coli* in a calf beyond the first few days of life?
- Adherence factors that allow colonization of the organism, such as the K99 antigen, are effective for only a short time.
  - Such factors as the K99b antigen aid penetration of the intestinal mucosal cells and are present for only a short time.
  - E. coli* strains are primary invaders of the intestinal tract throughout life.
  - Calves develop active immunity very quickly after initial exposure to *E. coli* strains.
  - Bacterial organisms require iron for proliferation, and the milk diet of calves is low in iron.
557. The diarrhea associated with enterotoxigenic *Escherichia coli* infection is due to:
- hypermotility
  - hypomotility
  - malabsorption
  - hypersecretion
  - osmosis
558. Diarrhea in neonatal calves can cause dehydration and electrolyte imbalance. An electrolyte that is **not** lost in great quantities during neonatal diarrhea is:
- potassium
  - calcium
  - sodium
  - chloride
  - bicarbonate
559. The hemogram of young calves with septicemia caused by *Salmonella typhimurium* typically shows:
- anemia
  - leukocytosis
  - leukopenia
  - monocytosis
  - lymphocytosis
560. Because primary bloat in cattle is treated differently from other forms of bloat, recognition of primary bloat is important. Primary bloat:
- occurs when eructation is diminished by obstructions or external pressures on the esophagus
  - may be a sequel to respiratory disease from enlarged mediastinal lymph nodes
  - never occurs on pasture
  - produces foam that traps rumen gases normally produced during fermentation
  - occurs with tetanus and hypocalcemia
561. Footrot (interdigital phlegmon, interdigital necrobacillosis, infectious pododermatitis) is:
- caused by *Fusobacterium necrophorum*
  - caused by aerobic gram-negative bacteria that are invasive to the skin and invade the interdigital tissues
  - usually secondary to acute laminitis
  - caused by *Bacteroides melaninogenicus*
  - caused by synergistic infection with two anaerobic gram-negative bacteria
562. A 1-week-old calf that initially appeared stiff is now unable to stand. The rectal temperature and feces are normal, and the calf nurses readily from a bottle. Palpation of the muscles of the shoulders and lumbar region produces a pain response. The most likely cause of these findings is:
- tetanus
  - magnesium deficiency
  - selenium-vitamin E deficiency
  - vitamin D deficiency
  - copper deficiency
563. Aseptic laminitis usually occurs:
- secondary to rumen acidosis, toxic metritis, and toxic mastitis
  - secondary to other foot problems, such as Rusterholz's ulcer
  - secondary to hepatic disease
  - as a primary condition caused by ingestion of plant toxins
  - as a primary condition caused by endotoxins associated with bacteremia

564. The only effective treatment for chronic laminitis in dairy cattle is:
- nonsteroidal antiinflammatory drugs
  - corticosteroids
  - footbaths
  - analgesics
  - therapeutic hoof care, such as corrective trimming
565. Aseptic laminitis in cattle:
- always occurs in all four feet
  - causes gross changes in hoof conformation when the disease is chronic
  - results from predisposing infections of the hoof, such as footrot
  - is primarily a disease of dairy cattle
  - is primarily a disease of feedlot cattle
566. Listeriosis, caused by *Listeria monocytogenes*, may cause any of the following syndromes **except**:
- gastroenteritis in adult cattle
  - encephalitis in adult cattle
  - abortion in adult cattle
  - septicemia in fetuses and neonatal calves
  - encephalitis and abortion in humans
567. Listeriosis in cattle is characterized by:
- unilateral facial paralysis
  - focal hepatic necrosis
  - opisthotonus
  - tetanic spasms
  - circulatory failure
568. In cattle with listeriosis, microscopic lesions of the brain are characterized by:
- suppurative meningitis
  - perivascular cuffing or mononuclear cells, with focal necrosis
  - petechial hemorrhage and laminar neuronal necrosis
  - focal or laminar areas of necrosis of the gray matter of the cerebral cortex
  - neuronal necrosis, gliosis, neurophages, and pericellular edema
569. Polioencephalomalacia or cerebrocortical necrosis is:
- a disease of mature ruminants
  - associated with grain feeding in young cattle
  - associated with pasture grazing in young cattle
  - associated with grain feeding in dairy cows
  - a disease of milk-fed calves
570. Polioencephalomalacia or cerebrocortical necrosis is caused by a dietary deficiency of:
- selenium
  - $\alpha$ -tocopherol
  - thiamin
  - vitamin A
  - choline
571. In cattle with polioencephalomalacia, microscopic lesions of the brain are characterized by:
- suppurative meningitis
  - perivascular cuffing of mononuclear cells, with focal necrosis
  - petechial hemorrhage and laminar neuronal necrosis
  - focal or laminar areas of necrosis of the gray matter of the cerebral cortex
  - neurofilamentous neuronal degeneration of the cerebrum and ganglion cells of the peripheral nervous system
572. Examination of cerebrospinal fluid (CSF) assists diagnosis of central nervous system disease. Which CSF finding is characteristic of polioencephalomalacia?
- increased CSF pressure
  - blood in CSF
  - 2+ to 4+ reaction to Pandy's reagent
  - increased total protein content
  - $>1.0 \times 10^9$  cells/L

573. The recommended treatment for polioencephalomalacia is:
- calcium disodium edetate
  - thiamin
  - tetracycline
  - penicillin
  - vitamin A
574. The recommended treatment for lead poisoning in cattle is:
- calcium disodium edetate (Ca EDTA)
  - British anti-lewisite
  - tetracycline
  - penicillin
  - vitamin A
575. Which alteration of cerebrospinal fluid (CSF) is **not** seen in cattle with bacterial meningitis?
- often clear and colorless gross appearance
  - increased cell numbers, often  $>0.1 \times 10^9/L$
  - cellular content primarily neutrophils
  - total protein content  $<1.0$  g/L
  - 2+ to 4+ Pandy's test
576. Blindness is a prominent clinical sign in polioencephalomalacia. Blindness is also a sign of:
- thromboembolic meningoencephalitis
  - rabies
  - lead poisoning
  - listeriosis
  - pseudorabies
577. Bacterial meningitis occurs most frequently in neonatal calves after septicemia. The organism most frequently isolated from neonatal calves with bacterial meningitis is:
- Haemophilus somnus*
  - Actinomyces pyogenes* (formerly *Corynebacterium pyogenes*)
  - Staphylococcus aureus*
  - Escherichia coli*
  - Streptococcus faecalis*
578. The Pandy test is used to assess which component of cerebrospinal fluid (CSF)?
- bacterial count
  - total protein content
  - cell count
  - glucose content
  - globulin content
579. Cerebrospinal fluid (CSF) can safely be obtained quite easily from which location in cattle?
- sacroccygeal space
  - thoracolumbar junction
  - foramen magnum
  - lumbosacral space
  - juncture of second and third cervical vertebrae
580. The incubation period for Johne's disease (paratuberculosis) is:
- 2 to 6 years
  - 7 to 10 days
  - 30 to 40 days
  - $<6$  months
  - 75 to 100 hours
581. Cattle most frequently develop clinical signs of Johne's disease (paratuberculosis) at what age?
- 3 to 6 months
  - 2 to 8 years
  - 7 to 12 years
  - 1 to 12 weeks
  - $<1$  year
582. Auscultation of the heart of a cow with vagus indigestion usually reveals:
- atrioventricular block
  - systolic murmur
  - atrial fibrillation
  - tachycardia
  - bradycardia
583. Renal amyloidosis is characterized by deposition of amyloid in the renal glomeruli. A common clinical sign of this disease is:
- chronic diarrhea
  - hemoglobinuria
  - constipation
  - hyperproteinemia (8 to 9 g/dl)
  - severe azotemia
584. Which heart irregularity is likely to be found in a dairy cow with left displacement of the abomasum?
- ventricular fibrillation
  - atrial fibrillation
  - myocarditis
  - systolic murmur
  - atrioventricular block
585. Johne's disease (paratuberculosis) is caused by:
- Mycobacterium tuberculosis*
  - Campylobacter jejuni*
  - Mycobacterium paratuberculosis*
  - Corynebacterium pseudotuberculosis*
  - Mycoplasma bovis*
586. Which of the following is **not** observed in cattle with Johne's disease (paratuberculosis)?
- chronic diarrhea
  - good appetite
  - intestinal malabsorption
  - hypoproteinemia
  - gastroenteritis
587. The normal pH range of rumen fluid is:
- 2.5 to 3.5
  - 7.0 to 8.5
  - 3.5 to 8.5
  - 5.5 to 7.0
  - 6.8 to 7.4
588. Hemoptysis can be a prominent sign of caudal vena caval thrombosis. What causes the hemorrhage in the lungs?
- Secondary respiratory infection develops from rumenitis.
  - Associated rumenitis produces thrombi that are carried to the lungs.
  - Thrombi pass to the lungs from thrombophlebitis caused by a hepatic abscess eroding through the vena caval wall.
  - Associated rumenitis causes endocarditis, and thrombi pass to the lungs.
  - A thrombus forms in the caudal vena cava, causing increased venous pressure and subsequent alveolar rupture in the lungs.
589. A cow has gradual and progressive weight loss, with scant, pasty feces. The left paralumbar fossa and the ventral right abdomen are distended. Rectal palpation reveals the ventral rumen sac extending to the right abdominal wall. The most likely cause of these findings is:
- vagus indigestion
  - abomasal dilatation
  - rumen bloat
  - intussusception
  - rumen atony
590. A poor, thin haircoat with hair depigmentation, especially around the eyes, slight anemia, and chronic diarrhea usually indicate a dietary deficiency of:
- zinc
  - cobalt
  - selenium
  - iron
  - copper
591. Diarrhea is common in all the following diseases **except**:
- bovine virus diarrhea
  - endoparasitism
  - salmonellosis
  - selenium deficiency
  - chronic peritonitis



592. *Aseptic laminitis is:*
- seen only in feedlot cattle
  - common in the immediate postpartum period in dairy cows
  - common in the dry period in dairy cows
  - seen only in dairy cattle
  - usually associated with other foot problems, such as Rusterholz's ulcer
593. *A major electrolyte imbalance that is characteristic of left displacement of the abomasum and abomasal volvulus is:*
- hypochloremia
  - hyperchloremia
  - hypernatremia
  - hypokalemia
  - hyperkalemia
594. *Which laboratory test is **not** very helpful in diagnosis of white muscle disease (nutritional myodegeneration) of calves?*
- serum aspartate transaminase activity
  - serum creatine kinase activity
  - blood selenium level
  - serum glutathione peroxidase activity
  - serum alkaline phosphatase activity
595. *Concerning white muscle disease (nutritional myodegeneration), which statement is **least** accurate?*
- An affected calf can have normal blood selenium levels.
  - Selenium-deficient soils are found only in certain areas of the United States.
  - Selenium deficiency may have a role in retained placenta, mastitis and other diseases.
  - Selenium and vitamin E protect cells from oxidative injury.
  - Selenium-vitamin E deficiency occurs only in young calves (1 month old).

596. *In a group of beef cows, several animals have lameness of the rear feet. Examination reveals pain and swelling proximal to the coronary band. The heart rate, respiratory rate and rectal temperature are generally increased. The feet of several cattle show necrosis of the skin distal to a line of demarcation separating healthy tissue from dry, leathery skin. In several other cattle, the hoof walls have separated at the coronary band. The most likely cause of these findings is:*
- infectious pododermatitis (footrot)
  - ergotism
  - bovine virus diarrhea
  - malignant catarrhal fever
  - verruccose dermatitis of the feet
597. *A group of steers has been grazing a pasture during the summer. The animals have a rough haircoat, and gains have been poor. The animals spend most of their time in the shade or standing in a pond and spend little time grazing. Respiratory rates are increased and several animals are slightly febrile. The most likely cause of these findings is:*
- fescue toxicity
  - infectious bovine rhinotracheitis
  - lupine toxicity
  - pasteurellosis
  - leptospirosis
598. *The preferred antibiotic treatment of acute leptospirosis in cattle is:*
- penicillin
  - dihydrostreptomycin
  - tetracycline
  - neomycin
  - chloramphenicol

599. *If mastitis is present in only one quarter of a dairy cow and an antibiotic preparation is infused into that quarter:*
- only milk from that quarter must be discarded for the time indicated on the drug label
  - milk from all quarters must be discarded for the time indicated on the drug label
  - withholding of milk from any or all quarters is not necessary

- only milk from the two quarters on the treated side must be discarded for the time indicated on the drug label
- only milk from that quarter must be discarded for the next milking

600. *Which group of antibiotics is **not** bactericidal?*

- tetracyclines
- aminoglycosides
- penicillins
- cephalosporins
- fluoroquinolones

#### P.L. Ruegg

601. *Concerning subclinical or chronic rumen acidosis of dairy cattle, which statement is most accurate?*
- It is definitively diagnosed at necropsy by the presence of miliary liver abscesses.
  - It is usually characterized by a high incidence of abomasal disease, indigestion, and laminitis.
  - It is usually caused by infection with *Fusobacterium necrophorum*.
  - It is usually the result of acute, severe metabolic acidosis.
  - It is usually treated with oral antibiotics.

- Affected cattle produce excessive saliva.
- The rumen papillae epithelium becomes necrotic.
- Affected cattle have rumen hypermotility.

604. *Which disease is most likely to cause abortions in cows at 4 to 6 months of gestation?*

- epizootic bovine abortion
- listeriosis
- brucellosis
- leptospirosis
- neosporosis

602. *Rumen pH in cattle with subclinical or chronic rumen acidosis usually ranges from:*

- 4.5 to 5.0
- 5.0 to 5.5
- 5.5 to 6.0
- 6.0 to 6.5
- 6.5 to 7.0

603. *Concerning periods of subclinical (chronic) rumen acidosis, which statement is most accurate?*

- The proportions of butyric and propionic acids in rumen fluid increase and acetate decreases.
- Large quantities of lactic acid accumulate in the rumen.

605. *Infection of a pregnant cow with bovine virus diarrhea virus usually results in:*

- congenital defects when infection occurs before 40 days of gestation
- congenital defects when infection occurs after 175 days of gestation
- persistently infected calves when infection occurs before 40 days of gestation
- persistently infected calves when infection occurs between 40 and 125 days of gestation
- persistently infected calves when infection occurs after 175 days of gestation

For Questions 606 through 610, select the correct answer from the five choices below.

- Staphylococcus aureus*
- Streptococcus agalactiae*
- Streptococcus uberis*
- Escherichia coli*
- Mycoplasma*

606. Generally causes severe mastitis that is not responsive to antibiotic therapy

607. A highly contagious, obligate pathogen of the udder

608. Causes mastitis that often resolves spontaneously, without treatment

609. Causes clinical and subclinical mastitis and usually is of environmental origin

610. A contagious pathogen that is often not responsive to antimicrobial therapy during lactation

#### Questions 611 through 613

You are called to examine a cow that has recently calved at a dairy farm that has been experiencing problems with cows during the first 2 weeks post partum. About 25% of recently calved cows have demonstrated reduced feed intake and seem to prefer forage rather than concentrates. The rectal temperature, pulse rate, and respiratory rate of the cow you examine are normal, but milk production is low. Rumens motility is normal. You detect ketones in the breath, urine, and milk. The cow appears partially blind and is quite aggressive.

611. What is the most likely cause of this cow's clinical signs?

- rabies
- bovine virus diarrhea
- ketosis
- lead poisoning
- listeriosis

612. Which of the following should be used in managing this cow?

- intravenous calcium borogluconate
- intravenous ethylenediaminetetraacetic acid
- intravenous dextrose
- intravenous antibiotics
- immediate slaughter and submission of the brain to a diagnostic laboratory for rabies testing

613. Future cases of similar illness in this herd are best prevented by:

- vaccination programs that include modified-live virus vaccines
- vaccination programs that include killed-virus vaccines
- confinement housing and a high-concentrate diet
- proper ensiling of chopped forages
- good nutritional management of dry and recently calved cows, and avoidance of overconditioning

614. Which agent is most likely to cause severe teat lesions in dairy cows, consisting of vesicles and edematous plaques that progress to erythema, crusting, and ulceration of teat skin?

- bovine herpesvirus 2
- bovine virus diarrhea virus
- pseudocowpox virus
- bovine papillomavirus
- Staphylococcus aureus*

615. Concerning dairy bulls that are infected with *Trichomonas foetus*, which statement is most accurate?

- They are found exclusively in commercial artificial insemination centers.
- They are usually concurrently infected with *Campylobacter fetus* var. *fetus*.
- They are usually younger than noninfected bulls.
- They show no outward signs of infection.
- They almost always develop immunity to the agent.

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For Questions 616 through 620, select the correct answer from the five choices below.

- infectious bovine rhinotracheitis virus
- bovine virus diarrhea virus
- bovine respiratory syncytial virus
- Pasteurella multocida*
- Pasteurella hemolytica*

616. This can be successfully treated with a wide variety of broad-spectrum antibiotics.

617. This causes respiratory disease and may be accompanied by peripheral corneal edema.

618. Nonpathogenic serotype 2 can, under stressful conditions, convert to the more virulent serotype 1.

619. Outbreaks of this pathogen are usually characterized by high morbidity and low mortality; affected cattle may demonstrate subcutaneous emphysema.

620. Severe leukopenia and immunosuppression during acute infections with this pathogen predispose to secondary infections.

621. In cattle excessive lacrimation, blepharospasm, and photophobia, followed by keratitis and an area of central corneal ulceration, are most characteristic of infection by:

- bovine virus diarrhea virus
- Moraxella bovis*
- Leptospira interrogans*
- Haemophilus somnus*
- Pasteurella hemolytica*

622. Which of the following is **not** characteristic of thromboembolic meningoencephalitis?

- at necropsy disseminated multifocal hemorrhages in the spinal cord, brain stem, and cerebral cortex
- infection via the respiratory tract

- usually responsive to treatment with intramuscular thiamine
- rectal temperature in affected animals of 40° to 40.5° C
- depression, anorexia, and possible ataxia of affected animals

623. Which of the following indicates failure of passive transfer of maternal antibodies in a normally hydrated 1-day-old calf?

- total plasma protein level of 5.0 g/dl
- serum immunoglobulin G level of 1900 mg/dl
- precipitation of 14%, 16%, and 18% solutions of sodium sulfite (3 ml) when mixed with calf serum (0.1 ml)
- serum albumin level of 3.5 g/dl
- complete coagulation of 10% glutaraldehyde mixed with serum (serum to test reagent ratio of 10:1)

624. Concerning *Cryptosporidium parvum*, which statement is most accurate?

- It is host specific.
- Infection is prevented by passive immunity through colostrum antibodies.
- It is an obligate parasite of calves.
- It can cause diarrhea in calves, lambs, pigs, and people.
- Infection is effectively treated with oral antibiotics.

625. Male calves that are recessive homozygotes for bovine leukocyte adhesion deficiency:

- generally die before 1 year of age
- appear healthy but may be carriers
- have normal immune system function
- are ideal for use as herd sires
- typically have neutropenia

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626. What is the most common cause of septicemia in neonatal calves?
- Escherichia coli*
  - Clostridium perfringens*
  - Pasteurella multocida*
  - Staphylococcus aureus*
  - Actinomyces pyogenes*
627. Which of the following provides the most important source of passive antibodies in neonatal calves?
- antibodies absorbed in utero during transplacental transfer
  - antibodies produced by the fetus in utero
  - antibodies secreted into the placental fluid and ingested and absorbed by the fetus in utero
  - colostral antibodies ingested during the first 12 to 24 hours post partum
  - plasma collected from the dam and administered to the calf as soon as possible post partum
628. Definitive antemortem diagnosis of septicemia in neonatal calves may be based upon:
- an elevated rectal temperature with diurnal variation
  - culture of bacteria from a sample of the neonate's blood, collected in an aseptic manner
  - clinical signs of stupor, coma, or convulsions
  - auscultation of a heart murmur
  - lameness and joint enlargement
629. Clinical signs of stage-two milk fever in a recently postpartum dairy cow are best described as:
- anorexia, hyperexcitability, and paresis
  - anorexia, an acetone odor to the breath, and reduced fecal output
  - hyperesthesia, particularly of the head and ears, and dilated pupils
  - sternal recumbency, increased heart rate with decreased intensity of heart sounds, and rumen stasis
  - lateral recumbency, flaccid paralysis, decreased rectal temperature, and coma
630. Clinical signs of hypomagnesemia (grass tetany, lactation tetany) are most closely correlated with:
- serum magnesium levels
  - dietary magnesium levels
  - cerebrospinal fluid magnesium levels
  - red blood cell magnesium levels
  - hepatic magnesium levels
631. You have been called to a client's farm to examine two adult crossbred beef cows. It is spring and this group of 75 cows with calves has recently been turned into a winter wheat pasture to graze. No mineral supplement is provided. As you near the pasture, you observe one cow in lateral recumbency and the other is trying to butt your client each time he opens the pickup door. On closer examination (through the window of your truck), you note that the recumbent cow has fine, rapid head and limb tremors. That cow has a tonic-clonic convulsion when the other cow bumps into it. The ears of the aggressive cow are rigid and angled rostrally, and the cow "snaps" them and her eyelids when your client waves his hat at the cow. The cow falls but continues to have exaggerated, hyperesthetic responses to stimuli. What are the most likely cause of these findings and the most appropriate treatment for these cows?
- hypocalcemia; intravenous infusion of calcium borogluconate solution
  - hypomagnesemia; intravenous infusion of a mixture of calcium borogluconate and magnesium hypophosphite
  - lead poisoning; oral and intravenous calcium oxalate solution
  - salt intoxication; oral and intravenous balanced electrolyte solution
  - nervous ketosis; intravenous 50% dextrose solution

632. Which disease does **not** cause affected cattle to produce red urine (hematuria or hemoglobinuria)?
- anaplasmosis
  - leptospirosis
  - bacillary hemoglobinuria
  - pyelonephritis
  - enzootic hematuria (bracken fern poisoning)
633. The California mastitis test (CMT) of milk detects:
- bacteria
  - an abnormally high protein content
  - red blood cells
  - white blood cells and other somatic cells
  - fat levels above 1.5%
634. Gut closure is said to occur when macromolecules (e.g., colostral proteins) can no longer be absorbed into the circulation from the digestive tract. In calves at what age does gut closure occur?
- 48 hours
  - 12 hours
  - 7 days
  - 24 hours
  - 6 weeks
635. In resting adult cattle the diagnostic threshold for tachycardia is a heart rate above:
- 90 beats/min
  - 50 beats/min
  - 110 beats/min
  - 30 beats/min
  - 120 beats/min
636. As a diagnostic test, within 15 minutes after administration of 30 mg atropine sulfate subcutaneously, the resting heart rate increases by at least 16% in adult cattle with:
- second-degree heart block
  - atrial fibrillation
  - vagal bradycardia
  - cardiac tamponade
  - mitral insufficiency
637. Pericardial murmurs occur as a result of heart action but are not always directly related to the cardiac cycle. They may be characterized as gurgling, slopping, or grating. What is the most common cause of these sounds in adult cattle?
- bovine leukosis involving the right atrium
  - valvular endocarditis
  - traumatic pericarditis
  - pericardial tuberculosis
  - pericardial transudate secondary to hypoproteinemia
638. Concerning bacterial endocarditis in adult dairy cattle, what are the most common client complaints about affected cows?
- recurrent fever, anorexia, poor milk production, and weight loss
  - brisket edema, tachypnea, excessive recumbency, and anorexia
  - tachypnea, associated mastitis, ventral edema, and weight loss
  - jugular vein distention, shifting-leg lameness, fever with diurnal variation, and associated mastitis
  - excessive recumbency, shifting-leg lameness, recurrent fever, and ventral edema
639. What is the most consistent of cardiac auscultation in cows with bacterial endocarditis?
- a systolic heart murmur
  - gurgling, slopping sounds associated with the heart beat
  - loud, pounding heart sounds
  - a gallop rhythm
  - muffled, indistinct heart sounds

640. When fluid therapy is a part of the regimen to treat gastrointestinal disease in cattle, the intravenous route is often preferred over the oral route because:
- it is less costly
  - intravenous fluids are more easily administered
  - fluids given orally are poorly absorbed in the presence of gastrointestinal stasis or reduced motility
  - of the danger of passing a stomach tube into the trachea
  - hypertonic solutions are best given intravenously
641. Blood cell changes can be helpful in diagnosing traumatic reticuloperitonitis in cattle. What is the most commonly noted hematologic change, occurring 4 to 72 hours after reticular penetration by a foreign object?
- marked eosinophilia
  - regenerative anemia
  - thrombocytopenia
  - neutrophilic leukocytosis
  - leukopenia
642. Calves less than 30 days old are most susceptible to Johne's disease. Whether the calf becomes chronically infected depends upon:
- its breed and sex
  - the number of bacilli ingested and host defense mechanisms
  - the amount of colostrum ingested and the continuing plane of nutrition
  - the virulence of the strain of *Mycobacterium paratuberculosis* ingested
  - prior antimicrobial treatment
643. Definitive antemortem diagnosis of Johne's disease in cattle can be based upon:
- positive reaction to intravenous johnin
  - positive reaction to intradermal johnin
  - positive agar gel immunodiffusion test
  - positive serum neutralization test
  - recovery of the causative organism from culture of feces or ileocecal lymph node
644. Which malignant tumor of cattle is associated with a virus and arises in lymphatic tissues from proliferation of atypical lymphocytes?
- lymphosarcoma
  - leukemia
  - leukosis
  - persistent lymphocytosis
  - lymphoma
645. Cattle have several unique anatomic features in their lungs. Which feature is particularly important in the pathogenesis of respiratory disease, in that it results in atelectasis distal to the obstructed airways?
- muscular pulmonary arteries
  - location of the bronchial opening of the right cranial lung lobe
  - complete separation of the secondary lobules by loose connective tissue
  - relatively small lungs in proportion to body size
  - complete separation of the two halves of the pleural cavity
646. Which diseases commonly cause metabolic acidosis?
- diarrheal diseases and diseases that cause excessive salivation
  - abomasal displacement and reticuloperitonitis
  - ileus from any cause and ketosis
  - acute shipping fever and infectious bovine rhinotracheitis
  - anaplasmosis and piroplasmiasis
647. Two readily apparent signs of dehydration in cattle are:
- weakness and a jugular pulse
  - tachycardia and excitement
  - sunken eyeballs and tenting of the skin upon pinching it
  - a dry nose and proptosis
  - dry feces and dilute urine
648. What is the most appropriate replacement and maintenance intravenous fluid for a cow with left abomasal displacement?
- Ringer's solution
  - lactated Ringer's solution
  - 5% sodium bicarbonate solution
  - 0.9% saline solution with 1.3% sodium bicarbonate
  - 5% dextrose in water
649. Why do ruminants have a greater capacity to reduce serum urea nitrogen levels than do monogastric animals?
- Ruminants have normally alkaline urine, which facilitates elimination of large urea loads presented to the distal convoluted tubule.
  - Ruminants recycle and eliminate urea through the saliva and rumen mucosa.
  - Ruminants selectively filter urea nitrogen in the distal renal tubules.
  - Ruminants have an enhanced capability to eliminate urea in the feces.
  - Ruminants have a lower dietary intake of urea than monogastrics, which reduces the baseline serum urea level.
650. You are called to examine several steers in a group of 50 animals. The steers were purchased at an auction and each weigh approximately 227 kg (500 lb). These animals have no previous vaccination history; yesterday your client administered vaccines (infectious bovine rhinotracheitis, bovine virus diarrhea, parainfluenza-3, multivalent *Clostridium bacterin/toxoid*) and an anthelmintic (injectable 1% ivermectin). Today he noticed that several steers were very lame and one was very sick. By the time you arrive the sick animal is dead and two others are now recumbent. You note that the hindquarters of one affected steer are grossly swollen. When you palpate the swollen area, it is cool and crepitant. Necropsy of the dead animal reveals dark, discolored areas in the lumbar, diaphragmatic, and cervical musculature. You also note a large amount of emphysema in and between various muscle bellies. What is the most likely cause of these findings?
- Haemophilus somnus* septicemia
  - coliform myositis
  - myositis caused by *Clostridium chauvoei* and/or *Clostridium septicum*
  - vitamin E-selenium deficiency
  - exertional rhabdomyolysis

## PIGS

S.C. Henry

### Questions 651 through 654

A group of 60 boars, each weighing approximately 20 kg, is gathered at a central testing facility. One week after arrival, 30% of the boars develop watery, yellow diarrhea. Affected animals have a decreased appetite and are dehydrated, and two boars die.

### 651. The most likely differential diagnoses include:

- colibacillosis, swine dysentery, septicemic salmonellosis
- proliferative enteritis, rotaviral diarrhea, *Clostridium perfringens* enterotoxemia

- ascarid infection, transmissible gastroenteritis, enterocolitic salmonellosis
- proliferative enteritis, enterocolic salmonellosis, transmissible gastroenteritis
- fumonisin aflatoxicosis, swine dysentery, coccidiosis

652. The most appropriate initial diagnostic steps are:

- necropsy of dead boars; assessing trends in temperature, pulse, and respiration of affected animals; fecal flotation
- feed sampling for aflatoxins, complete blood count, fecal flotation
- fecal culture, necropsy of dead boars, water analysis for sulfates
- necropsy of dead boars, fecal culture, serologic tests for transmissible gastroenteritis
- sacrifice of acutely affected animals for necropsy, necropsy of dead animals, fecal culture

653. Gross postmortem lesions in the boars include necrotic typhlitis and colitis with moist, enlarged mesenteric lymph nodes. These findings are most suggestive of:

- coccidiosis and *Serpula*-induced colitis
- clostridial enterotoxemia and *Salmonella* enterocolitis
- proliferative adenomatosis and transmissible gastroenteritis
- swine dysentery and *Salmonella* enterocolitis
- Salmonella choleraesuis* infection and *Trichuris typhlitis*

654. Five weeks after the initial outbreak of diarrhea, eight animals are unthrifty, have lost weight, and still suffer from diarrhea. Two of these pigs show abdominal distention, and examination reveals a rectal stricture preventing normal fecal evacuation. These sequelae are most often associated with failure to recover from:

- fumonisin aflatoxicosis
- Salmonella* enterocolitis
- swine dysentery
- rectal prolapse
- proliferative adenomatosis

#### Questions 655 through 661

Piglets are dying within 48 hours of birth, and the concerned producer brings one dead piglet and another, alive but moribund, to you for a diagnosis. Both piglets show severe dehydration. The living piglet has clear, fluid diarrhea soiling the hindquarters. The owner has administered a variety of antibiotics, with no apparent positive response. You request more history as you prepare for examination and necropsy.

655. Which information is **least** relevant to the history?

- incidence of diarrhea within the litter
- incidence of diarrhea among litters
- medication included in the gestation diet
- concurrent signs of illness in sows
- specific treatments used by the owner

656. Given the signs and history, which disease is **least** likely responsible for these signs?

- enteric colibacillosis
- clostridial enterotoxemia
- proliferative adenomatosis
- transmissible gastroenteritis
- rotaviral diarrhea

657. You observe no visible abnormalities during necropsy of the dead piglet. The moribund piglet dies and also has no visible lesions. Fecal pH of both piglets is above 8. These observations suggest:

- malabsorptive diarrhea, with mucosal necrosis caused by clostridial enterotoxemia
- secretory diarrhea caused by villous atrophy from viral enteritis
- bacterial enterotoxemia resulting in secretory diarrhea
- proliferative enteropathy resulting in malabsorptive diarrhea
- toxic milk syndrome

658. What are the most appropriate samples to collect for submission to the diagnostic laboratory?

- swab of the stomach for cultures; samples of small intestine for viral fluorescent antibody testing; formalin-fixed large and small intestine for histopathologic examination
- mucosal impression smears of ileum and jejunum for coccidial merozoites; formalin-fixed tissue for fluorescent antibody testing
- fresh sections of ileum and jejunum for culture and fluorescent antibody testing; fixed liver, kidney, brain, and lung for histopathologic examination; cecal contents for *Serpula* culture
- fixed sections of small and large intestine for histopathologic examination; swab of the ileum for culture; fresh ileum and jejunum for viral fluorescent antibody testing
- spiral colon for viral and bacterial isolation; tied and frozen sections of small intestine for clostridial isolation

659. The enteric infections of nursing piglets most likely to produce lesions of small bowel mucosal necrosis are:

- Isopora suis* coccidiosis, clostridial enterotoxemia
- colibacillosis, clostridial enterotoxemia
- rotaviral enteritis, swine dysentery
- transmissible gastroenteritis, proliferative adenomatosis
- colibacillosis, *I. suis* coccidiosis

660. Immunization of sows to stimulate passive protection in their piglets is a common procedure for preventing which enteric diseases of nursing piglets?

- coccidiosis, clostridial enterotoxemia, colibacillosis
- transmissible gastroenteritis, colibacillosis, clostridial enterotoxemia
- colibacillosis, swine dysentery, rotaviral diarrhea
- proliferative adenomatosis, clostridial enterotoxemia, transmissible gastroenteritis
- colibacillosis, *Salmonella* enterocolitis, *Serpula* colitis

661. The pathogenicity of *Escherichia coli* in neonatal piglets is related to:

- specific adhesive properties of bacterial pili
- production of endotoxin
- capsular mucin
- very low environmental temperatures
- primary immunosuppressive diseases of piglets

662. Histopathologic lesions in the brains of 8-week-old pigs may be observed with:

- proliferative enteritis, porcine parvovirus infection
- swine infertility and respiratory syndrome virus infection, vitamin E deficiency
- edema disease, *Streptococcus suis* type II infection
- Salmonella choleraesuis* infection, *Mycoplasma hyosynoviae* infection
- pseudorabies, *Serpula* infection

663. Coliform mastitis in sows is a result of:

- endotoxic effects of bacterial septicemia
- bacterial colonization and tissue necrosis following ascending infection
- serotype-specific *Klebsiella pneumoniae* endotoxemia and septicemia
- endotoxic effects of ascending localized infection from a variety of coliform bacteria
- endotoxemia secondary to diet-induced gastrointestinal stasis and constipation

664. Therapy for acute coliform mastitis in sows might logically include any of the following **except**:

- penicillin
- prednisolone
- flunixin
- glucose and electrolytes for the piglets
- oxytocin

665. A legal, approved treatment for *Clostridium perfringens* type C enteritis is:
- procaine penicillin G by injection of sows and pigs
  - bacitracin methylene disalicylate at 275 ppm in prefarrowing and lactation diets
  - lincomycin at 220 ppm in lactation diets
  - furazolidone oral suspension for piglets
  - enrofloxacin oral solution for piglets
666. Concerning swine erysipelas, which statement is most accurate?
- Soil is the most important reservoir for the causal organism.
  - Over 30% of healthy animals harbor the causal organism in lymphoid tissue.
  - Both modified-live and killed bacterins effectively prevent chronic erysipelas arthritis.
  - Vegetative endocarditis is a pathognomonic postmortem finding in acute swine erysipelas.
  - Sulfonamides and aminoglycosides are most effective in chronic erysipelas therapy.
667. Concerning swine erysipelas, which statement is most accurate?
- It is characterized by proliferative, nonsuppurative synovitis; there is no practical treatment.
  - It is characterized by degenerative, suppurative osteoarthritis; erysipelas antiserum and dipyrone are effective.
  - It is characterized by vegetative endocarditis and proliferative synovitis; prednisolone and gentamicin are effective.
  - It is characterized by fibrinous tenosynovitis and osteomalacia; there is no practical treatment.
  - It is characterized by unilateral coxofemoral suppurative osteoarthritis; surgical drainage is effective.
668. Osteoporosis with pathologic fractures:
- occurs primarily in fast-growing castrates at 6 months of age
  - is primarily due to dietary calcium deficiency in lactation diets

- is most prevalent in young, heavily lactating sows following weaning
  - is a breed- and age-specific problem in aged sows of the white breeds
  - can be avoided by maintaining a 2:1 ratio of phosphorus to calcium in all swine diets
669. Excessive salt in swine diets may result in:
- meningitis caused by sodium intoxication
  - decreased feed consumption
  - ascites and hypochloremia
  - renal calculi
  - chronic diarrhea
670. Mulberry heart disease:
- is limited to pigs on diets containing more than 12% fat
  - is a peracute oxidative crisis with primary cardiac and hepatic lesions
  - is precipitated by encephalomyocarditis infection enzootic in the sow herd
  - results in congestive heart failure in chronically affected animals
  - is a component of porcine malignant hypothermia syndrome
671. Gastric ulcerations:
- result in fresh red blood in feces
  - are due to acidic excess, with loss of glandular gastric epithelium
  - are uniformly fatal because of gastric perforation and peritonitis
  - are desquamations of the gastric cardia
  - produce iron-deficiency anemia in chronically affected nursing piglets
672. Attenuated *Erysipelothrix* vaccines:
- were developed from a species other than *Erysipelothrix rhusiopathiae*
  - are recommended for use in conjunction with antiserum
  - should be used with concurrent antibiotic treatment to reduce side effects
  - contain weakly virulent strains of *E. rhusiopathiae* that replicate in the pig
  - may only be given orally

## Questions 673 through 682

It is fall and a producer new to the business has purchased 50 hybrid white line gilts from a source noted for their large litter size, low backfat, and excellent growth performance. He has converted an old barn into housing with straw bedding for breeding and gestation purposes. He is properly concerned about husbandry practices and stops by your office frequently for advice.

673. He asks, "What vaccinations should be given before breeding?" You appropriately recommend:
- tetanus, erysipelas, and pseudorabies
  - based on history of previous vaccinations and the geographic region
  - parovirus
  - atrophic rhinitis, pleuropneumonia, leptospirosis (*Leptospira bratislava*)
  - Escherichia coli*, *Salmonella*, multivalent *Leptospira*, and parvovirus
674. One morning the producer finds two gilts with rectal prolapse. You go to the farm to repair the prolapses and to identify the cause of the problem. On the way you conclude that the most likely contributing factor could be:
- spinal meningitis with paresthesia and anal sphincter paralysis
  - colitis caused by *Escherichia coli* infection and resulting diarrhea
  - straining as a result of cystitis and vaginitis at puberty
  - congenital weakness in this line of pigs
  - piling as a result of cold environmental temperatures
675. You decide to surgically treat the prolapsed rectal tissue. For epidural anesthesia you appropriately inject:
- 2 to 4 ml of lidocaine with epinephrine into the sacrococcygeal intervertebral space
  - 8 to 12 ml of procaine without epinephrine into the sacrococcygeal intervertebral space
  - 2 to 4 ml of lidocaine or procaine without epinephrine into the lumbosacral intervertebral space
  - 8 to 12 ml of procaine with epinephrine into the lumbosacral intervertebral space
  - 8 to 12 ml of lidocaine without epinephrine into the lumbosacral intervertebral space
676. The epidural injection should be given:
- at the intersection of lines drawn from the opposing ischial and iliac crests
  - caudal to a line from the fold of the flank, over the tuber coxae and at an angle 10 degrees caudal to perpendicular and on the midline
  - 12 cm cranial to a line between the most prominent point on the tuber coxae, on the midline, with the needle directed 20 degrees cranial to perpendicular
  - at the palpable depression of the sacrococcygeal junction, on the midline, with the needle directed slightly cranial to perpendicular
  - on the midline, 4 to 8 cm caudal to a line drawn between the femoral trochanters, with the needle directed 10 degrees caudal to perpendicular
677. The vasculature of surgical concern in rectal prolapse amputation involves:
- a single large artery dorsal to the rectum
  - a single large artery with multiple major veins, ventral to the rectum
  - multiple arteries, lateral to the rectum, with venous return of little or no consequence
  - multiple large and small arteries around the circumference of the rectum
  - a single artery, ventral to the rectum, with branches also supplying the vagina
678. Rectal prolapse can be repaired but carries certain risks. Concerning this surgery, which statement is most accurate?
- Replacement and retention with a purse-string may lead to tenesmus and abortion.
  - Insertion of a tube into the rectum with a rubber band may cause rectal stricture.
  - Clostridial infections and gangrene are often fatal side effects of rectal prolapse.
  - All methods of repair may lead to rectal stricture.
  - Vaginal prolapse is a common sequela of rectal prolapse repair.

679. Your client is delighted when the first gilt farrows 15 live pigs. By the following evening, however, three of the litter are comatose, paddling, and markedly hypothermic, with foamy saliva around the lips and a fuzzy haircoat. The most likely cause of these signs is:
- pseudorabies
  - streptococcal meningitis
  - encephalomyocarditis
  - hypoglycemia
  - hypoxic coma from smothering
680. More litters are born and the next alarm occurs when pigs in two litters, 2 and 4 days of age, begin to sneeze and a few pigs show respiratory distress. A severely affected pig is killed and submitted for laboratory examination. Your list of likely tentative diagnoses should include:
- atrophic rhinitis, *Mycoplasma hyopneumoniae* infection
  - porcine cytomegalovirus infection, pseudorabies
  - dust pneumonia, *Pasteurella multocida* type A infection
  - hemagglutinating encephalomyelitis virus infection, *Actinobacillus pleuropneumoniae* (*Haemophilus parahaemolyticus*) infection
  - ascaris migration, porcine respiratory coronavirus infection
681. The histology report indicates large, basophilic inclusion bodies. You are glad you decided to submit samples of:
- fixed trachea
  - fresh and fixed cerebellum
  - fixed nasal turbinates
  - frozen lung and kidney
  - fixed urinary bladder
682. Considering the cause of the problem, you appropriately advise the client that:
- herd depopulation is required
  - the herd must be quarantined
  - this problem will recur as long as he retains this particular genetic line
  - he should expect abortions and deaths in the remaining pregnant gilts
  - first-litter sows most often produce pigs with this problem because of a lack of naturally acquired immunity
683. Pigs with eperythrozoonosis are most likely to have:
- icterus, hemorrhage, and microcytic normochromic anemia
  - thrombocytopenia, hyperchromic normocytic anemia, and no sign of hemorrhage
  - subcutaneous hemorrhage, epistaxis, and microcytic hypochromic anemia
  - cold agglutinins, macrocytic normochromic anemia, and icterus
  - icterus, macrocytic normochromic anemia, delayed clotting time, and bruising
684. Necropsy of a 9-week-old pig reveals a fibrinopurulent exudate on the liver and heart. The most likely causes of this finding are:
- Salmonella* septicemia and *Mycoplasma hyorhinis* infection
  - Haemophilus parasuis* and *M. hyorhinis* infections
  - Actinobacillus pleuropneumoniae* (*Haemophilus parahaemolyticus*) and *Mycoplasma hyosynoviae* infections
  - bacterial septicemia and aflatoxicosis
  - M. hyorhinis* and *M. hyosynoviae* infections
685. Which internal parasite of swine is most likely to cause hematochezia?
- Eimeria*
  - Oesophagostomum*
  - Trichuris*
  - Ascaris*
  - Balantidium coli*
686. Perirenal edema on necropsy of recently purchased, pastured feeder pigs is most suggestive of:
- Stephanurus* infection
  - peracute edema disease
  - Amaranthus* toxicity
  - Phytolaca* toxicity
  - carbamate toxicity
687. In 3- to 8-week-old pigs that died suddenly following signs of encephalitis, microscopic examination of brain sections reveals lesions of degenerative angiopathy. Such lesions are most likely associated with:
- hemagglutinating encephalomyelitis virus infection
  - edema disease
  - streptococcal meningitis
  - pseudorabies
  - Japanese B encephalitis virus infection
688. The parasite, and its associated lesion, of greatest impact on the swine industry is:
- Ascaris suum* and pneumonia
  - Hyostrongylus rubidis* and gastric ulcers
  - Stephanurus dentatus* and pyelonephritis
  - Oesophagostomum dentatum* and proliferative adenomatosis
  - Balantidium coli* and typhlitis
689. Zearalenone, an estrogenic mycotoxin, may have pronounced effects on reproduction. Concerning zearalenone toxicity, which statement is **least** accurate?
- Rectal prolapse caused by tenesmus is common.
  - Anestrus may be induced in mature sows.
  - It does not result in abortion, as estrogens are luteotrophic in sows.
  - It is a differential diagnosis in midgestational abortion in gilts.
  - It causes vaginal edema and preputial enlargement.
690. A group of adult sows becomes acutely ill with dehydration and diarrhea. You submit diarrheic feces to the diagnostic laboratory. Of the following pathogens isolated by the laboratory, which is most likely to be associated with the clinical signs observed?
- hemolytic *Escherichia coli*
  - coccidial oocysts
  - Oesophagostomum* ova
  - coronavirus particles
  - rotavirus particles
691. Which disease is most likely to cause suppurative dermatitis in a litter of 10-day-old piglets?
- Sarcoptes* infestation
  - pityriasis rosea
  - exudative epidermitis
  - Demodex* infestation
  - Streptococcus suis* type II infection
692. In normal, fertile boars, the volume of the sperm-rich portion of an ejaculate is:
- 2 to 10 ml in boars of all ages
  - over 750 ml in boars of all ages
  - 25 to 50 ml in young boars
  - over 125 ml in mature boars
  - related to gel-fraction volume and unrelated to fertility
693. In swine, prostaglandin is **not** effective in:
- inducing abortion
  - stimulating libido in boars
  - synchronizing estrus
  - synchronizing parturition
  - terminating pseudopregnancy
694. Pregnant mare serum gonadotropin (equine chorionic gonadotropin) and human chorionic gonadotropin are approved for use in swine for:
- inducing estrus during lactation
  - synchronizing estrus in cyclic females
  - accelerating puberty and synchronizing estrus in noncyclic gilts
  - treating delayed estrus syndrome
  - treating anestrus in multiparous sows

695. Necropsy of an 80-kg pig that died reveals a  $3 \times 5$  cm gastric ulcer, chronic apical pneumonia, and an enlarged kidney with cavitation and urine retention. Considering these findings, which statement is **least** accurate?
- Cystic kidneys are relatively common in pigs.
  - Gastric ulcers, when severe enough to be noted grossly, must be considered the likely cause of death.
  - Chronic pneumonia is present in most 80 kg pigs.
  - There is no association between cystic kidneys and pneumonia.
  - All these findings could be incidental and not associated with death.
696. You have been directing the management of a group of pigs since they were purchased as feeders. Soon after the animals were purchased, swine dysentery appeared and you recommended addition of lincomycin to the feed until the pigs reach slaughter weight. Now, when the pigs weigh about 60 kg, some develop pneumonia and the owner says that he has additionally included 400 g chlortetracycline per 1000 kg in the ration. Considering this, you should comment to the owner that:
- this drug combination will act synergistically to resolve the problem
  - antibiotic combinations are legal under the Food and Drug Administration's extralabel drug use policy, but the withdrawal time must be extended
  - this combination is proper but only because he is feeding his own pigs, and that he requires a prescription to obtain the drugs
  - chlortetracycline and lincomycin in the feed cause "sterile bowel" diarrhea
  - feed additives should only be used as labeled and should not be combined

697. You work with a herd in a pseudorabies-enzootic area. The herd owner vaccinates sows and pigs as a precautionary measure with a gene-deleted marker vaccine. Cull sows from this herd are tested by the state at slaughter using the serum neutralization test. The herd is quarantined because the results are positive. The owner is very upset and asks your opinion. You appropriately explain that:

- pseudorabies vaccination does not protect animals from infection, and he must accept the fact that the herd has become infected with field virus
- sows vaccinated with the gene-deleted vaccine would register as false positives on the serum neutralization test
- the quarantine is a precaution and a complete herd test is necessary, as field virus infection is the likely cause of positive results
- the vaccine virus has reverted to a virulent state, and herd depopulation is necessary
- quarantine cannot be imposed because of serologic results alone, and virus isolation studies are required

698. In a group of 3-week-old pigs that are plump and apparently thrifty, several have died with no premonitory signs. Hematologic examination in four pigs reveals packed cell volumes of 13%, 21%, 19%, and 26%. Blood smears demonstrate small red blood cells that stain very poorly with Wright's-Giemsa stain. From these findings, you appropriately conclude that:

- eperythrozoosis is the likely cause and further serologic testing is indicated
- vitamin K deficiency is the cause and should be corrected with injectable vitamin K<sub>3</sub>
- iron-deficiency anemia is the likely cause and serum iron assay is needed to confirm the diagnosis
- zinc/copper toxicity has caused red blood cell destruction
- vitamin E deficiency is causing myocarditis and sudden death

699. Piglets are 4 to 8 days old when they become depressed, huddle together, lose weight, weaken, and die. Death losses climb from an expected 10% to 60%. Histopathologic examination of multiple tissue samples reveals no lesions other than mononuclear interstitial pneumonia. The most likely cause of these findings is:

- Actinobacillus pleuropneumoniae* (*Haemophilus paraahaemolyticus*) infection
- Streptococcus suis* type II infection
- porcine reproductive and respiratory syndrome
- porcine parvovirus infection
- coronavirus infection

700. As you stand in a damp, hot, poorly ventilated nursery barn, you recall that environmental conditions may markedly affect the transmission and expression of swine respiratory conditions. Considering the poor ventilation, you tell the owner that he should install several fans to:

- remove animal-generated heat from the barn
- remove toxic gases, especially ammonia, from the barn
- pull needed oxygen into the barn
- remove water-laden air from the barn
- prevent accumulation of carbon dioxide and carbon monoxide in the barn

### B.E. Straw

701. When enterotoxemic *Escherichia coli* infection interferes with normal intestinal function, the nutrient lost in the largest proportion by the piglet is:

- calcium
- water
- lactose
- glucose
- protein

702. Which of the following is a leading cause of death in baby piglets?

- pneumonia
- trauma
- septicemia
- malformations
- meningitis

703. Why are antibiotics and vaccines relatively ineffective in treatment and control of infections in the nasal cavity of swine?

- The organisms involved rapidly acquire plasmids that confer antibiotic resistance.
- Most nasal infections have a viral cause.
- The infectious agents involved do not invade the nasal epithelium and are removed from contact with antibiotics or immunoglobulins.

d. The infectious agents involved are intracellular organisms and protected from contact with antibiotics or immunoglobulins.

e. Most nasal infections have a mycotic cause.

704. At what age do pigs develop the ability to produce antibodies?

- as fetuses, at about day 70 of gestation
- at birth
- 3 to 5 days after birth
- 2 weeks after birth
- as embryos, during the first month of embryonic life

705. How do pigs normally acquire passive immunity?

- through the placenta before birth
- through vaccination with an inactivated vaccine in the first few months of life
- through absorption of maternal antibodies in colostrum as neonates
- through vaccination with a live vaccine in the first few months of life
- through ingestion of the sow's feces as neonates



706. Which of the following is most likely to cause a sow to abort her entire litter?
- treatment with dexamethasone between 30 and 40 days of gestation
  - ovariectomy
  - death of two out of 10 fetuses
  - death of five out of 10 fertilized eggs
  - death of three out of 10 embryos
707. Which statement best describes how mycoplasmal pneumonia occurs in swine?
- Mycoplasma hyopneumoniae* invades alveolar macrophages and diminishes their ability to phagocytize other microorganisms.
  - Mycoplasma flocculare* establishes a nonpathogenic commensal residence in the upper airway, then becomes invasive secondary to viral infection with swine influenza, adenovirus or pseudorabies.
  - M. flocculare*, *Pasteurella multocida*, and *Actinobacillus pleuropneumoniae* act synergistically to establish infection in the interalveolar spaces.
  - Mycoplasma hyosynoviae* is present in most herds, localized in the joints; the organism propagates when pigs are stressed and produces septicemia that carries infection to the lungs.
  - M. hyopneumoniae* is the primary agent of mycoplasmal pneumonia. It destroys cilia on respiratory tract mucosa and is immunosuppressive, allowing secondary bacterial invasion.
708. Where is the best location to collect a skin scraping from a pig with suspected *Sarcoptes scabiei* var. *suis* infestation?
- axillary area
  - inguinal area
  - folds of skin on the neck
  - ear canal
  - ventral abdomen
709. Paratyphoid nodules are associated with what disease of swine?
- proliferative enteritis
  - salt poisoning
  - swine dysentery
  - salmonellosis
  - intestinal tuberculosis
710. In 1-day-old piglets diarrhea that is nonhemorrhagic and produces no obvious lesions at necropsy is most likely caused by:
- coccidiosis
  - overnutrition (milk scours)
  - Escherichia coli* infection
  - cold environment
  - rotaviral infection
711. In 5-day-old piglets antimicrobials are very effective in treatment of:
- colibacillosis complicated by rotaviral infection
  - infection with Lelystad virus (porcine reproductive and respiratory syndrome)
  - coccidiosis
  - acute clostridial enteritis
  - acute transmissible gastroenteritis
712. Which disease produces lesions that are limited to the small intestine?
- swine dysentery
  - salmonellosis
  - Trichuris suis* infection
  - edema disease
  - transmissible gastroenteritis
713. Which skin disease is associated with high mortality?
- Sarcoptes scabiei* var. *suis* infestation
  - pityriasis rosea
  - Staphylococcus hyicus* infection
  - swine pox infection
  - dermatomycosis
714. At the time of an acute outbreak of transmissible gastroenteritis, sows that are due to farrow within 2 weeks should be:
- vaccinated with a gene-deleted, modified-live-virus vaccine orally and intraperitoneally
  - moved to an isolated farrowing area
  - exposed to live virus through feeding of intestines from affected piglets
  - induced to farrow, and piglets treated with antiserum at birth
  - vaccinated with a gene-deleted, killed-virus vaccine orally and intramammarily
715. The major resource of *Isospora suis* infection in unweaned piglets is:
- older multiparous sows
  - first-parity sows
  - contaminated feed
  - environmental contamination
  - dogs and cats
716. The major source of *Salmonella typhimurium* organisms infecting pigs is:
- meat and bone meal
  - fish meal
  - garbage feeding
  - dogs, cats and rodents
  - other pigs
717. What precautions should be taken to protect piglets when rotaviral enteritis is diagnosed in calves housed nearby?
- No special precautions are necessary.
  - Pigs should be vaccinated with a combination killed-virus bovine and porcine rotavirus vaccine.
  - Pigs should be vaccinated with a combination live-virus bovine and porcine rotavirus vaccine.
  - Pigs should be vaccinated with a live-virus bovine rotavirus vaccine
  - Strict sanitation should be implemented, including fumigation with formaldehyde.
718. The best way to monitor the results of a control program for atrophic rhinitis is to:
- do a slaughter check, initiate control measures, and repeat the slaughter check in 12 months
  - initiate control measures, then do quarterly monitoring of the level of coughing in the nursery
  - initiate control measures, then do quarterly monitoring of the level of sneezing in the grow-finish area
  - initiate control measures, then do quarterly monitoring of the level of sneezing in the nursery
  - do a slaughter check, initiate control measures, and repeat the slaughter check in 6 months
719. What is the etiologic agent in Glasser's disease?
- Streptococcus suis* type II
  - Haemophilus parasuis*
  - Actinobacillus pleuropneumoniae*
  - Haemophilus somnus*
  - Actinobacillus suis*
720. A litter of 3-day-old pigs is showing central nervous system signs. Some are ataxic, some are in lateral recumbency and paddling, and some have died. What are the most likely causes of these signs?
- edema disease, porcine stress syndrome, pseudorabies
  - listeriosis, Glasser's disease, *Streptococcus suis* type II infection
  - cytomegalovirus infection, pseudorabies, edema disease
  - Streptococcus suis* type II infection, pseudorabies, hypoglycemia
  - thiamin deficiency, listeriosis, Glasser's disease
721. Which disease of finishing pigs is characterized by an explosive outbreak and low mortality?
- parakeratosis
  - mange
  - mycoplasmal pneumonia
  - exudative epidermitis
  - swine influenza

722. Which skin disease causes pruritus?
- Microsporium canis* infection
  - pityriasis rosea
  - Sarcoptes suis* infestation
  - exudative epidermitis
  - parakeratosis
723. Which skin disease warrants the worst prognosis?
- necrotic ear syndrome
  - epitheliogenesis imperfecta
  - dermatosis vegetans
  - pityriasis rosea
  - exudative epidermitis
724. The most likely cause of swollen joints in baby piglets is:
- Streptococcus* infection
  - iron deficiency
  - pseudorabies
  - juvenile osteochondrosis
  - Mycoplasma flocculare* infection
725. Which condition is commonly associated with extreme variability in growth rate of finishing pigs, "stall outs," and runts?
- selenium deficiency
  - porcine stress syndrome
  - proliferative enteritis
  - parvovirus infection
  - tuberculosis
726. Nursery-age pigs and some pigs in the finishing barn are dying, with no antemortem signs. Necropsy of several pigs shows extensive generalized edema (subcutis, lung, mesentery, gallbladder); pleural, pericardial, and peritoneal transudates; a mottled heart with areas of pale necrosis and hemorrhage; and a mottled hemorrhagic liver with dark red depressed areas. The most likely cause of these findings is:
- aflatoxicosis
  - warfarin toxicity
  - thrombocytopenic purpura
  - salmonellosis
  - selenium deficiency
727. A swine producer has just treated his 25-kg nursery pigs with levamisole in the water. Two days later all the pigs look good except for those in the smallest pen, at the end of the barn. These pigs are noticeably thinner than the pigs in other pens. The floor of their pen is dry and shows no evidence of vomiting or diarrhea. A few pigs wander aimlessly, and the owner reports that earlier he observed a pig having an "epileptic fit." The most likely cause of these signs is:
- nitrate toxicity
  - levamisole toxicity
  - larval migration and death in the lung parenchyma
  - salt poisoning/water deprivation
  - edema disease
728. What is the best method for selecting an appropriate bacterin for use in a herd with an ongoing problem with neonatal colibacillosis?
- Collect serum samples from cull sows to produce an autogenous antiserum.
  - Purchase a commercial mixed bacterin containing K88, K99, and 987P antigens.
  - Collect serum samples from sows and submit them to a reference laboratory for serotyping.
  - Collect serum samples from recovered piglets and submit them to a reference laboratory for serotyping.
  - Perform an antibacterial sensitivity test on the organism isolated from scouring piglets.
729. The species responsible for most of the diseases observed in swine is:
- Escherichia coli*
  - Homo sapiens*
  - Bordetella bronchiseptica*
  - Actinomyces pyogenes*
  - Pasteurella multocida*
730. A characteristic of coccidiosis in piglets is:
- incomplete or prolonged recovery
  - more severe signs in gilt litters than in sow litters
  - more severe signs in piglets on cold wire mesh floors than on solid wood floors
  - vomiting and occasional central nervous system signs
  - onset of clinical signs at 1 to 3 days of age
731. Rectal strictures are a common sequel to:
- proliferative enteritis
  - swine dysentery
  - Trichuris suis* infection
  - enterotoxigenic *Escherichia coli* infection
  - salmonellosis
732. Minute white areas of focal necrosis in the liver are associated with:
- ascarid infection
  - fluke infection
  - pseudorabies
  - contagious hepatitis
  - hepatosis dietetica
733. Transmissible gastroenteritis (TGE) virus cross-reacts serologically with:
- pseudorabies virus
  - hog cholera virus
  - bovine virus diarrhea virus
  - rabies virus
  - porcine corona respiratory virus
734. The major immunoglobulin in sow's milk is:
- IgG
  - IgM
  - IgE
  - IgA
  - IgS
735. Which of the following is **not** a zoonotic disease?
- pseudorabies
  - erysipelas
  - brucellosis
  - salmonellosis
  - Streptococcus suis* type II infection
736. In swine, death of all of the embryos on day 10 after fertilization results in:
- delayed return to estrus
  - pseudopregnancy
  - return to estrus at a regular interval
  - endometritis and anestrus
  - cystic ovaries and nymphomania
737. A farmer farrows 10 sows in a group each week. He culls 20% of the sows after each group of pigs is weaned. Piglets are weaned on Fridays and mating is done on Mondays, Tuesdays, and Wednesdays. He raises his own replacement gilts. How large should his gilt pool be to ensure that he can continue to farrow 10 sows per week?
- five to eight gilts
  - 10 to 15 gilts
  - 20 to 25 gilts
  - 60 to 70 gilts
  - 40 to 45 gilts
738. Pregnancy can be reliably diagnosed before 30 days of gestation by:
- Doppler ultrasound examination
  - observation of return to estrus
  - rectal palpation
  - radiography
  - amplitude-depth ultrasound examination
739. A litter of eight piglets contains two live pigs, two fully formed stillborn pigs, two partially mummified pigs, and two 10-cm mummified fetuses. The most likely cause of these fetal deaths is:
- viral infection in the uterus
  - carbon monoxide toxicity in the farrowing barn
  - breeding the sow too soon after weaning
  - overcrowding and fighting among gestating sows
  - malnutrition of the sow during gestation

740. Which disease can cause extensive hemorrhagic enteritis of the small intestine that may be acute and severe enough to result in death from hypovolemic shock?
- swine dysentery
  - intestinal adenopathy
  - Salmonella typhimurium* infection
  - ulceration of the pars esophagea
  - Trichuris suis* infection
741. Which disease is **not** likely to affect pigs more than 10 weeks of age?
- regional ileitis
  - clostridial enteritis
  - Salmonella* enterocolitis
  - proliferative intestinal adenomatosis
  - swine dysentery
742. The most likely cause of respiratory distress in 2-week-old piglets is:
- swine influenza
  - ascarid larval migration
  - selenium deficiency
  - Fusarium moniliforme* toxicity
  - iron deficiency
743. Which disease is most common in newborn piglets?
- hypoglycemia
  - iron deficiency
  - streptococcal meningitis
  - middle ear infection
  - congenital tremors
744. The most likely causes of sudden death without prior clinical signs in grow-finish pigs are:
- gastric volvulus, selenium deficiency, and swine dysentery
  - cardiac insufficiency, organophosphate toxicity, and vitamin D deficiency
  - mesenteric torsion, swine dysentery, and hemorrhagic bowel syndrome
  - selenium deficiency, necrotic enteritis, and mycoplasmal pneumonia
  - Actinobacillus pleuropneumoniae*, systemic salmonellosis, and porcine stress syndrome
745. The most likely cause of icterus and anemia in 4-day-old piglets is:
- Hemobartonella suis* infection
  - zearalenone toxicity
  - iron toxicity
  - Eperythrozoon suis* infection
  - Toxoplasma gondii* infection
746. A clinical diagnosis of porcine proliferative enteritis can be confirmed by:
- culture of feces from live animals
  - analysis of DNA in feces from affected pigs
  - mucosal smears stained with Wright's stain
  - a fourfold increase in titer of recovered animals
  - histopathologic examination
747. Which gas can be smelled by people at 100 parts per million in swine facilities?
- methane
  - carbon monoxide
  - ammonia
  - nitrogen
  - carbon dioxide
748. *Salmonella choleraesuis* infection is:
- identical to disease caused by *Salmonella typhimurium* and cannot be distinguished except by isolation of the organism
  - asymptomatic in swine but poses a major health threat to people working with affected pigs
  - mainly expressed as an enteric infection, whereas *S. typhimurium* infection is typically expressed as septicemia
  - primarily spread to susceptible swine through ingestion of poorly cooked garbage
  - likely to produce septicemia and pneumonia

749. Organophosphate toxicity can occur when a cholinesterase-inhibiting agent is used in conjunction with:
- levamisole
  - pyrantel
  - dichorvos
  - hygromycin B
  - ivermectin
750. In a mange-free confinement sow herd where farrowing and weaner facilities are all-in, all-out and floors are totally slatted and washed between groups, which deworming procedure is most appropriate?
- deworming the sows and weaned pigs continuously with hygromycin B in the feed
  - deworming only the piglets at weaning
  - discontinuing all deworming procedures
  - deworming the sows twice during gestation with fenbendazole and adding hygromycin B to the feed of nursery pigs
  - deworming only the sows with dichorvos just before farrowing
751. In a swine herd the prevalence of disease X is 10%. If the test to detect disease X has 90% sensitivity and 80% specificity, what percentage of the pigs in this herd will react positively when tested?
- 20%
  - 27%
  - 10%
  - 8%
  - 15%
752. Sometimes it is extremely important not to have any false-positive results of a diagnostic test, such as with a test for *Mycoplasma hyopneumoniae*, which could unjustly cause a specific pathogen-free swine producer to lose accreditation. When false positives are to be avoided, which test characteristics are most desirable?
- 80% sensitivity, 100% specificity
  - 95% sensitivity, 85% specificity
  - 90% sensitivity, 90% specificity
  - 85% sensitivity, 95% specificity
  - 100% sensitivity, 80% specificity
753. Which compound is primarily responsible for boar taint in the meat of intact boars slaughtered at 200 to 240 lb?
- testosterone
  - androsterone
  - skatole
  - estradiol
  - pheromone
754. Concerning hairballs (trichobezoars) in swine, which statement is most accurate?
- Hairballs do not occur in swine because pigs are unable to groom themselves.
  - Hairballs are common in swine and are readily passed through the gastrointestinal tract and excreted in the manure.
  - Hairballs are most commonly found in young or nursing piglets.
  - Most hairballs are not actually composed of hair, but usually of plant fibers derived from the feed.
  - Hairballs occasionally cause death in swine.
755. Which pathogen survives for the **shortest** time in the environment?
- transmissible gastroenteritis virus
  - Serpulina hyodysenteriae*
  - Pasteurella multocida*
  - Actinobacillus pleuropneumoniae*
  - porcine parvovirus
756. What are common signs of severe sunburn in pigs?
- cyanosis and necrosis of the ears
  - respiratory distress and panting
  - diamond-shaped areas of erythema and swelling
  - stiff gait and sudden collapse
  - reddened perineal area and swelling of the anus

## Question 757

The following table lists reproductive performance by parity.

Parity	% of litters	Live pigs per litter	Stillborn per litter	Mummies per litter
1	25	9.7	0.50	0.6
2	17	9.0	0.41	0.4
3	16	10.0	0.53	0.3
4	14	11.2	0.58	0.4
5	11	11.0	0.78	0.2
6	8	10.8	1.00	0.1
7+	9	10.4	1.20	0.2

757. What is your interpretation of the data?

- inadequate nutrition of replacement gilts
- poor genetic reproductive traits
- parvoviral infection
- too many old sows in the herd
- weaning too early

## Question 758

The following table lists reproductive performance by parity.

Parity	% of litters	Live pigs per litter	Stillborn per litter	Mummies per litter
1	21	9.7	0.50	0.6
2	19	9.8	0.41	0.4
3	17	10.3	0.53	0.3
4	15	10.4	0.58	0.4
5	10	10.5	0.78	0.2
6	8	10.2	1.00	0.1
7+	10	10.1	1.20	0.2

758. What is your interpretation of the data?

- parvoviral infection
- weaning too early
- inadequate nutrition of replacement gilts
- poor genetic reproductive traits
- too many old sows in the herd

## Question 759

The following table lists reproductive performance by parity.

Parity	% of litters	Live pigs per litter	Stillborn per litter	Mummies per litter
1	20	9.2	0.50	0.6
2	19	9.8	0.41	0.4
3	17	10.3	0.53	0.3
4	14	10.4	0.58	0.4
5	10	10.5	0.78	0.2
6	9	10.2	1.00	0.1
7+	11	10.1	1.20	0.2

759. What is your interpretation of the data?

- parvoviral infection
- too many old sows in the herd
- inadequate nutrition of replacement gilts
- weaning too early
- poor genetic reproductive traits

## Question 760

The following table lists reproductive performance by parity.

Parity	% of litters	Live pigs per litter	Stillborn per litter	Mummies per litter
1	21	8.3	0.61	1.0
2	19	10.3	0.41	0.4
3	17	11.0	0.53	0.3
4	15	11.2	0.58	0.4
5	10	11.0	0.78	0.2
6	8	10.8	1.00	0.1
7+	10	10.4	1.20	0.2

760. What is your interpretation of the data?

- weaning too early
- poor genetic reproductive traits
- parvoviral infection
- too many old sows in the herd
- inadequate nutrition of replacement gilts

761. Which of the following is **not** a practical use of prostaglandins in swine?

- synchronization of estrus in cycling gilts
- stimulation of boar libido
- abortion at days 15 to 30 of gestation
- abortion at days 25 to 40 of gestation
- synchronization of farrowing

762. Respiratory tract infections that are spread by aerosol and reach the lung alveoli through the airways tend to produce lesions localized in the:

- interstitial spaces of the lung
- cranioventral lobes of the lung
- interseptal spaces of the lung
- dorsal diaphragmatic lobes of the lung
- trachea and major bronchi

763. A common reservoir of *Eubacterium suis* is:

- the prepuce of boars
- chronically infected growing pigs
- wet feeds, especially those containing meat or bone meal
- contaminated soil
- under-floor manure pits or lagoons

764. Endotoxin-producing *Escherichia coli* infections of the mammary glands of sows inhibit lactogenesis through:

- damage to the endothelium of the glands, which allows leakage of serum into the alveolar spaces
- inflammation and swelling of mammary tissue, with a negative-feedback effect on lactogenesis
- suppression of progesterone and transcortin production
- suppression of prolactin production
- toxemia that depresses feed and water intake of sows

765. Which condition produces lameness at the **earliest** age?

- septic polyarthritis
- Mycoplasma hyorhinis* infection
- ricketts
- epiphyseal separation
- acute erysipelas

766. Villus atrophy associated with transmissible gastroenteritis is most prominent:

- in the proximal duodenum
- in the glandular portion of the stomach
- in the jejunum and ileum

- throughout the length of the small intestine
- in pigs from a herd with enzootic infection

767. Vaccination of swine with a *gI* gene-deleted *pseudorabies* vaccine:

- prevents infection with live virus
- prevents shedding of live virus
- prevents development of latent carriers
- is useful for limiting economic losses
- interferes with correct interpretation of serologic tests

768. Anorexia, conjunctivitis, lethargy, chilling, and yellowish-gray diarrhea in 3-month-old pigs are signs of:

- zearalenone mycotoxicosis
- exposure to ammonia gas at 100 to 150 ppm
- hog cholera
- clostridial enteritis
- cytomegalovirus infection

769. Concerning atrophic rhinitis, which statement is most accurate?

- Toxigenic strains of *Pasteurella multocida* type A are the bacteria most commonly associated with severe, progressive atrophic rhinitis.
- Toxigenic strains of *Bordetella bronchiseptica* are required for initiation of lesions in the nasal turbinates.
- Toxins produced by strains of *P. multocida* type A diffuse only locally into underlying tissue, whereas toxins produced by strains of *P. multocida* type D may circulate systemically.
- Dietary calcium-phosphorus imbalance is a prerequisite to bacterial colonization of the nasal mucosa.
- Toxigenic strains of *P. multocida* type D have poor ability to colonize the nasal mucosa.

770. In the United States most cases of tuberculosis in swine are caused by:

- Mycobacterium tuberculosis*
- Mycobacterium avium*
- feeding pigs unpasteurized milk
- failure to vaccinate the sow herd
- Mycobacterium bovis*

771. *Bloody diarrhea in 3-month-old pigs consuming feed containing 50g of carbadox/ton is most likely to be associated with:*
- Serpulina hydysenteriae* infection
  - clostridial enteritis
  - Trichuris suis* infection
  - Balantidium coli* infection
  - ionophore toxicity
772. *The best indication of coliform mastitis in sows is:*
- a positive California mastitis test on milk from two or more glands
  - presence of bacteria in milk
  - high somatic cell counts in milk
  - starvation and hypoglycemia in piglets
  - udder heat, pain, and reddening
773. *Coliform mastitis in sows is best controlled by:*
- vaccination during gestation with an autogenous bacterin
  - sanitation of farrowing quarters and induced farrowing
  - vaccination during gestation and feeding tylosin in the gestation ration
  - oral vaccination during gestation with an autogenous product, followed by feeding tylosin in the lactation ration
  - intramammary inoculation of coliforms to stimulate natural immunity
774. *Necropsy of a 5-month-old pig euthanized for slow growth and swollen joints reveals synovitis and arthritis in several joints, with slightly cloudy serosanguineous synovial fluid, vegetative endocarditis, and several infarcts in the kidneys. The most likely cause of these findings is:*
- acute *Streptococcus suis* type II infection
  - chronic erysipelas
  - chronic hog cholera
  - ricketts, with secondary degenerative joint disease
  - acute *Mycoplasma hyosynoviae* infection
775. *Assay of blood collected from the cranial vena cava of a pig would be most valuable in determining the:*
- serum creatine kinase activity for porcine stress syndrome
  - serum calcium concentration for osteoporosis
  - serum phosphorus concentration for calcium to phosphorus imbalance in the feed
  - blood eosinophil count for subclinical parasitism
  - serum glutathione peroxidase activity for selenium deficiency

## SHEEP

P.G. Eness

776. *Concerning use of ivermectin as an ovine anthelmintic, which statement is most accurate?*
- It is not approved for use in the United States.
  - It is approved for use in the United States as an injectable anthelmintic.
  - It is approved for use in the United States as a pour-on anthelmintic.
  - It is approved for use in the United States as an oral anthelmintic.
  - It is an effective anticestodal.
777. *In the first month of pregnancy, ewes:*
- should not be dewormed at all because of the danger of fetal malformation and abortion
  - should not be dewormed with albendazole because of the danger of fetal malformation and abortion
  - should not be dewormed with ivermectin because of the danger of fetal malformation and abortion
  - should not be dewormed with thiabendazole because of the danger of fetal malformation and abortion
  - can be safely dewormed with ivermectin, but it must be used at a reduced dosage
778. *Chronic wasting disease in adult sheep is most likely to be caused by:*
- Corynebacterium pseudotuberculosis*
  - caprine arthritis-encephalitis virus
  - Coccidia*
  - Mycobacterium tuberculosis*
  - border disease virus
779. *Ammonium molybdate is recommended in the treatment of:*
- urolithiasis
  - chronic coughing
  - lactic acidosis
  - copper toxicity
  - goiter
780. *The incidence of clinical urolithiasis is reduced by:*
- adding ammonium chloride to the ration
  - adding low levels of tetracycline to the ration
  - reducing levels of salt (sodium chloride) in the ration
  - increasing the phosphorus content of the ration
  - adding lasalocid to the ration
781. *Follicular conjunctivitis in sheep is caused by:*
- Moraxella bovis*
  - Chlamydia psittaci*
  - Escherichia coli*
  - plant pollen
  - feed lot dust
782. *Goiter is most likely to be manifested clinically in:*
- pastured lambs
  - adult rams
  - adult ewes
  - fetuses and neonates
  - show animals
783. *Clinical coccidiosis is most common in:*
- newborn lambs
  - lambs 1 to 2 weeks of age
  - feedlot lambs
  - yearlings
  - adult ewes and rams
784. *Lasalocid is an ionophore that is approved for use in sheep to control:*
- colibacillosis
  - hemochromatosis
  - coccidiosis
  - toxoplasmosis
  - paratuberculosis
785. *Commercial vaccines are available in the United States for prevention of all of the following except:*
- contagious footrot
  - caseous lymphadenitis
  - chlamydial abortion
  - contagious ecthyma
  - coccidiosis
786. *Which common ovine disease is caused by a lentivirus?*
- scrapie
  - ovine progressive pneumonia
  - Cache Valley fever
  - contagious ecthyma
  - bovine leukemia virus infection
787. *Humans are often infected when vaccines are handled carelessly during vaccination of lambs against:*
- leptospirosis
  - enterotoxemia
  - infectious footrot
  - caseous lymphadenitis
  - contagious ecthyma
788. *Copper toxicity in sheep is closely related to dietary levels of which trace element?*
- magnesium
  - sulfur
  - selenium
  - molybdenum
  - iodine

789. *Campylobacteriosis* is a common cause of abortion outbreaks in sheep flocks. This condition is transmitted from animal to animal primarily by:

- the fecal-oral route
- venereal contact
- inhalation of infectious aerosol
- contaminated needles and surgical instruments
- fomites

790. All permanent incisor teeth of sheep have normally erupted by what age?

- 12 months
- 18 months
- 24 months
- 36 months
- 48 months

791. Concerning codon 171 gene typing, which statement is most accurate?

- It identifies carriers of the spider trait.
- It is a diagnostic test for abomasal emptying defect.
- It is a diagnostic test for scrapie.
- It indicates susceptibility to scrapie.
- It can be used as a diagnostic test for ovine progressive pneumonia.

792. In ewes, agalactia associated with hard bag (indurative mastitis) is most commonly related to:

- ovine progressive pneumonia
- selenium deficiency
- Mycoplasma agalactiae* infection
- Clostridium septicum* infection
- Pasteurella multocida* infection

793. Pneumonia in neonatal lambs is most commonly caused by:

- Pasteurella haemolytica*
- adenovirus

- parainfluenza virus
- Mycoplasma ovipneumoniae*
- respiratory syncytial virus

794. Focal, light-colored, doughnut-shaped lesions in the liver of an aborted fetus indicate abortion caused by:

- toxoplasmosis
- enzootic abortion
- campylobacteriosis
- listeriosis
- Escherichia coli* septicemia

795. Multiple white foci on the cotyledonary surface of the placenta are characteristic of abortions resulting from:

- toxoplasmosis
- enzootic abortion
- campylobacteriosis
- listeriosis
- Escherichia coli* septicemia

796. Postmortem lesions including fibrin clots in the pericardial fluid, necrosis of kidneys, and hemorrhagic ileitis in a feedlot lamb indicate death caused by:

- septicemic pasteurellosis
- lactic acidosis
- coccidiosis
- enterotoxemia
- selenium deficiency

797. Severe adverse reactions and some deaths may occur when ewes in the last trimester of pregnancy are injected with:

- enterotoxemia vaccine
- contagious ecthyma vaccine
- benzathine penicillin
- a vitamin E-selenium combination
- leptospirosis vaccine

798. Why should Q fever be of concern to sheep producers?

- It can cause fetal deformities if ewes are infected during pregnancy.
- It can cause severe losses from neonatal respiratory disease.
- It has frequent adverse effects on reproduction.
- Infected flocks must be destroyed and the premises quarantined.
- It can cause disease in humans.

799. Vasectomized rams are most commonly used to:

- help in predator protection
- help synchronize estrus in ewes
- identify ewes in heat for artificial insemination
- bring ewes in heat while lambs are still nursing
- stimulate reproductive activity in breeding rams

800. In addition to multiple fetuses, what is the most characteristic postmortem finding in ewes with pregnancy toxemia?

- renal necrosis
- increased pericardial fluid
- epicardial ecchymoses
- serosanguineous fetal fluid
- an enlarged, friable, pale yellow liver

801. Oral propylene glycol is commonly used in the treatment of:

- polioencephalomalacia
- nose bot infestation
- infectious footrot
- neonatal hypothermia
- pregnancy toxemia

802. Bluebag (gangrenous mastitis) of range ewes is most likely to be associated with infection by:

- Pasteurella haemolytica*
- Escherichia coli*
- Corynebacterium pyogenes*
- Mycoplasma agalactiae*
- Corynebacterium pseudotuberculosis*

803. What is the most striking clinical sign in lambs heavily parasitized with *Haemonchus contortus*?

- diarrhea
- anorexia
- anemia
- a depraved appetite
- a persistent cough

804. Phenothiazine is one of the oldest drugs available for:

- treatment of mastitis in sheep and goats
- prevention of urolithiasis in lambs
- use as a feed additive to prevent coccidiosis in lambs
- treatment of nematode infections in sheep
- estrus synchronization in ewes

805. Ingestion of spoiled or improperly prepared silage (pH 5.6 or greater) may result in which disorder of ewes?

- listeriosis
- enterotoxemia
- polioencephalomyelitis
- bloat
- abomasal emptying defect

806. Which of the following is **not** considered to be a cause of abortion in sheep?

- chlamydiosis
- toxoplasmosis
- salmonellosis
- listeriosis
- pseudotuberculosis

807. Which of the following is **not** a zoonotic disease?

- leptospirosis
- Q fever
- contagious ecthyma
- polioencephalomalacia
- toxoplasmosis

808. In commercial sheep operations, enterotoxemia in neonatal lambs is best prevented by:
- adding tetracycline to the ration of ewes before lambing
  - vaccinating lambs at birth with *Clostridium perfringens* types C and D toxoid
  - vaccinating of pregnant ewes with *C. perfringens* types C and D toxoid
  - vaccinating of pregnant ewes with *C. perfringens* types C and D antitoxin
  - isolating of infected animals
809. Clinical white muscle disease most commonly occurs in:
- nursing lambs from birth to 4 weeks of age
  - pregnant ewes
  - recently weaned lambs
  - feedlot lambs following long-distance transport
  - range ewes
810. Lactic acidosis is most likely to occur following overconsumption of:
- soybeans
  - urea
  - corn
  - milk replacer
  - green, leafy alfalfa
811. What is the treatment of choice for polioencephalomalacia?
- nicotinic acid
  - niacin
  - vitamin A
  - thiamine
  - magnesium
812. Ovine progressive pneumonia is characterized by:
- failure of lungs to collapse when the thoracic cavity is opened
  - hepatization of the ventral apical lobes
  - emphysema of the caudal and dorsal lung region
  - focal areas of consolidation
  - miliary abscesses throughout the lungs
813. Concerning clinical pseudorabies, which statement is most accurate?
- It does not occur in sheep.
  - It occurs only in adult sheep.
  - It is often mistaken for scrapie.
  - It occurs in sheep with direct or indirect contact with swine.
  - It is effectively controlled by vaccination.
814. What is the principal viral reservoir for the bluetongue virus?
- wild ruminants
  - domestic cats
  - rodents
  - pheasants
  - cattle
815. Developmental defects frequently occur when ewes are infected during pregnancy with:
- Chlamydia psittaci*
  - bluetongue virus
  - scrapie virus
  - Campylobacter* spp.
  - Q fever
816. Scabies in sheep is caused by:
- a slow virus
  - infectious agents of the prion classification
  - one of five species of pathogenic mites
  - Melophagus ovinus*
  - Damalinia ovis*
817. Bluetongue virus is transmitted from animal to animal by:
- insect vectors
  - the fecal-oral route
  - fomites
  - body contact
  - bats
818. Concerning scrapie, which statement is most accurate?
- It occurs only in the Suffolk breed.
  - It occurs only in black-faced breeds.
  - It occurs most often in the Suffolk breed.
  - It occurs most often in the Hampshire breed.
  - There is no breed predilection.
819. What is the scientific name of the sheep ked?
- Damalinia ovis*
  - Linognathus ovillus*
  - Oestrus ovis*
  - Melophagus ovinus*
  - Psoroptes ovis*
820. Chondrodysplasia (spider syndrome) of lambs is attributable to:
- infection of ewes with border disease virus during pregnancy
  - infection of ewes with Cache Valley fever virus during pregnancy
  - consumption of veratrum alkaloid during pregnancy
  - deworming with phenothiazine during pregnancy
  - an autosomal recessive mutant gene
821. Concerning rectal prolapse in sheep, which statement is most accurate?
- It is most often associated with chronic coughing.
  - It is most often seen in pregnant ewes.
  - It frequently occurs immediately after lambing.
  - It is usually associated with ingestion of estrogenic compounds.
  - It is most commonly seen in pastured animals.
822. Which coccidian of sheep forms a cyst and requires an intermediate host?
- Toxoplasma gondii*
  - Eimeria zuernii*
  - Isospora ovinum*
  - Eimeria caprina*
  - Eimeria ovinoidalis*
823. Which of the following is least likely to be detected by standard fecal flotation?
- Haemonchus ova*
  - Fasciola ova*
  - Eimeria* oocysts
  - Trichostrongylus ova*
  - Ostertagia ova*
824. Ivermectin is not effective against:
- Oestrus ovis*
  - Haemonchus contortus*
  - most benzimidazole-resistant nematodes
  - Ostertagia* spp.
  - Fasciola hepatica*
825. In sheep, how long is the life cycle of pathogenic coccidia?
- 3 to 4 days
  - 1 to 2 weeks
  - 3 to 4 weeks
  - 2 to 3 months
  - 3 months or more
826. Epididymitis in rams is caused by *Brucella ovis* and results in economic loss through:
- reduced conception rates
  - carcass condemnation of culled rams
  - the cost of treatment and vaccination
  - late-term abortions
  - sterility of ewes resulting from venereal infection
827. Commercial vaccines are commonly used for prevention of ovine abortions caused by:
- toxoplasmosis
  - listeriosis
  - brucellosis
  - campylobacteriosis
  - Cache Valley fever

828. Concerning toxoplasmosis in nonpregnant ewes, which statement is most accurate?
- It causes transient blindness.
  - It results in infertility.
  - It is usually asymptomatic.
  - It delays return to estrus after lambing.
  - It causes abortion in ensuing pregnancy.
829. Complete breeding soundness evaluation of rams should include, in addition to semen evaluation, a negative enzyme-linked immunosorbent assay within 30 days of purchase or breeding season for which disease?
- ovine progressive pneumonia
  - paratuberculosis
  - brucellosis
  - leptospirosis
  - campylobacteriosis
830. Which organism causes hemorrhagic enterotoxemia in newborn lambs?
- Escherichia coli*
  - Clostridium perfringens* type C
  - C. perfringens* type D
  - Clostridium septicum*
  - Salmonella enteritidis*
831. Adult stages of *Fasciola hepatica* and *Fascioloides magna* are effectively treated in sheep using:
- albendazole
  - levamisole
  - tetracycline
  - amprolium
  - decoquinate
832. Cyclopiation malformation of lambs occurs when pregnant ewes:
- are infected with border disease virus
  - ingest certain toxic plants
  - are infected with bluetongue virus
  - are fed iodine-deficient diets
  - are dewormed with albendazole
833. Lambs that have been exposed to border disease virus as fetuses during the first half of gestation:
- are rarely affected by the virus
  - should be kept for breeding replacements
  - are always aborted
  - develop neutralizing antibodies at a young age
  - may exhibit neurologic signs characteristic of cerebellar hypoplasia
834. Pneumonia in neonatal lambs is best controlled by:
- vaccinating lambs at birth with infectious bovine rhinotracheitis-parainfluenza-3 vaccine
  - treating lambs at birth with antibiotics
  - raising lambs in a warm building
  - controlling humidity in the lambs' environment
  - vaccinating pregnant ewes with *Pasteurella multocida* vaccine
835. Concerning footrot in sheep, which statement is most accurate?
- It is self-limiting within a flock.
  - In most animals it involves only one hoof.
  - It is typically characterized by low morbidity within a flock.
  - It can be successfully treated with antibiotic feed additives.
  - Control may be aided by vaccination.

For Questions 836 through 840, select the correct answer from the five choices below.

- albendazole
  - levamisole
  - ivermectin
  - thiabendazole
  - phenothiazine
836. May cause urine staining of wool
837. Effective against *Oestrus ovis*

838. Effective against gastrointestinal cestodes in sheep

839. Affects the cholinergic receptors of worms, causing their rapid paralysis

840. Mainly limited in use by the problem of widespread nematode resistance, particularly of *Haemonchus contortus*

## GOATS

K.N. Bretzlaff

841. Which of the following is **not** a clinical sign of caprine arthritis-encephalitis?
- lameness (polyarthritis)
  - hardbag (interstitial mastitis)
  - chronic nonresponsive (interstitial) pneumonia
  - diarrhea (enteritis)
  - ataxia followed by paralysis (leukoencephalomyelitis)
842. Which breed of goats has the **lowest** prevalence of seropositivity for caprine arthritis-encephalitis virus?
- Saanen
  - Nubian
  - LaMancha
  - Angora
  - Alpine
843. Caprine arthritis-encephalitis is most commonly transmitted via:
- respiratory tract discharge
  - vulvar discharge
  - feces
  - draining tracts from affected joints
  - infectious colostrum and milk
844. Which of the following is recommended to reduce the prevalence of caprine arthritis-encephalitis in goat herds?
- Isolate kids at birth and feed only heat-treated colostrum and pasteurized milk.
  - Treat clinical cases with phenylbutazone as needed.
  - No special measures are needed, as the goats are usually culled for other reasons before clinical signs become apparent.
  - Cull goats with clinical signs.
  - Perform serologic testing periodically and milk seropositive animals last.
845. Transmission of several contagious diseases to newborn kids can be prevented by feeding heat-treated colostrum and pasteurized milk. What is the difference in the preparation between heat-treated colostrum and pasteurized milk?
- There is no difference; they are prepared the same way.
  - Colostrum is heated to a lower temperature for a longer time than is pasteurized milk.
  - Colostrum is heated to a higher temperature for a longer time than is pasteurized milk.
  - Colostrum is heated to a lower temperature for a shorter time than is pasteurized milk.
  - Colostrum is heated to a higher temperature for a shorter time than is pasteurized milk.



846. Concerning vaccination for caprine arthritis-encephalitis, which statement is most accurate?

- A modified-live virus vaccine is administered once at 4 months of age and annually thereafter.
- A killed-virus vaccine is given as two injections 4 weeks apart beginning at 4 months of age initially, and annually thereafter.
- There is no vaccine for this disease.
- A vaccine is not commercially available, but autogenous vaccines can be made.
- Vaccination should only be used in herds known to be infected.

847. Which of the following is **not** a common clinical condition caused by *Mycoplasma* infection in goats?

- diarrhea
- arthritis
- pneumonia/pleuritis
- mastitis
- conjunctivitis

848. What is the treatment of choice for caprine arthritis-encephalitis?

- metronidazole
- sulfamethazine
- dipyron
- dexamethasone
- no specific treatment is available

849. Likely causes of arthritis in goats include all of the following **except**:

- caprine arthritis-encephalitis virus
- Mycoplasma*
- bluetongue virus
- Staphylococcus*
- Streptococcus*

850. In the United States the most common causes of infectious abortion in goats are:

- chlamydiosis and brucellosis
- chlamydiosis and campylobacteriosis
- toxoplasmosis and campylobacteriosis
- toxoplasmosis and chlamydiosis
- chlamydiosis, campylobacteriosis, and toxoplasmosis

851. Differential diagnoses for chronic weight loss in goats include all of the following **except**:

- caseous lymphadenitis
- chronic hemonchosis
- caprine arthritis-encephalitis
- toxoplasmosis
- Johne's disease

852. The cause of caseous lymphadenitis in goats is:

- Streptococcus pyogenes*
- Fusobacterium necrophorum*
- Staphylococcus aureus*
- Actinomyces pyogenes*
- Corynebacterium pseudotuberculosis*

853. A goat has a swelling in the throat region. Possible causes of this lesion include all the following **except**:

- contagious ecthyma
- caseous lymphadenitis
- salivary cyst
- enlarged thymus
- goiter

854. The treatment of choice for an individual goat with external lesions of caseous lymphadenitis is to:

- segregate the animal and administer penicillin intramuscularly
- segregate the animal, lance the abscess, and flush it with dilute iodine solution
- excise the abscess
- administer potentiated sulfa drugs orally
- do nothing, as most lesions heal on their own in a few weeks

855. The most common cause of infectious keratoconjunctivitis (pinkeye) in goats is:

- Moraxella bovis*
- Moraxella caprae*
- Mycoplasma conjunctivae*
- Rickettsia conjunctivae*
- Pseudomonas caprae*

856. A routine vaccination program for goats should include protection against:

- enterotoxemia and tetanus
- brucellosis and chlamydiosis
- enterotoxemia and contagious ecthyma
- contagious ecthyma and infectious keratoconjunctivitis
- contagious ecthyma, chlamydiosis, and enterotoxemia

857. Somatic cell counts in goat milk:

- are similar to those in cow milk
- are lower than those in cow milk
- are higher than those in cow milk
- do not increase in late lactation
- are irrelevant because of the apocrine secretory system in goats

858. The most common cause of abortion in Angora goats is:

- chlamydiosis
- toxoplasmosis
- stress caused by poor nutrition
- bluetongue
- toxic plants

859. Short interestrus intervals or "short cycles" of 5 to 7 days in goats are:

- common and usually associated with cystic ovarian disease
- normal at the onset of the breeding season
- usually reported after induction of estrus with prostaglandin
- common 10 to 14 days after kidding
- rare and usually associated with a granulosa-cell tumor

860. Treatment of short interestrus intervals or "short cycles" in goats consists of:

- ovariectomy
- gonadotropin-releasing hormone
- equine chorionic gonadotropin (pregnant mare serum gonadotropin)
- initially no treatment, as the condition usually resolves spontaneously
- progesterin for 9 to 14 days

861. Concerning pseudopregnancy in goats, which statement is **least** accurate?

- It is associated with a retained corpus luteum and prolonged elevations of levels of progesterone.
- It may be diagnosed as hydrometra with ultrasonography.
- It may resolve spontaneously with a hemorrhagic vulvar discharge.
- It is associated with precocious udder development in doelings.
- It may resolve as a "cloudburst" of fluid after an apparent normal gestation.

862. What is the treatment of choice for pseudopregnancy in goats?

- dexamethasone
- none needed; let the condition run its course and breed the doe the next year
- prostaglandin
- progesterone
- progesterone and equine chorionic gonadotropin (pregnant mare serum gonadotropin)

863. The intersex condition in goats can be prevented by:

- ensuring that at least one parent is horned
- ensuring that at least one parent is polled
- ensuring that both parents are horned
- ensuring that both parents are polled
- not breeding intersex animals to each other

864. Goats with the intersex condition are:

- genetically female
- always phenotypic males
- true hermaphrodites
- females born twin to a male
- the result of aggressive crossbreeding programs

865. Concurrent anemia and hypoproteinemia are commonly associated with infection with any of the following **except**:

- Leptospira*
- Hemonchus contortus*
- Linognathus stenopsis*
- Eimeria arloingi*
- Fascioloides*

866. Which clinicopathologic finding is compatible with enterotoxemia in goats?

- ketonuria
- glycosuria
- elevated transketolase activity in erythrocytes
- $\gamma$ -globulinemia
- elevated serum creatinine level

867. A 4-month-old dairy goat has severe depression, diarrhea, a rough haircoat, and a history of "getting into the feed room." Likely differential diagnoses include all the following **except**:

- polioencephalomalacia
- coccidiosis
- enterotoxemia
- rumen acidosis
- Johne's disease

868. Which of the following is the most likely to be seen in a goat with bluetongue?

- swollen muzzle with a cyanotic color
- swelling around the coronary bands
- nonspecific lameness
- mucosal erosions
- no specific signs, as clinical disease from bluetongue is rare in goats

869. Concerning Johne's disease in goats, which statement is **least** accurate?

- A primary clinical sign is progressive weight loss.
- A primary clinical sign is profuse watery diarrhea.
- Intestinal thickening with mucosal corrugation is rarely seen on necropsy.
- Clinical disease rarely develops before 1 year of age.
- There is no effective treatment.

870. The most common isolate from milk of dairy goats with subclinical mastitis is:

- Streptococcus agalactiae*
- Staphylococcus aureus*
- gram-negative coliforms
- Pasteurella haemolytica*
- coagulase-negative *Staphylococcus*

871. A dairy goat with blisterlike pustules on the skin of the caudal aspect of the udder, perianal and vulvar areas, and ventral aspect of the tail is most likely to have:

- contagious ecthyma
- cow pox
- goat pox
- udder impetigo
- photosensitization

#### Questions 872 and 873

Last night a 5-year-old dairy goat delivered triplets. The kidding was assisted because the owner believed the doe was taking too long to deliver each kid. Today the doe is depressed and ataxic, and has scant, very dry feces and retained fetal membranes.

872. The most likely cause of these findings is:

- hypocalcemia
- ketosis
- enterotoxemia
- toxic mastitis
- selenium deficiency

873. An appropriate treatment for this doe is:

- Clostridium perfringens* type D antitoxin
- 1 to 2 L propylene glycol per os twice daily for 3 days
- 20 ml 10% glucose solution intravenously
- 25 to 100 ml 23% calcium gluconate solution intravenously
- 250 ml 23% calcium gluconate solution intravenously and another 250 ml subcutaneously

874. Which of the following is compatible with pregnancy toxemia in goats?

- ketonuria
- glycosuria
- elevated transketolase activity in erythrocytes
- $\gamma$ -globulinemia
- malodorous vulvar discharge

875. The source of progesterone to support pregnancy in goats is the:

- placenta
- corpus luteum
- corpus luteum and adrenal glands
- corpus luteum for the first 50 days of gestation and placenta from 50 days to term
- pineal gland and placenta

876. Considering the answer to Question 875, what is the drug of choice for induction of parturition in goats?

- dexamethasone
- estrogen
- prostaglandin
- progesterone
- oxytocin

#### Questions 877 and 878

A 12-month-old Nubian that is grossly overconditioned has depression, a reduced appetite, incoordination, and teeth grinding. The goat was bred 4½ months ago and comes from a line of does that have multiple births.

877. The most likely cause of these signs is:

- enterotoxemia
- pregnancy toxemia
- listeriosis
- polioencephalomalacia
- brain abscess

878. Which of the following is **not** an appropriate treatment for this doe?

- 4 L oral electrolytes given per os
- injectable B vitamins
- 60 to 120 ml propylene glycol given per os
- 250 to 500 ml 20% glucose solution given intravenously
- 20,000 IU/kg procaine penicillin G given intramuscularly

879. The genetic composition of goats with the intersex condition is usually:

- XX
- XY
- XXY
- XO
- XX, XY chimera

880. Intersex goats that are phenotypically male commonly have one or more of the following anatomic modifications, with the **exception** of:

- hypoplastic testes in a short scrotum
- hypospadias
- shortened penis
- inguinal testes
- palpable bulbourethral glands

881. Which of the following is **not** associated with the intersex condition in a phenotypically female goat?
- hypoplastic teats
  - increased anogenital distance
  - enlarged clitoris
  - atretic vagina
  - "bucky" odor
882. The primary significance of *Coxiella burnetii* infection in goats is as:
- an abortifacient
  - a cause of pneumonia
  - a zoonotic agent
  - a cause of mastitis
  - an immunosuppressive agent
883. Out-of-season breeding in goats can be accomplished to some degree using any of the following **except**:
- melatonin
  - progesterin plus equine chorionic gonadotropin (pregnant mare serum gonadotropin)
  - sudden introduction of a buck to females that have been isolated from any males for 30 days
  - early weaning of kids
  - removal of supplemental lighting to mimic decrease in day length
884. Which of the following is an accurate indication of pregnancy in goats?
- elevated serum progesterone concentrations at 5 days after breeding
  - elevated urinary estrone sulfate concentrations at 50 days after breeding
  - elevated serum progesterone concentrations at 21 days after breeding
  - elevated urinary estrone sulfate concentrations at 21 days after breeding
  - decreased urinary estrone sulfate concentrations at 21 days after breeding
885. Concerning listeriosis in goats, which statement is **least** accurate?
- The most common clinical sign is abortion.
  - It is spread primarily by ingestion.
  - Abortion is most common in late pregnancy.
  - Retained fetal membranes and metritis are common sequelae of abortion.
  - Clinical signs appear approximately 3 weeks after exposure to spoiled silage.
886. Brucellosis in goats is caused by:
- Brucella ovis*
  - Brucella canis*
  - Brucella abortus*
  - Brucella melitensis*
  - Brucella suis*
887. The primary clinical sign of iodine deficiency in goats is:
- goiter in the majority of goats in the herd
  - small mature size of adults
  - inappetence and diarrhea
  - parakeratosis
  - birth of dead, weak, or premature kids with a scant haircoat and goiter
888. Copper deficiency in goats:
- is very rare because goats are not very susceptible
  - appears as ill-thrift and an off-colored haircoat
  - causes enzootic ataxia in kids under 3 months of age
  - is often secondary to deficiency of sulfur and molybdenum
  - causes a hemolytic crisis, with dyspnea and hemoglobinuria

### Questions 889 and 890

A herd of dairy goats has an outbreak of swollen joints and high fever, primarily in young kids. Some of the kids have pneumonia. Umbilical palpation is unremarkable.

889. The most likely cause of these findings is:

- mycoplasmosis
- chlamydiosis
- joint ill
- white muscle disease
- caprine arthritis-encephalitis

890. What is an appropriate treatment for these kids?

- tylosin
- penicillin
- cephalothin
- trimethoprim-sulfa
- selenium-vitamin E

891. Which of the following is **not** an important control measure for *Mycoplasma mycoides* ss *mycoides* infection in a dairy goat herd?

- feeding heat-treated colostrum and pasteurized milk to kids
- euthanizing affected kids to prevent production of carriers
- vaccination of pregnant does 4 weeks before kidding
- culturing milk of postparturient does and culling culture-positive animals
- unnecessary, as this organism does not cause clinical disease in goats

892. Toxoplasmosis in goats is **not** associated with:

- transplacental transmission
- late-term abortion
- mummified fetuses
- resorption of embryos
- generalized placentitis

893. Toxoplasmosis in goats is best controlled by:

- serologic testing and culling of seropositive animals
- vaccination
- controlling barn cat populations
- controlling wild rodent populations
- feeding large doses (three times the recommended dosage) of monensin to pregnant does

894. Which of the following is diagnostic of toxoplasmosis associated with abortion?

- elevated titers in the aborting dam
- presence of specific antibody in presuckle serum or body fluids of kids
- nonsuppurative encephalitis on histologic examination
- white flecks (necrotic foci) on gross examination of the intercotyledonary placenta
- necrotic myocarditis on histologic examination

895. Concerning mannosidosis in kids, which statement is **least** accurate?

- It is a congenital defect.
- It causes mannosidemia, with resulting central nervous system signs.
- It is an enzyme deficiency that results in accumulation of oligosaccharides in neural and other tissues.
- It has been reported primarily in Nubians or Nubian crosses.
- Affected kids cannot stand and have carpal flexures and intention tremors.

896. As compared with rams, bucks have a scrotal circumference that is:

- larger
- smaller
- unrelated to fertility
- variable
- similar

897. *During the nonbreeding season, bucks have increased:*
- libido
  - odor
  - sperm concentration per ejaculate
  - volume of semen
  - percentages of morphologically normal spermatozoa
898. *Which of the following is a common cause of sterility in bucks?*
- sperm granuloma
  - varicocele
  - testicular neoplasms
  - Brucella ovis* epididymitis
  - excision of the urethral process to relieve urolithiasis
899. *Transabdominal ultrasonography is most accurate for pregnancy diagnosis during what stage of gestation?*
- days 60 to 90
  - days 30 to 60
  - day 10 to term
  - days 20 to 120
  - days 45 to 100
900. *A goat that has had access to the grain bin develops depression, diarrhea, blindness, and head pressing. You suspect polioencephalomalacia. What clinicopathologic procedure can be used to confirm your diagnosis of polioencephalomalacia?*
- complete blood cell count
  - determination of serum creatine kinase activity
  - determination of transketolase activity in erythrocytes
  - culture of cerebrospinal fluid
  - determination of erythrocyte fragility

## Answers

- d** Peripheral evidence of erythrocyte regeneration is rarely seen in responsive anemia. Only demonstration of adequate erythropoiesis in bone marrow is a common finding in equine regenerative anemias.
- a** Ingestion of red maple leaves causes Heinz-body hemolytic anemia in horses.
- a** Lymphosarcoma has been documented in horses of all ages but is most common in horses 4 to 9 years of age.
- c** Streptococci are not sensitive to gentamicin and amikacin and are only sometimes sensitive to oxacillin and trimethoprim-sulfamethazine. *S. equi* is nearly always sensitive to penicillin.
- e** All the other drugs listed are cleaved by  $\beta$ -lactamase.
- c** Nonsteroidal antiinflammatory drugs decrease production of prostaglandins, which increase the sensitivity of nerves to painful stimuli.
- e** Forages contain the large quantities of potassium that are needed to replace potassium deficits. It is difficult to safely administer sufficient quantities intravenously.
- c** Administration of dexamethasone can precipitate laminitis.
- e** Changes in exercise patterns and carbohydrate feeding are the most common predisposing factors.
- b** Most of the bacteria are localized in the synovial membrane and not the synovial fluid. Low flow rate in the synovial capillaries allows bacterial deposition. Articular cartilage is destroyed by enzymes produced by synovial and inflammatory cells.
- c** Exotoxins produced by *Clostridium* can cause extensive tissue destruction and systemic illness.
- b** Dislodging by pressure from a nasogastric tube causes extensive esophageal damage and may force the impaction into a more distal and less accessible part of the esophagus.
- d** Such should be fed a slurry of pelleted feed so as not to aggravate mucosal damage.
- e** Affected foals occasionally exhibit abdominal pain. However, diarrhea, poor growth, and rough haircoat are more common signs.
- d** Esophageal impaction is unlikely to produce diarrhea.
- c** The other signs listed are sometimes seen. Copious nasogastric reflux is the most consistent finding.
- d** This is done to prevent gastric rupture.
- a** Horses with diffuse peracute peritonitis rapidly develop circulatory shock. The other signs listed are seen with localized peritonitis and abscessation.
- b** The most common abnormalities are hemoconcentration; prerenal or renal azotemia, neutropenia, and leftward shift from endotoxemia; electrolyte abnormalities from loss in diarrhea; and protein loss from the damaged intestinal tract. Therefore this combination allows assessment of the severity of these changes and helps to adjust therapy appropriately. Fecal cultures for *Salmonella* are useful to help determine the cause of diarrhea.
- e** Though the other agents listed play a role in treatment of diarrhea and acute toxemia, fluid therapy is the most important component initially.
- d** Many horses develop an antibody titer at the onset of clinical signs. Therefore only 50% of cases are successfully diagnosed via serologic tests. A decreasing titer is also diagnostic.
- a** Oxytetracycline is indicated in treatment of monocytic ehrlichiosis.
- e** Aspartate aminotransferase and lactate dehydrogenase are nonspecific. Creatine kinase is specific for muscle. Alanine aminotransferase is not leaked from damaged equine hepatocytes as it is in other species.
- c** Prolonged prothrombin time occurs more frequently than the other abnormalities listed.
- b** These signs are related to hepatoencephalopathy.
- c** Only intravenous glucose is an appropriate therapy.
- c** Horses with cholelithiasis tend to show mild colic intermittently.
- a** Dysphagia is associated with inflammation around the glossopharyngeal and vagus nerves in close proximity to the guttural pouch.
- d** Parasympatholytics (e.g., atropine),  $\beta$ -adrenergic agonists (e.g., clenbuterol),  $\alpha$ -adrenoceptor antagonists (e.g., phenoxybenzamine), and phosphodiesterase inhibitors (e.g., theophylline) are bronchodilators.
- a** The other choices are not correct.
- e** At therapeutic levels digoxin slows the heart rate and atrioventricular conduction, causes vasodilation, and increases contractility. At toxic levels digoxin causes supraventricular arrhythmias.
- b** Botulism causes neuromuscular weakness progressing to paralysis.
- e** Second-degree atrioventricular block is common in horses because of their high vagal tone.
- d** The murmur is heard on the right because of a left-to-right shunt. The murmur is localized over the pulmonic valve because of increased flow through the right outflow tract.
- c** All the other signs listed occur in foals with foal-heat diarrhea and in foals with viral enteritis. Only foals with enteritis develop anorexia; foals with foal-heat diarrhea appear healthy other than the change in fecal character.
- d** The other agents listed have been isolated from foals with diarrhea but are considered rare causes of diarrhea.
- b** Some years ago *S. zooepidemicus* was considered the most common cause of septicemia in neonates. Several recent retrospective studies have demonstrated that *E. coli* is the most common isolate. The other agents listed are less common causes.
- a** The first clinical sign is fever. Coughing and sometimes purulent nasal discharge, diarrhea, and joint effusion occur much later.
- c** The abdominal pain, which usually results from intestinal inflammation, may precede diarrhea. There is no laboratory test specific for acute toxic enteritis. Any intestinal disease resulting in endotoxemia causes neutropenia.
- e** Hyperglobulinemia, hypoalbuminemia, anemia, hyperproteinemia, and hyper- $\beta$ -globulinemia occur with many causes of chronic inflammation. Demonstration of strongyle ova in feces confirms parasitism but does not necessarily indicate that disease is related to parasitism.
- b** Once infected horses carry this virus for life. Neutralizing antibody decreases the severity of signs but cannot clear viral infection. Natural transmission occurs via biting insects, especially tabanid flies. Few foals born to infected mares remain infected.
- b** Several dermatoses respond to corticosteroids. There are no biopsy findings specific to this disease; biopsy only helps rule out other diseases. Insect allergy does not usually respond to antimicrobial therapy unless complicated by bacterial infection.

43. **c** The signs described are most consistent with fly-bite allergy or onchocerciasis. Corticosteroids will reduce the pruritus causing the self-trauma and ivermectin will kill *Onchocerca* larvae. Fly control is necessary to reduce fly bites to which the animal may be hypersensitive. The other choices specify incomplete or unnecessary therapies.
44. **e** Both pinworm infection and *Culicoides* hypersensitivity produce pruritus, excoriations, and broken hairs at the base of the tail. The other choices listed do not produce similar lesions.
45. **b** Granulomatous enteritis produces small intestinal malabsorption, which leads to weight loss. Large-colon lesions leading to diarrhea occur late in the disease. Peripheral lymphadenopathy, fever, and anorexia are not usually found in horses with granulomatous enteritis.
46. **d** Fecal egg counts are not necessarily related to the severity of disease. Because disease can result from prepatent stages, fecal examination for ova can be negative in horses with disease related to endoparasitism.
47. **d** Parasitism, neoplasia, and granulomatous enteritis are the most important differential diagnoses. Of these, parasitism is the only treatable disease, so treatment for parasitism is a reasonable option before completing laboratory examination.
48. **a** Feces are not always abnormal in horses with colitis, especially early in the disease. Antimicrobial therapy should not be initiated unless a specific indication is found. Fever does not cause dry mucous membranes. Dry mucous membranes suggest that the horse is dehydrated and needs fluid therapy.
49. **d** Neutrophilia and leukocytosis are uncommon in horses with chronic inflammation. Hyperproteinemia, not hypoproteinemia, is typical.
50. **a** The signs described are most consistent with foal-heat diarrhea. Treatment and laboratory assessment are not necessary; however, the foal should be monitored because early rotaviral infection or salmonellosis cannot be ruled out.
51. **d** Sand can damage the colonic mucosa and allow absorption of endotoxin. The other choices listed are incorrect.
52. **c** The auscultation findings and heart rate are normal. Exercise intolerance is probably not due to heart disease. The other choices listed are incorrect.
53. **c** Because of the coughing and normal cardiac auscultation, respiratory disease should be ruled out first.
54. **d** The grade 3/5 holosystolic murmur could be consistent with tricuspid insufficiency. Because the horse is exercise tolerant, there probably is only minimal insufficiency that may not result in cardiac failure. However, an echocardiogram should be performed to assess the degree of insufficiency.
55. **c** The clinical signs described are consistent with heart failure. There is no definitive evidence of monensin toxicity, though this could be a differential diagnosis. The other choices listed are incorrect.
56. **b** The clinical signs and diagnostic findings are consistent with benign atrial fibrillation.
57. **b** Because there is no evidence of heart failure, digitalization is not necessary. Lidocaine is not effective therapy for supraventricular arrhythmias. Stall rest is not indicated because horses with atrial fibrillation do not spontaneously convert to normal sinus rhythm.
58. **a** These signs are most consistent with ventricular septal defect.
59. **b** Cyanosis is consistent with a right-to-left shunt, which could be associated with tetralogy of Fallot.
60. **d**  $7\% \times 500 \text{ kg} = 35 \text{ L}$
61. **a** The murmur and jugular pulsation are consistent with tricuspid insufficiency. The fever suggests it may be due to vegetative endocarditis.
62. **a** These diagnostic findings and clinical signs indicate the likelihood of myocardial damage.
63. **c** The arrhythmia is not likely to lead to fibrillation or cardiac insufficiency at this point; therefore antiarrhythmic therapy is not needed. Treatment of the intestinal disease and fluid and electrolyte imbalances will resolve the arrhythmia.
64. **d** The auscultation findings are consistent with heart block (sinus or atrioventricular). Atrioventricular block is common in horses, usually as a result of high vagal tone, and usually resolves with exercise or excitement. A preexercise electrocardiogram will confirm the type of arrhythmia and a postexercise electrocardiogram will confirm that it is due to high vagal tone.
65. **c** Digoxin and furosemide should be used to reduce preload and increase cardiac contractility. Lidocaine and potassium chloride are ineffective treatment for cardiac failure. Quinidine gluconate is a negative inotrope and is contraindicated in this case of cardiac failure. The atrial fibrillation is due to atrial enlargement and will probably not be converted by quinidine.
66. **b** The most likely diagnosis is equine viral arteritis. Of the choices listed, a nasal swab for virus isolation is the best diagnostic test.
67. **c** Rapid respiratory rate, coughing, and cyanosis can result from an upper respiratory or a pulmonary abnormality. Respiratory stridor suggests upper respiratory obstruction. Expiratory abdominal lift is the only choice that is specific for pulmonary disease.
68. **e** Positive results of serologic examination are the best indicator of *Borrelia* infection.
69. **b** *Culicoides* is a small flying gnat whose feeding can be prevented by air movement created by fans.
70. **a** It is possible, though very unlikely, that *S. neurona* infection and verminous myelopathy could cause urinary incontinence. However, urinary incontinence is a common sign of equine herpesvirus-1 myelopathy.
71. **b** Horses with atrial fibrillation rarely spontaneously convert to normal sinus rhythm. Lidocaine is not effective for treatment of supraventricular arrhythmias. Horses respond poorly to digoxin therapy.
72. **c** Antimicrobials do not change the course of diarrhea caused by salmonellosis.
73. **a** The clinical disease has resolved, therefore therapy is not necessary. However, the mare is still shedding *Salmonella* organisms, and steps should be taken to prevent spread to other animals.
74. **c** The other choices listed do not provide adequate prophylaxis in an unvaccinated horse.
75. **a** The other signs listed are uncommon in horses with hepatic failure or are not clinical signs of hepatic failure.
76. **a** Pleuropneumonia or lung abscesses are found in approximately two thirds of horses with pleural effusion.
77. **e** Activated clotting time reflects the integrity of the intrinsic coagulation pathway.
78. **d** Glucose concentrations less than 40 mg/dl in pleural fluid are most often associated with positive bacterial cultures.
79. **b** Septic arthritis is best treated with a combination of joint drainage and lavage and with parenteral antimicrobial therapy.
80. **d** Bacteria are seldom observed on cytologic examination of synovial fluid.
81. **e** Aspiration of synovial fluid for aerobic and anaerobic bacterial culture and cytologic analysis is the most definitive way to diagnose septic tenosynovitis.
82. **c** The causative agent of protozoal myelitis is *S. falcatula*.
83. **e** Penicillin is not effective against protozoa.
84. **e** Trimethoprim is not effective against *Toxoplasma*.
85. **b** One-stage prothrombin time is used to monitor the effects of warfarin therapy.
86. **a** True neurotransmitters are depleted in affected animals.
87. **c** The slap (adductor reflex) test is not a reliable test for laryngeal hemiplegia.
88. **e** Phenytoin blocks sodium and calcium channels in cell membranes.
89. **a** Sarcoids are not malignant.
90. **a** Periocular sarcoids are particularly susceptible to bacille bilié de Calmette-Guérin therapy. Using multiple injections, success rates can approach 100%.
91. **e** Static stenosis occurs most commonly in older horses.
92. **b** Lipopolysaccharide is released by gram-negative bacteria during rapid bacterial growth or lysis.
93. **e** There is no evidence that benzimidazoles or ivermectin at approved dosages are effective against third-stage encysted larvae.
94. **b** Myelography should not be performed if meningitis is suspected or if systemic bacteremia is diagnosed or suspected.
95. **a** Metrizamide competitively inhibits the enzymatic action of hexokinase and produces seizures and other neurotoxic effects.
96. **a** Purulent uterine debris and fluid accumulate because the cervix is closed.
97. **d** The muscular walls of the umbilical arteries normally contract shortly after birth and produce a small or negligible lumen.
98. **b** Abdominal fluid is anechoic unless secondary peritonitis has developed.
99. **a** Interstitial pneumonia produces minimal ultrasonographic abnormalities.

100. **d** Elevated serum creatine kinase and aspartate transferase activities indicate muscle damage and necrosis.
101. **d** Corneal neovascularization develops from the limbic vasculature.
102. **d** *Onchocerca* lesions usually originate in the temporal or dorsal limbus and bulbar conjunctiva and progress into the adjacent cornea.
103. **a** *Streptococcus*, *Staphylococcus*, *Pseudomonas*, and *Aspergillus* are commonly isolated from horses with external eye disease.
104. **a** *Bacillus*, *Corynebacterium*, *Staphylococcus*, and *Aspergillus* are commonly isolated from the eyes of normal horses.
105. **a** Most CSF (70%) originates in the ventricular choroid plexuses of the lateral ventricles.
106. **b** The cerebellum can herniate through the foramen magnum if there is a marked decrease in CSF pressure during CSF collection from the atlantooccipital space in horses with increased intracranial pressure.
107. **c** The internal carotid artery is not directly related to CSF pressure.
108. **b** The CSF-brain barrier is formed by the pia mater and the ependyma of the ventricles.
109. **b** Before manure is spread on a pasture, it should be composted for 1 year to kill cyathostome larvae.
110. **b** Tapeworms are best detected using a sedimentation technique.
111. **a** *Cryptosporidium* infection can occur in immunocompetent foals and has been associated with diarrhea.
112. **b** The life cycle of *Anoplocephala* involves mites as intermediate hosts.
113. **c** Direct trauma to the penis or prepuce is the most common cause of paraphimosis.
114. **b** Phenothiazine-derivative tranquilizers are contraindicated in evaluation of horses with paraphimosis.
115. **b** Seizures are atypical but may occur during the later stages of the disease.
116. **d** Usually greater than 75% of the hepatic mass must be affected before signs of hepatoencephalopathy become evident.
117. **a** *Fusarium moniliforme* is the causative agent of leukoencephalomalacia.
118. **b** Plasma ammonia levels correlate poorly with the severity of clinical signs of hepatoencephalopathy.
119. **a** Warfarin inhibits factor VII and protein C and prolongs prothrombin time.
120. **a** The false neurotransmitter hypothesis is based on increased levels of aromatic amino acids (phenylalanine, tyrosine, and tryptophan).
121. **d** An increase in the conjugated (direct-reacting) bilirubin fraction indicates hepatic disease.
122. **b** Oral neomycin alters the gastrointestinal flora and predisposes to diarrhea, such as from *Salmonella*.
123. **c** Factors that predispose to permanent intraabdominal adhesions include ischemic tissue, infection, serosal trauma, and foreign material.
124. **d** Tissue plasminogen activators initiate the fibrinolytic cascade by converting plasminogen to plasmin.
125. **b** Anticoagulants that inhibit fibrin formation include antithrombin III and protein C.
126. **b** Large-colon displacement has not been recognized as a clinical problem associated with peritoneal adhesions.
127. **c** Inhalation of moist, hot air (>302° F) results in burns of the upper airway.
128. **d** Carbon monoxide poisoning reduces the oxygen-carrying capacity of hemoglobin.
129. **d** The second stage of smoke inhalation injury is pulmonary edema, which develops secondary to the inflammatory response.
130. **c** The tracheobronchial mucosal barrier reforms within about 2 weeks.
131. **b** Removal of carbon monoxide associated with smoke inhalation injury is greatly facilitated by administration of 100% oxygen.
132. **c** Small (<3 cm) umbilical hernias usually close spontaneously without complications within the first year of life.
133. **c** Quarter horse females have a high prevalence of umbilical hernias.
134. **b** Ultrasonographic examination can help distinguish uncomplicated umbilical hernias from those with cellulitis or abscess formation.
135. **d** Umbilical hernias with anechoic ultrasonographic findings are not associated with cellulitis or abscessation.
136. **e** Fever is not a common clinical finding in horses with renal disease.
137. **e** The ureters are not normally visualized unless they are grossly dilated.

138. **c** Client complaints of sore back in their horse are infrequently related to kidney problems.
139. **b** Cantharidin toxicosis is associated with acute lesions in the gastrointestinal, urinary, and cardiovascular systems.
140. **e** Renal pelvic calculi could result in a dilated renal pelvis but would not affect the ureters.
141. **b** Interleukin-1 activates neutral metalloproteoglycanase in chondrocytes, which degrades the cartilage matrix.
142. **b** Primary afferent neurons release neuromediators of inflammation (substance P, neurokinins A and B, and calcitonin gene-related peptide).
143. **c** Substance P stimulates release of prostaglandin E<sub>2</sub> and collagenase, which perpetuates synovitis and cartilage destruction.
144. **c** Hyaluronic acid is a boundary lubricant of the synovial membrane.
145. **a** Dentigerous cysts originate from failure of the first branchial cleft to close.
146. **b** Dentigerous cysts have been reported in horses, dogs, cattle, and sheep.
147. **d** The teeth within dentigerous cysts most often resemble molars.
148. **d** Dentigerous cysts are typically located at the base of the ear.
149. **a** There is no breed predilection with dentigerous cysts.
150. **c** Larval development of *P. equorum* is arrested at temperatures less than 10° C.
151. **b** Third-stage *P. equorum* larvae migrate via the portal blood to the liver 24-48 hours after they are ingested.
152. **a** The prepatent period for *P. equorum* infection is 75 to 100 days.
153. **e** Protein-losing enteropathy is not commonly associated with *P. equorum* infection.
154. **d** During hepatic migration there is little alteration in serum activities of liver-derived enzymes.
155. **e** Serum precipitin titers against whole-worm antigen increase as active immunity against *P. equorum* develops.
156. **a** Because *P. equorum* can cause intestinal obstruction or rupture, the degree of infection (parasite burden) should be considered when choosing an appropriate anthelmintic.
157. **e** Benzimidazole anthelmintics inhibit fumarate reductase.
158. **b** Piperazine causes neuromuscular hyperpolarization.
159. **c** Levamisole causes ganglionic stimulation.
160. **a** Pyrantel is a cholinergic agonist.
161. **c** Organophosphate anthelmintics inhibit cholinesterase.
162. **d** Avermectins potentiate  $\gamma$ -aminobutyric acid.
163. **e** The most common causes of acquired cataracts in horses are recurrent uveitis and trauma.
164. **a** Cataract surgery is most successful in foals younger than 6 months of age.
165. **e** Jugular vein thrombophlebitis is an uncommon complication of chronic renal failure.
166. **e** Serous ocular discharge is not a common clinical sign in horses with jugular vein thrombophlebitis.
167. **c** Collateral circulation does not influence development of thrombophlebitis.
168. **c** Hemostasis is the physiologic balance between coagulation and fibrinolysis.
169. **b** Ventricular septal defect is the most common congenital cardiac anomaly in horses.
170. **e** Loss of vascular endothelial integrity does not result in adherence of platelets to Hageman factor.
171. **a** Platelets do not secrete or release prostacyclin.
172. **e** Tissue thromboplastin is a procoagulant related to the extrinsic coagulation pathway and not related to clot formation and localization.
173. **a** Disseminated intravascular coagulation in horses is most commonly associated with gram-negative septicemia.
174. **b** *E. coli* is the most common cause of septicemia in foals less than 3 days of age.
175. **c** Ivermectin is not effective against biting lice.
176. **a** Sites most commonly affected by black flies include the pinnae and medial thighs.
177. **b** *Culicoides* hypersensitivity is manifested as seasonal pruritus involving the mane and base of the tail.
178. **d** Transmission of viruses (e.g., western equine encephalitis, eastern equine encephalitis, Venezuelan equine encephalitis) is the most important impact that mosquitoes have on equine health.

179. **d** Proper disposal of hay and manure is essential in control of house fly and stable fly larvae.
180. **c** Cutaneous habronemiasis is a seasonal granulomatous skin disease transmitted by house flies and stable flies.
181. **d** Ivermectin therapy does not kill adult *O. cervicalis* worms.
182. **e** Dental disease is usually chronic and progressive and thus is not likely to result in rapid osseous facial changes.
183. **e** Snorting and upper airway sounds are not associated with wolf teeth problems.
184. **c** In rare instances the incisors may be retained and become impacted.
185. **a** Sharp enamel edges normally develop along the lingual aspect of the lower arcade, not the buccal aspect.
186. **c** Nutritional muscular dystrophy is a degenerative disease of the skeletal and cardiac muscles and does not involve inflammation.
187. **d** Cough, nasal discharge, and fever are not commonly associated with nutritional muscular dystrophy.
188. **e** Dietary levels of zinc are not related to nutritional muscular dystrophy in foals.
189. **b** Whole-blood selenium concentration and glutathione peroxidase activity are the tests of choice for assessing selenium concentrations in horses.
190. **d** Serum creatine kinase activity increases in proportion to the severity of muscle involvement.
191. **e** Head tilt is not commonly associated with prehension or mastication disorders.
192. **a** Nigropallidal encephalomalacia is caused by ingestion of yellow star thistle (*C. solstitialis*).
193. **e** Aminoglycosides are not considered photosensitizing agents.
194. **b** Care should be exercised when examining a horse with dysphagia because of the risk of contracting rabies.
195. **c** Dysphagia following a snakebite is usually associated with pharyngeal edema.
196. **b** Phenothiazine tranquilizers are contraindicated in medical management of priapism.
197. **b** Squamous-cell carcinoma is the most common tumor of the equine penis and prepuce.
198. **b** Uterine torsion accounts for 5% to 10% of the cases of dystocia in mares.
199. **a** Colic is the most common clinical sign associated with uterine torsion in mares.
200. **c** As viewed from the rear, the direction of uterine torsion in mares is equally likely to be clockwise or counterclockwise.
201. **a** In a study of septicemic foals, all affected foals had serum IgG levels less than 800 mg/dl.
202. **b** Most meconium impactions respond to mild enemas and oral laxatives.
203. **c** Urine is high in potassium and low in sodium and chloride, therefore serum reflects these changes as it equilibrates with the retained urine.
204. **e** All of the listed organisms can cause neonatal septicemia, but *E. coli* and *Klebsiella* are most frequently involved.
205. **a** Affected foals have no presuckle IgM and a lymphocyte count of <1000 cells/ $\mu$ l in peripheral blood.
206. **a** Icterus can be caused by hemolysis, anorexia, and liver disease.
207. **c** In neonatal isoerythrolysis the dam makes antibodies against the foal's red blood cells, and these antibodies are concentrated in the colostrum.
208. **c** Purpura hemorrhagica is thought to be an immune reaction to an antigen. Affected horses often have history of exposure to *Streptococcus*, which is susceptible to penicillin.
209. **b** These represent the three most common upper airway pathogens of horses.
210. **d** Corticosteroids can actually induce laminitis, therefore they are contraindicated in treatment of the disease.
211. **a** *R. equi* is an intracellular organism. Erythromycin and rifampin achieve high levels intracellularly.
212. **c** Decreasing environmental dust is one of the most important aspects in treatment of heaves.
213. **d** Absence of airway sounds in the ventral chest suggests fluid accumulation or lung consolidation.
214. **a** The most common congenital cardiac defect in foals is ventricular septal defect.
215. **a** In atrial fibrillation there are no atrial contractions, therefore there are no P waves.
216. **b** Vitamin D decreases tubular excretion of phosphate.
217. **c** Respiratory distress, a loud murmur, and pulmonary edema suggest congestive heart failure secondary to a severe valvular defect.
218. **b** Holosystolic murmurs are common in newborn foals. Such murmurs usually disappear within a few days.
219. **e** Foals generally ingest a volume of milk approximating 20% of their body weight in kilograms.
220. **b** Neonates with lung lesions may have normal respiratory sounds. Radiographs and arterial blood gas analysis provide information on structure and function.
221. **a** Diazepam is safe for use in neonates and works rapidly.
222. **c** Because lactated Ringer's solution is a crystalloid fluid, it stays in the vascular space better than 5% dextrose alone. Foals in shock are often hypoglycemic and acidotic; this solution helps correct these problems.
223. **a** The facial nerve runs along the side of the face, and damage to this nerve could cause these signs.
224. **c** Cerebellar abiotrophy is a genetic disease of the Arabian breed. It causes intentional tremors and a hypermetric gait.
225. **b** These are the most likely causes of symmetric ataxia in young horses.
226. **d** The neurologic form of herpesviral encephalomyelitis commonly causes these signs.
227. **a** Trimethoprim-sulfadiazine and pyrimethamine act to inhibit folic acid in the protozoal organism.
228. **d** Yellow star thistle toxicity causes necrosis of the substantia nigra and the globus pallidus regions of the brain.
229. **c** Clostridia are gas-producing organisms and are associated with postinjection infections in horses.
230. **d** Of the drugs listed, amikacin is the most effective against *E. coli*.
231. **a** Cranial nerves VII and VIII exit the skull in the region of the petrous temporal bone. Fractures in this region are thought to be secondary to fusion of the temporohyoid joint associated with otitis media-interna.
232. **b** These viruses are transmitted by mosquitoes.
233. **e** The main pathologic findings in equine herpesvirus-1 encephalomyelitis are vasculitis, ischemia, and hemorrhagic infarcts.
234. **a** A common name for leukoencephalomalacia is moldy corn disease. The causative agent is *E. moniliforme*.
235. **a** Horses do not produce reticulocytes.
236. **b** Because horses do not show peripheral signs of red blood cell regeneration, bone marrow examination is the most accurate way to assess red blood cell production.
237. **a** With external blood loss red blood cells and protein are lost.
238. **b** In intravascular hemolysis release of bilirubin results in icterus. Hemoglobinuria occurs when the excess hemoglobin from lysed red blood cells is passed through the kidneys.
239. **d** The Coggins' test is an agar gel immunodiffusion procedure that detects antibodies against the virus of equine infectious anemia.
240. **a** Limited transfusion studies in adult horses indicate that the life span of transfused red blood cells is only 2 to 4 days.
241. **a** Whole-blood transfusions should be used in acute life-threatening situations when the packed cell volume falls precipitously to 12% to 15%.
242. **a** The toxins in red maple leaves cause methemoglobinemia and Heinz-body anemia.
243. **b** When hemoglobin is oxidatively denatured, it precipitates to form Heinz bodies.
244. **a** Lymphosarcoma is the most common hematopoietic neoplasm of horses.
245. **e** These three can cause intravascular hemolysis in horses.
246. **c** The dilemma of this case is the very low packed cell volume and the need for diuresis. Transfusion of whole blood can increase the packed cell volume and intravenous fluids can decrease the chance of hemoglobinuric nephrosis.
247. **a** Lysed red blood cells in the plasma are toxic to the renal tubules.
248. **c** Effusions associated with anaerobic infections are often malodorous.
249. **e** Some strains of *B. fragilis* produce  $\beta$ -lactamase, resulting in resistance to  $\beta$ -lactam antibiotics. Metronidazole is the drug of choice.
250. **a** *S. equi* infections commonly cause abscesses in the lymph nodes of the upper airway.
251. **b** Acute and convalescent antibody titers are the most practical method of confirming viral infection.

252. **a** The causative bacteria can be cultured from nasal secretions and abscess drainage.
253. **a** Adenoviral disease is usually subclinical, except in immunocompromised animals.
254. **a** Guttural pouch infections can occur after viral infection, but empyema is usually the result of rupture of the retropharyngeal lymph nodes.
255. **a** Ethmoid hematoma and guttural pouch mycosis must be considered in nonexercising horses with spontaneous epistaxis.
256. **d** In laryngeal hemiplegia neurogenic atrophy of the cricoarytenoideus dorsalis muscle causes occlusion of the airway by the adducted arytenoid cartilage and vocal fold.
257. **d** The permanent first molar erupts at 9 to 12 months of age.
258. **a** Retained deciduous premolars may result in hard swellings on the ventral mandible.
259. **c** Dentigerous cysts arise from misplaced tooth germ of the branchial arch. They appear as temporal cysts and may drain into the ear.
260. **c** Passage of a nasal gastric tube can confirm esophageal obstruction. If done carefully it may relieve the obstruction as well.
261. **a** In horses with esophageal obstruction, saliva, food, and water may be inhaled.
262. **b** The most common site is the squamous portion of the margo plicatus.
263. **d** The large amount of gastric reflux and the significant relief of pain following removal of this fluid indicate proximal enteritis/duodenitis.
264. **a** Equine saliva contains large amounts of sodium and chloride. Chloride losses lead to hypochloremic metabolic alkalosis.
265. **a** *E. risticii* is the causative organism.
266. **c** The fluid deficit can be calculated as follows: 7% dehydration = 0.07 L/kg. 450 kg × 0.07 L/kg = 31.5 L.
267. **c** The daily maintenance fluid requirement is 40 to 80 ml/kg, or 18 to 36 L for a 450-kg horse.
268. **a** Treatment goals for proximal enteritis include decreasing the amount of gastric contents and replacing fluid losses with intravenous fluids.
269. **b** The mucoprotective function of these prostaglandins is inhibited by nonsteroidal antiinflammatory drugs.
270. **d** Endotoxin is found in the cell wall of gram-negative bacteria.
271. **d** Flunixin meglumine inhibits thromboxane production.
272. **b** Only the pelvic flexure and small intestine are devoid of teniae.
273. **b** None of the other enzymes listed is specific for liver disease.
274. **c** *B. piliformis* is the cause of Tyzzer's disease.
275. **a** Hyperlipemia occurs in fat ponies that have had a sudden decrease in caloric intake. As a result these ponies begin to mobilize their own body fat.
276. **b** Pyrrolizidine alkaloid toxicity causes liver disease.
277. **c** If a horse is dehydrated, its urine will be concentrated.
278. **a** Acute tubular necrosis is the most common cause of renal failure in horses.
279. **e** It is believed to be the result of deposition of antigen-antibody complexes.
280. **a** Acute renal failure has been reported as an idiosyncratic reaction to vitamin K<sub>3</sub>.
281. **d** The first sign of aminoglycoside toxicity is elevated  $\gamma$ -glutamyltransferase activity in urine.
282. **c** Aminoglycoside toxicity results in renal tubular necrosis.
283. **b** Inhibited mitosis of hepatic cells results in formation of megalocytes.
284. **a** *Actinobacillus* causes microabscesses of the kidneys in septicemic foals.
285. **b** Acorn toxicity can result in renal failure. Tannin is the toxic principle.
286. **c** In old horses, pituitary adenomas are associated with increased secretion of adrenocorticotropic hormone, which results in elevated serum levels of glucose and endogenous glucocorticoids.
287. **a** Increased secretion of adrenocorticotropic hormone results in hyperglycemia.
288. **b** Nutritional hyperparathyroidism, or bran disease, is caused by excessive dietary phosphorus.
289. **a** Activity of these enzymes is elevated in muscle disease.
290. **b** Creatine kinase has a short half-life. Serum activity generally peaks 6 hours after exercise.
291. **c** Hyperkalemic periodic paralysis is a genetic disease that results in periodic weakness and elevated serum potassium levels.

292. **b** Synchronous diaphragmatic flutter occurs secondary to decreased serum levels of calcium, potassium, and magnesium.
293. **a** Infusion of calcium solution generally alleviates the problem.
294. **d** In severe rhabdomyolysis, stall rest is important in preventing further muscle damage.
295. **a** Vitamin E and selenium deficiencies result in white muscle disease.
296. **b** In early spring, mares often go through a transitional phase from anestrus to normal cycling.
297. **b** Increasing day length initiates cycling in mares.
298. **a** Most mares expel their placenta within 3 hours after foaling. If the placenta has not been expelled by this time, it is considered retained.
299. **d** Laminitis may occur in mares with a retained placenta. It is thought to be due to endotoxin released from the retained placenta.
300. **a** Suturing the dorsal commissure of the labia is known as the Caslick's operation.
301. **b** Herpesvirus causes abortion in the last 3 months of gestation.
302. **d** Paraphimosis is the inability to retract the penis into the sheath.
303. **d** Pemphigus foliaceus is an autoimmune phenomenon directed against the cell membrane-associated epidermal antigen.
304. **a** Grooming to remove crusts and bathing with an iodine-based shampoo are the best therapy for this disease.
305. **b** Immunosuppressive levels of corticosteroids and gold salts (chrysotherapy) are important in treatment of pemphigus foliaceus.
306. **a** Ivermectin is an effective filaricide.
307. **b** Chorioptic mange is known as foot and leg mange. It is usually only a problem in draft horses.
308. **a** *Culicoides* hypersensitivity is a dorsally distributed, seasonal, pruritic dermatitis.
309. **a** Nodular necrobiosis causes nonpainful, nonpruritic, firm nodules over the neck, withers and back.
310. **c** Aa and Qa are considered the most antigenic blood types. If a mare negative for either of these types is exposed, she will develop antibodies that are passed to the foal in the colostrum.
311. **b** Monensin toxicity is associated with cardiomyopathy in horses.
312. **e** Acidosis in this horse is due to significant loss of bicarbonate. The Pco<sub>2</sub> is in the normal range; therefore, the acidosis is uncompensated.
313. **c** The normal bicarbonate level is 24 mEq/L; therefore, this horse has a base deficit of 14 mEq/L (24 - 10 = 14). The amount of bicarbonate needed to correct this deficit is calculated as follows: base deficit × % extracellular fluid volume × body weight (kg). 14 mEq/L × 0.4 L/kg × 400 kg = 2240 mEq/L.
314. **a** A transient second-degree heart block is a common side effect of xylazine use in horses.
315. **b** These clinical signs are most prominent when the horse attempts to back.
316. **c** In the past this disease was known as bran disease because it was typically associated with excessive intake of bran, which has a high phosphorus content.
317. **d** Selenium deficiency is the most common cause of white muscle disease.
318. **c** Hypercalcemia and hyperphosphatemia are the most common abnormalities with vitamin D toxicity.
319. **c** There is soft-tissue calcification, especially of the great vessels of the heart.
320. **a** This blocks only the caudal one third of the hoof.
321. **a** Lameness associated with navicular disease is commonly improved with a caudal digital nerve block.
322. **d** To block the dorsal aspect of the foot, a basal sesamoid nerve block is necessary.
323. **a** The femoropatellar joint connects with the medial femorotibial joint but not frequently with the lateral femorotibial joint.
324. **c** Damage to the suprascapular nerve results in paralysis of these muscles, leading to neurogenic atrophy.
325. **d** The radial nerve supplies motor innervation to the extensors of the forelimb.
326. **d** *S. equi* is the causative agent of strangles in horses. *S. zooepidemicus* can cause pneumonia. Migration of *P. equorum* through the lungs may contribute to pneumonia. *R. equi* causes pneumonia and diarrhea.
327. **b** *S. falcatula* is one of the causative agents of equine protozoal myelitis.



328. **e** Trimethoprim-sulfa and pyrimethamine are the treatment of choice for equine protozoal myelitis. Both drugs block folic acid synthesis. Tetracycline is the drug of choice for *Ehrlichia risticii* infection (Potomac horse fever). Metronidazole and penicillin are effective against many anaerobic bacteria. Penicillin and gentamicin is a common combination used in horses. Ceftiofur is useful in treatment of respiratory infections.
329. **c** Second-degree atrioventricular block is the most common nonpathologic arrhythmia in horses.
330. **a** Atrial fibrillation is the most common pathologic arrhythmia in horses.
331. **d** Dental disease, inadequate diet, equine infectious anemia, and intestinal parasitism are the most common causes of chronic weight loss in horses.
332. **a** Glucagon is not used in treatment of hyperlipemia in horses and ponies. Insulin, glucose/dextrose, galactose, and heparin are used in treatment.
333. **d** Equine hyperkalemic periodic paralysis is a genetic disease of muscle cell membrane affected by the potassium in the diet and renal excretion of potassium. It can occur in horses of all ages.
334. **d** A papillomavirus causes warts in horses.
335. **d** EHV-4 is associated with rhinopneumonitis, EHV-1 with abortions and neurologic disease, EHV-2 with follicular lymphoid hyperplasia, and EHV-3 with coital exanthema.
336. **b** Washed red blood cells from the dam are the ideal transfusion source for foals with neonatal isoerythrolysis. A donor that is negative for Aa and Qa antigens is the second choice, with an unrelated gelding on the farm as third choice. Whole blood from the mare and any cells from the sire should never be used to transfuse such foals.
337. **a** *R. equi* causes diarrhea, in addition to pneumonia, in horses.
338. **b** Equine hyperkalemic periodic paralysis is inherited in an autosomal dominant mode, with incomplete penetrance.
339. **b** Salmonellosis is the primary differential diagnosis for acute diarrhea in adult horses, but not the most common cause.
340. **e** Sand ingestion can result in diarrhea, weight loss, malabsorption, and impaction in horses.
341. **b** Tetanus antitoxin administration has been historically associated with serum hepatitis (Theiler's disease). Though in theory other equine-derived biologics could cause serum hepatitis, none has been shown to be associated.
342. **e** Megalocytic hepatopathy is pathognomonic for pyrrolizidine alkaloid toxicity in horses.
343. **c** Squamous-cell carcinoma does not commonly affect the ears of horses.
344. **c** Laryngeal paralysis and dorsal displacement of the soft palate do not cause epistaxis.
345. **a** Hypophyseal adenoma (pituitary tumor) causes most cases of Cushing's syndrome and diabetes in horses. Primary Cushing's disease and diabetes mellitus are rare in horses.
346. **e** Anemia is not a mechanism of ventral edema in horses.
347. **a** Malocclusion is not a mechanism of diarrhea in horses.
348. **a** EHV-1 subtype 1 is associated with neurologic disease in horses. EHV-1 subtype 2 is an old name for EHV-4.
349. **b** Endotoxin is found primarily as part of the outer cell walls of gram-negative bacteria.
350. **c** Nasal insufflation with oxygen is not associated with pleuropneumonia.
351. **b** Pings associated with cecal torsion and abomasal volvulus are usually heard in the right paralumbar fossa. Pings associated with rumen gas are usually heard over the entire left side of the abdomen. Pings associated with pneumoperitoneum are usually detectable on both sides of the abdomen.
352. **d** Pluriparous Jersey cows are predisposed to milk fever following calving. All of the other conditions listed generally occur later after parturition.
353. **e** A freemartin calf is a heifer born as a twin of a bull calf. Ninety percent of these heifer calves are born with hypoplasia or agenesis of the reproductive organs.
354. **a** Milk fever is associated with by hypocalcemia. Hypophosphatemia, hypermagnesemia, and hyperglycemia are also often present. Endotoxemia is not a cause of milk fever.
355. **d** Infectious bovine rhinotracheitis is caused by herpesvirus type 1. This virus causes several distinct syndromes in cattle, including respiratory tract disease, conjunctivitis, infectious pustular vulvovaginitis, balanoposthitis, abortion, encephalomyelitis, and mastitis.
356. **c** The rumen normally contracts 1.5 to 3 times per minute.
357. **b** Approximately 80% of all cows with cystic ovarian disease are anestrous. About 20% exhibit nymphomania. Vulvar hemorrhage is seen during metestrus, and a mucous vulvar discharge is seen during estrus.
358. **a** This description is very characteristic of an abscess. Most swellings caused by hematoma or ruptured penis involve the area near the sigmoid flexure, near the neck of the scrotum. Fibropapillomas and preputial eversion usually do not cause noticeable swellings of the prepuce.
359. **c** By 25 days postpartum, the uterus of a dairy cow should feel like a normal, open tract. The endometrium is usually not completely repaired until 45 days postpartum. Before 25 days postpartum, the uterus is grossly enlarged.
360. **b** The first postpartum ovulation in most normal dairy cows is usually "silent" because circulating levels of progesterone are very low. The first visible postpartum estrus in most dairy cows is usually about 35 to 38 days after calving.
361. **d** Rupture of the allantoic chorion indicates that the first stage of labor is complete and the second stage has begun. Cervical dilatation occurs during the first stage of labor. Expulsion of the fetus, release of oxytocin from the posterior pituitary, and rupture of the amniotic membrane all occur during the second stage of labor.
362. **a** The placenta is normally expelled within 8 hours after calving. However, many cows not passing their placenta until later do not exhibit signs of illness.
363. **b** The normal bovine estrous cycle is 18 to 24 days long. Cycles shorter than this indicate nymphomania, and cycles longer than this indicate anestrous.
364. **b** Twins are the most likely reason for finding more than two limbs in the birth canal during a bovine dystocia. Though more than two limbs may be present within the birth canal with schistosomus reflexus, these occurrences are much rarer than twins. Transverse presentations are extremely rare. Calves with perosomus elumbus are usually single. Calves with amorphus globosa do not have limbs.
365. **a** These are very typical signs of fescue foot. Selenium toxicosis usually does not occur in animals on pasture, and affected animals have elevated tissue levels of selenium. Footrot usually affects individual animals, often in dry lots. Frostbite usually occurs in the cold months of the year, when the animals are not grazing.
366. **e** Adult dairy cows are very prone to develop hoof imperfections because of walking on concrete and other hard surfaces that allow entry of infectious agents and development of subsolar abscesses.
367. **a** Though all these organisms can cause bovine ocular lesions, *Moraxella bovis* is considered to be the cause of infectious bovine keratoconjunctivitis.
368. **d** Postcoital pyometra is rare with the other diseases listed.
369. **c** The first permanent incisor usually erupts at 18 months of age. Usually the second permanent incisor erupts at 24 months and the third permanent incisor erupts at 30 months of age.
370. **e** The average normal resting heart rate for an adult cow is 60 beats/min (range 40 to 80). The average resting heart rate for a young calf is 120 beats/min (range 100 to 140).
371. **b** The average normal resting respiratory rate in adult cows is 24 breaths/min (range 12 to 36).
372. **d** The average normal scrotal circumference for an 18-month-old Angus bull is 34 cm (range 31 to 36 cm). This is true for all of the European beef breeds (Angus, Hereford, Simmental, Charolais, etc.).
373. **e** The progesterone level in a milk sample from a cow with a mature, functional corpus luteum should be greater than 5 ng/ml. The progesterone level in the circulating plasma of the same cow should be 1 to 2 ng/ml. Because progesterone is fat soluble, it is concentrated in milk.
374. **c** A mature corpus luteum should be present during diestrus, usually on days 6 to 16 of the estrous cycle.
375. **b** Metestrual bleeding is observed in 5% to 10% of cycling cows on most farms.
376. **d** During proestrus the corpus luteum should be regressing and a new follicle should be developing.
377. **a** The bovine uterus is very turgid during estrus.
378. **d** The CAMP test is used to identify *S. agalactiae* and *Streptococcus uberis*.

379. **c** The rumen fluid pH typically ranges between 6 and 7 in animals fed mostly forage. It usually is 5.5 to 6.5 in animals fed mostly grain.
380. **d** The bovine placenta is cotyledonary. This is typical of ruminants. Mares and sows have a diffuse placenta, dogs and cats have a zonary placenta, and primates and rodents have a discoidal placenta.
381. **c** The bovine, equine, porcine, and ovine placenta is epitheliochorial. The placenta of dogs and cats is endotheliochorial, and the placenta of primates and rodents is hemochorial.
382. **a** The bovine diploid chromosome number is 60, equine is 64, donkey is 62, pig is 38, and sheep is 54.
383. **b** Of the conditions listed, hydramnios and hydrallantois are most common. Hydrallantois occurs approximately 10 times as often as hydramnios.
384. **a** A 30-day bovine amniotic vesicle is approximately pea sized (1 cm). It is about plum sized (2.5 to 3.0 cm) at 40 days, about 3.5 to 5.0 cm at 50 days, and 6 to 7.5 cm at 60 days.
385. **a** A 60-day bovine fetus is about mouse sized. A 90-day fetus is rat sized, a 120-day fetus is small-cat sized, and a 150-day fetus is large-cat sized.
386. **d** A placentome the size of a quarter near the cervix indicates 120 days of gestation. Placentomes are about dime sized (1 cm) at 90 days and half-dollar sized (3.5 cm) at 150 days.
387. **b** The testicles have normally migrated into the scrotum by the beginning of the fifth month of gestation in bovine fetuses.
388. **b** The fetal membrane slip can usually first be palpated at about 30 days of gestation. Before this time the membranes are too small to be palpated rectally.
389. **a** The bovine amniotic vesicle can usually be palpated between 28 and 50 days of gestation. Before this time it is too small and after this time it is too soft to be palpated rectally.
390. **e** Though detecting fremitus in the uterine artery is a good presumptive sign of pregnancy in cows, fremitus can be present in nonpregnant cows.
391. **e** Gonadotropin-releasing hormone causes release of both LH and follicle-stimulating hormone from the anterior pituitary gland.
392. **c** Gonadotropin-releasing hormone is the best treatment because of its efficacy, small molecular size (not likely to stimulate an immune response), and low cost.
393. **b** Parturition vaginal prolapse is considered to be hereditary. It also tends to recur.
394. **a** The site for epidural injection in young to middle-aged cattle is the sacrococcygeal articulation. In older animals this site is ossified, so the first intercoccygeal articulation is used.
395. **c** Trichomoniasis usually causes early embryonic loss and varying periods of infertility.
396. **d** The abdomens of cows with hydrallantois usually enlarge very rapidly. Cows with bloat usually do not continue to eat. The abdomens of cows with twins or hydramnios do not enlarge very rapidly. The abdomens of cows with uterine torsion usually do not enlarge more than for a normal pregnancy.
397. **b** The fertilized ovum remains in the oviduct for 3 to 4 days before rapidly moving into the uterus. This is important to know if you are doing ova transfer techniques.
398. **b** The half-life of oxytocin following injection is very short. It is also important to remember that epinephrine release caused by stress often blocks many of the desired effects of oxytocin.
399. **e** The primary reproductive effect of injecting prostaglandin is luteolysis. Some of the other choices listed occur secondary to this.
400. **c** You would expect 50% of the cows to respond, because each cow has a functional corpus luteum during about 50% of the estrous cycle. Therefore there is a 50% chance that each individual cow will have a corpus luteum on any given day and will respond to prostaglandin.
401. **c** Most cows with a mature, functional corpus luteum exhibit estrus 3 to 4 days after injection with prostaglandin.
402. **a** Ovulation occurs 10 to 14 hours after the end of estrus. In most other domestic species, ovulation occurs during estrus.
403. **d** The milk sample should be obtained on the 21st day after breeding. If the cow is not pregnant, she should be in estrus (normal estrous cycle is 18 to 24 days).
404. **c** At most dairies, many cows thought to be not cycling are actually cycling. Inadequate estrus detection is the number one reproductive problem at most dairies.
405. **c** Bovine virus diarrhea is a sporadic cause of abortion during the first 150 days of gestation. All the other choices listed cause abortion late in gestation in cattle.
406. **e** Most cases of hydrallantois are due to a dysfunctional placenta. Though the other answers listed are thought by some clinicians to cause hydrallantois, this has not been verified by reports in the literature.
407. **a** Several reports have demonstrated that inducing abortion with prostaglandin and delivering the calf vaginally results in better recovery rates than trying to drain the excessive placental fluid through a trocar or pipette. Cesarean section is not necessary and difficult to do because of the thinness of the uterine wall. Most packing companies will not accept cows with advanced hydrallantois.
408. **c** The normal presentation of the bovine fetus at birth is cranial longitudinal. Over 95% of all calves are born with the head and forelimbs presented first. Because of the shape of bovine uterus, transverse presentations are nearly impossible.
409. **d** The normal position of the bovine fetus at parturition is dorsal sacral. The dorsum of the calf is in apposition to the sacrum of the maternal pelvis.
410. **e** The bulbourethral glands cannot be palpated per rectum in normal bulls because they are deep to the pelvic urethra. If the pelvic urethra is greatly atrophied, the bulbourethral glands can be palpated.
411. **a** A tightly coiled tail is considered a primary sperm abnormality. All the other choices listed are considered secondary abnormalities.
412. **b** Distal protoplasmic droplets are considered a secondary sperm abnormality in bulls. All the other choices listed are primary abnormalities.
413. **b** Calving interval is the most encompassing measure of reproductive performance. However, it is the slowest to change and therefore is not a good indicator of short-term performance to use for decision making.
414. **b** A live fetus is necessary for glucocorticoids to cause abortion or premature birth.
415. **a** Acute enterotoxigenic colibacillosis usually occurs in calves under 5 days of age and rarely later. The onset is very rapid, and previously healthy calves can be in a state of collapse within 24 hours. The time of onset is helpful in determining the presumptive diagnosis.
416. **b** Enteric salmonellosis usually occurs in calves 2 to 6 weeks of age. The feces are foul smelling and usually contain blood and mucus.
417. **b** Diarrhea caused by rotavirus infection usually occurs in calves 1 to 2 weeks of age.
418. **e** Up to 80% of cows in which parturition is induced have a retained placenta. Induced calving may increase the length of postpartum anestrus and may increase the incidence of postpartum infections secondary to retained placenta. The calves are not weaker at birth unless the induction was done too early in gestation. The incidence of ovarian cysts is not affected by induced calving.
419. **e** The protein content of milk replacer should be at least 20%. The National Research Council recommends 22%. However, 20% is adequate if all of the protein ingredients are from milk sources.
420. **b** The fat content of milk replacers should be at least 10%. Higher levels usually give better results.
421. **e** Until the calf consumes cereal grains, vitamin E supplementation is required to prevent white muscle disease.
422. **b** The calcium to phosphorus ratio in the diets of dry cows should be 1.5:1. A ratio that is too narrow or too wide often precipitates milk fever at calving time.
423. **c** Dietary selenium deficiency may cause placental retention, downer cow syndrome, premature and weak calves, and sudden death in young calves.
424. **e** Vitamin K is essential to blood clotting.
425. **c** Though parturient paresis can occur at any time near parturition, it usually occurs within the first 24 hours following calving.
426. **b** Evaluation of the eating patterns of acetonemic cows is helpful in making a diagnosis. Affected cows usually refuse grain first and then silage. These cows usually continue to eat hay.
427. **a** Forced fetal extraction does not usually cause the downer cow syndrome. Most downer cows are not alert and exhibit systemic disease.

428. **a** Cows with grass tetany usually have low serum magnesium levels.
429. **d** The signs listed are most consistent with fat cow syndrome. It is significant that this cow weighs 1500 lb.
430. **c** Excessive salivation is usually caused by ingestion of parasitized red clover pasture or hay.
431. **e** The signs listed are most consistent with lead poisoning.
432. **d** Unless one sees a cow being struck by lightning, the most reliable method of diagnosis is a thorough necropsy.
433. **c** Infectious bovine rhinotracheitis can be manifested in a variety of forms: respiratory disease, conjunctivitis, genital tract infections and abortions, and central nervous system disease.
434. **a** All these signs are consistent with foot-and-mouth disease. Many of the signs are seen with vesicular stomatitis, bluetongue, IBR, malignant catarrhal fever, BVD, and rinderpest. Though the last reported case of foot and mouth disease in the United States was in 1929, veterinarians should be aware of the signs.
435. **d** All the other diseases listed commonly have signs that can be confused with the signs of rabies.
436. **a** Though some cows have a positive leukemia virus titer, only 5% to 10% of these actually develop clinical signs.
437. **c** Actinomycosis usually involves bone. Tuberculosis can be diagnosed using a tuberculin test. Caseous lymphadenitis occurs in sheep and goats. Ulcerative lymphangitis is an extremely rare disease involving the feet of cattle.
438. **d** A definitive diagnosis of listeriosis can only be made by isolating and identifying the causative organism. Usually there are no unique gross lesions seen at necropsy. There are no serologic tests for listeriosis, and the clinical signs are similar to those of many other neurologic diseases.
439. **b** Necropsies should not be done on animals with suspected anthrax because of contamination of the environment and unnecessary exposure of the people involved.
440. **a** Animals dying of blackleg should be disposed of very carefully because they are a source of the infective spores.
441. **a** Dyspnea of a strictly inspiratory nature is almost always a sign of upper airway disease.
442. **b** Necrotic laryngitis is the most common upper airway disease of calves in this age range.
443. **d** Bovine herpesvirus type 1 often causes an infection in which conjunctivitis is the most prominent clinical sign.
444. **b** Most outbreaks of infectious bovine rhinotracheitis are characterized by mild disease with high morbidity and low mortality.
445. **e** Increasing the humidity of the environment to above 70% would be detrimental to calves with pneumonia and would promote the spread of disease.
446. **b** The first cases of shipping fever bronchopneumonia usually occur 10 to 14 days after shipment.
447. **c** Pulmonary abscesses are common in the aftermath of shipping fever bronchopneumonia. The walled-off nature and poor blood flow to the center of the abscesses makes them resistant to antimicrobial therapy.
448. **b** In general, illness and debility decrease the rate of clearance of antimicrobial drugs from the body. Thus cattle that have been severely ill or that have received prolonged antimicrobial therapy or large doses of antimicrobials may need to be withheld from slaughter for periods longer than indicated on the labels of the drugs used.
449. **a** All the answer choices except squamous metaplasia of the tracheal epithelium are important effects of stress that predispose to pneumonia.
450. **d** Pneumonia usually develops first in the most dependent portion of the bovine lung, the accessory lobe, which is ventral and cranial on the right side.
451. **b** All the other signs listed are common signs of type I hypersensitivity in cattle.
452. **d** Because of the copious loss of saliva, which is rich in bicarbonate, cattle become acidotic and hemoconcentrated when the esophagus is obstructed.
453. **c** The described lesion clearly involves the subcutaneous tissues, whereas the lesions associated with the other choices would involve deeper structures.
454. **a** Cattle can become infected with bluetongue virus, but the infection is usually subclinical.
455. **b** There are many clinical manifestations of bovine virus diarrhea, but most infections are inapparent.
456. **b** Simultaneous infection with the cytopathic and noncytopathic biotypes of bovine virus diarrhea virus is thought to be the most common cause of mucosal disease.
457. **e** The early stages of bovine virus diarrhea are usually characterized by reduced numbers of circulating neutrophils and lymphocytes (panleukopenia).
458. **a** The packed cell volume of cattle with grain overload is usually increased because of a shift of water from the vascular compartment to the rumen.
459. **b** Isotonic sodium bicarbonate solution is a good first choice because most affected animals are acidotic.
460. **c** Such an animal would almost certainly be 10% to 15% dehydrated. Thus, 30 to 35 L solution would have to be administered just to overcome the fluid deficit.
461. **a** Severely dehydrated animals usually have concentrated urine with a specific gravity well above 1.009.
462. **d** Vagal indigestion is characterized by impaired passage of ingesta through the rumen, resulting in a chronic debilitating disease.
463. **a** After 3 days of age, calves are usually no longer susceptible to enterotoxigenic *E. coli* infection.
464. **b** Sodium and glucose are essential ingredients in promoting water absorption from the intestine of neonatal calves with diarrhea.
465. **a** Nearly all passively acquired antibodies are transferred via colostrum.
466. **c** Calves with diarrhea are usually acidotic as well as dehydrated, so treatment with an alkalinizing electrolyte solution, such as sodium bicarbonate, is important.
467. **e** Antibiotic therapy is not essential in treatment of diarrhea in neonatal calves.
468. **b** Ivermectin is the only choice listed that is effective against the arrested forms of *O. ostertagi*.
469. **c** Though liver abscesses are extremely common in cattle, they are most often inapparent.
470. **d** Grain overload is the usual precursor to liver abscesses in cattle.
471. **a** Most cattle with traumatic reticuloperitonitis and localized peritonitis do not have diarrhea, and in fact may have feces more dry than normal.
472. **e** Legume bloat, also called frothy bloat, is caused by formation of a stable foam in the rumen that prevents eructation.
473. **c** Squamous-cell carcinoma is the most likely cause of such a lesion in a cow of this description.
474. **a** The unilateral and developmental nature of this lesion makes lymphosarcoma the most likely possibility.
475. **c** *Eimeria* (coccidia) often causes clinical disease in cattle of this age group following environmental stress.
476. **e** Winter dysentery occurs as an explosive outbreak but usually is not a life-threatening disease in dairy herds during cold weather.
477. **c** Q fever is a rickettsial disease that is of public health significance. In general it causes no clinical signs in cattle, though occasional abortions may occur.
478. **d** There are no palpable lymph nodes at the thoracic inlet of a normal cow.
479. **a** Rapid open-mouth breathing with the neck extended is not a common sign of heart failure in cows, though the respiratory rate may be mildly elevated.
480. **a** Splashing fluid sounds are commonly heard on thoracic auscultation of cows with traumatic pericarditis, though muffled heart sounds are also common.
481. **b** Lymphosarcoma commonly involves the peripheral lymph nodes, right atrium, and spinal cord.
482. **c** Tachycardia, not bradycardia, is characteristic of gram-negative mastitis.
483. **e** Plasma fibrinogen concentrations become elevated as a result of a chronic inflammatory stimulus.
484. **a** A percutaneous needle biopsy specimen from the liver can be obtained through the right 10th intercostal space at the level of the greater trochanter.
485. **b** Intramammary antimicrobial therapy during the dry period is the most practical and effective treatment for *S. aureus* mastitis, though even then the cure rate is not high.

486. **d** Amyloidosis in cattle is characterized by severe hypoproteinemia accompanied by dependent edema, diarrhea, and frequent urination.
487. **b** Polioencephalomalacia causes cerebrocortical edema, usually accompanied by cortical blindness.
488. **d** Bracken fern poisoning in cattle is characterized by thrombocytopenia and petechial hemorrhage. Affected horses show peripheral neuropathy.
489. **a** These signs best describe lead poisoning.
490. **c** Epinephrine (1:1000 solution) administered intravenously at 1 ml/45 kg (1 ml/100 lb) is the treatment for acute anaphylaxis in cattle.
491. **e** Though a good indicator of hepatocellular damage in some species, serum alanine aminotransferase activity is not helpful in diagnosis of liver disease in cattle.
492. **b** Blackleg is most consistent with the described signs.
493. **c** Albendazole is the most effective of the listed anthelmintics against liver flukes in cattle.
494. **b** The listed signs best describe urethral blockage caused by urolithiasis.
495. **a** The California mastitis test is based on the presence of nucleic acids arising from nucleated cells in milk.
496. **c** Cows with abomasal volvulus are usually alkalotic and hypochloremic. They are frequently hypokalemic as well.
497. **d** After injection of a single 20-mg dose of dexamethasone, abortion of a late-term pregnancy is the untoward reaction most likely to occur in cows.
498. **a** Freshly cut corn silage, especially if heavily fertilized and drought damaged, is most likely to induce nitrate intoxication.
499. **d** Dermatophilosis (rain scald) is the most likely diagnosis given this description.
500. **d** Penicillin is a good choice because it is concentrated in urine, is effective against the most common organism causing pyelonephritis in cattle, is approved for use in food-producing animals, and is not nephrotoxic.
501. **c** This describes chorioptic mange.
502. **a** Hypoglycemia, rather than hyperglycemia, is characteristic of liver disease. This is especially true in ruminants because they are in a constant state of hepatic gluconeogenesis.
503. **b** Sulfonamides, such as sulfadimethoxine, are the only antimicrobials administered orally to ruminants at therapeutic dosages.
504. **b** This calf shows signs of upper motor neuron disease characteristic of a cervical cord lesion.
505. **d** Organophosphates would be expected to cause acute onset of the signs described.
506. **e** The signs and history described are typical of radial nerve paralysis. The prognosis is guarded, but some cows recover.
507. **a** Hypovitaminosis A causes increased cerebrospinal fluid pressure accompanied by papillary edema and at times central nervous system signs.
508. **e** Polioencephalomalacia is due to a functional or absolute thiamin deficiency and is treated by thiamin administration.
509. **a** The typical area of ping in cattle with abomasal volvulus with torsion is from the right ninth or 10th intercostal space, extending to the cranial portion of the paralumbar fossa at about the level of the greater trochanter.
510. **e** Administration of concentrated dextrose solutions is normally accompanied by spillover of glucose into the urine.
511. **d** These signs are typical of pyrrolizidine alkaloid toxicity due to consumption of *Senecio* or *Crotalaria*.
512. **b** Retinal lesions are common but not always present in cattle with thromboembolic meningoencephalitis.
513. **d** The appropriate prophylactic dose of selenium for a calf is 2 to 3 mg.
514. **e** Salmonellosis can cause fever and severe diarrhea with passage of blood in adult dairy cows.
515. **b** Most cows with milk fever have a slightly elevated heart rate, usually in the range of 70 to 90 beats/min and seldom over 100 beats/min.
516. **a** Endotoxemia from mastitis caused by gram-negative organisms frequently results in paresis that can resemble milk fever.
517. **a** D-Lactate from microbial metabolism in the rumen is usually responsible for the acidosis and increased anion gap in cattle with grain overload.
518. **c** The usual dosage of calcium for intravenous treatment of milk fever is 1 g/45 kg (1 g/100 lb). For an average-sized Holstein cow this would be 9 to 18 g.

519. **a** The rumen of cows with abomasal obstruction is usually only moderately full and contains comparatively liquid ingesta. Thus a firm, easily palpable mass of ingesta in the dorsal rumen is not consistent with complete or partial abomasal obstruction.
520. **b** Colostrum from unvaccinated dams is relatively ineffective in preventing all the listed diseases except septicemic colibacillosis.
521. **a** Atrial fibrillation is relatively common in cows, especially those with or recovering from diseases characterized by abnormal plasma electrolyte concentrations.
522. **c** Sequestering of hydrogen ions in the abomasum (via hydrochloric acid secretion) causes metabolic alkalosis.
523. **d** Tetanic spasms are not characteristic of white muscle disease.
524. **a** Normal rumen chloride levels are less than 30 mmol/L.
525. **d** The gas-distended abomasum is located on the left side, most often underlying the last three ribs. Percussion and auscultation in this area is most productive.
526. **d** Bacteria (*Fusobacterium necrophorum*) enter the portal venous system through the rumen wall when it has been damaged by rumenitis.
527. **a** The distended abomasum lies between the liver and the last two to three ribs on the right side.
528. **e** The blind end of the gas-distended cecum is usually located at the pelvic inlet.
529. **a** About 80% of foot lesions are found in the lateral claw of the rear feet.
530. **e** The other conditions listed have slower onset and a more chronic course and/or do not cause severe abdominal pain.
531. **d** Though left displacement of the abomasum may be found at other times, most cases occur during the first 4 to 6 weeks postpartum.
532. **c** A ping can be heard when the right paralumbar fossa is auscultated and percussed if there is dilatation or torsion of the cecum.
533. **a** Peritonitis is an anaerobic infection, and penicillin is an excellent choice for anaerobic infections.
534. **e** The Liptak test (paracentesis of the left abdomen to obtain digestive fluids) measures pH to indicate left displacement of the abomasum.
535. **d** Rumen distention is not observed with left displacement of the abomasum.
536. **c** In cattle with localized peritonitis associated with traumatic reticulitis, abrupt application of pressure to the xiphoid region of the cranial abdomen causes the animal to grunt or hold its breath.
537. **e** Benign bleeding ulcers most often occur in cows 2 to 5 years of age. Lymphosarcoma commonly affects the abomasal wall, causing ulcers in older cows.
538. **e** Lymphosarcoma can cause abomasal ulcers, but usually in older cows.
539. **b** Hemoptysis is the coughing up of blood or blood-stained sputum.
540. **a** A normal serum chloride level in cattle is 103 mEq/L.
541. **a** *Cryptosporidium* can infect humans and other species.
542. **c** There is no effective treatment for cryptosporidiosis. Supportive therapy, such as fluid administration, is the best choice if necessary.
543. **c** Calves can become infected with *Cryptosporidium* as early as 3 days of age.
544. **a** Finding oocysts in the feces does not indicate coccidiosis unless clinical signs are present.
545. **e** Furazolidone is not approved for use in food-producing animals.
546. **c** *E. coli* is the only organism listed that affects calves at this early age.
547. **c** Viruses cause villus atrophy, which causes malabsorption.
548. **b** Severe diarrhea causes metabolic acidosis.
549. **c** Oral and intravenous fluids for replacement therapy in calves with diarrhea usually include sodium bicarbonate.
550. **a** This calf is severely dehydrated and comatose, and acid-base imbalance and fluid and electrolyte deficits must be quickly corrected.
551. **a**  $44 \text{ kg} \times 0.12 \text{ L/kg} = 5.28 \text{ L}$ .
552. **d** The daily fluid maintenance requirement of calves is 50 ml/kg.  $50 \text{ ml/kg} \times 44 \text{ kg} = 2200 \text{ ml}$ .
553. **c** In young animals, extracellular water is estimated at 0.5 L/kg.  $44 \text{ kg} \times 0.5 \text{ L/kg} \times 20 \text{ mmol/L} = 440 \text{ mmol bicarbonate}$ .
554. **d** These are effective field tests for evaluating serum immunoglobulin levels.

555. **e** Colostral antibodies are absorbed from the intestine only for the first 24 hours of life, with peak absorption at 6 hours.
556. **a** Adherence factors, such as the K99 pilus antigen and capsule, allow adhesion of bacteria to the intestinal mucosa and colonization but are effective only for a few days.
557. **d** Two enterotoxins cause hypersecretion.
558. **b** Major whole-body losses of potassium, sodium, chloride, and bicarbonate occur during diarrhea.
559. **c** Marked leukopenia with a severe leftward shift is common with septicemic salmonellosis.
560. **d** Primary or foamy bloat produces foam that traps rumen gases normally produced by fermentation.
561. **e** A synergistic infection by *F. necrophorum* and *B. melaninogenicus* causes footrot.
562. **c** The cause is white muscle disease from selenium and/or vitamin E deficiency.
563. **a** Cattle with grain overload and toxic metritis and mastitis may develop acute aseptic laminitis.
564. **e** Chronic laminitis causes abnormal hoof growth, which may necessitate foot trimming at regular intervals.
565. **b** Gross changes in hoof conformation occur with chronic laminitis.
566. **a** The infection may enter via the digestive tract, but gastroenteritis is not characteristic of listeriosis.
567. **a** Unilateral facial paralysis is a common finding in cattle with listeriosis.
568. **b** Perivascular cuffing with mononuclear cells and varying degrees of focal necrosis are observed with *Listeria monocytogenes* infection.
569. **b** Polioencephalomalacia is usually associated with grain feeding and especially with sudden changes in the feed of young cattle.
570. **c** Polioencephalomalacia is caused by a thiamin deficiency in grain-fed young cattle.
571. **d** Focal or laminar areas of necrosis in the gray matter of the cerebral cortex may be seen grossly or microscopically with polioencephalomalacia.
572. **a** CSF pressure is often markedly elevated with polioencephalomalacia.
573. **b** Parenteral administration of thiamin is the usual treatment for polioencephalomalacia.
574. **a** Parenteral administration of Ca EDTA is a common treatment of lead poisoning in cattle.
575. **d** The total protein content of CSF is increased (>1.0 g/L) with bacterial meningitis.
576. **c** Blindness is a prominent sign of lead poisoning.
577. **d** Septicemia in neonatal calves is most frequently associated with *E. coli* diarrhea.
578. **e** The Pandy test measures CSF globulin concentration.
579. **d** CSF can usually be obtained by spinal puncture at the lumbosacral space.
580. **a** Young calves can become infected, but clinical signs usually require 2 to 6 years to develop.
581. **b** Clinical signs usually develop at 2 to 6 years of age. Heavily infected animals may occasionally show signs as early as 1 year of age.
582. **e** Lesions of the vagus nerve may disrupt digestive tract function and slow the heart rate.
583. **a** Persistent diarrhea, partially the result of decreased oncotic pressure, parallels the severity of hypoproteinemia.
584. **b** Atrial fibrillation may be associated with electrolyte imbalance in left displacement of the abomasum.
585. **c** *M. paratuberculosis* is the cause of Johne's disease (paratuberculosis).
586. **e** *Mycobacterium paratuberculosis* infects the ileum and proximal large intestine.
587. **d** Rumen fluid has a normal pH range of 5.5 to 7.0.
588. **c** The pathogenesis of caudal vena caval thrombosis is as follows: ruminitis → hepatic abscess → thrombophlebitis of caudal vena cava → thrombi into lung → hemoptysis.
589. **a** An L-shaped rumen is characteristic of vagus indigestion.
590. **e** Copper deficiency causes characteristic depigmentation of hair around the eyes.
591. **d** Selenium deficiency does not affect the digestive system.
592. **b** Aseptic laminitis commonly occurs in the early postpartum period in dairy cows.
593. **a** Chloride ions from hydrochloric acid secretion are sequestered in the abomasum, causing a low serum chloride level. Hypernatremia may result from severe dehydration. Hypokalemia is not a consistent finding.
594. **e** Serum alkaline phosphatase activity does not indicate muscle damage.
595. **e** Selenium-vitamin E deficiency affects other species and ages of animals.
596. **b** Ergotism from ingestion of *Claviceps purpurea* causes gangrene of the feet in cattle.
597. **a** Summer slump is caused by *Acremonium coenophialum*, a fungal endophyte of tall fescue.
598. **b** Leptospirosis is one of the few remaining diseases in which dihydrostreptomycin is effective.
599. **b** After intramammary administration of antibiotics, the milk from all four quarters must be discarded for the time indicated on the drug label, regardless of the number of quarters treated.
600. **a** Tetracyclines are bacteriostatic.
601. **b** Subclinical rumen acidosis is characterized by a high incidence of abomasal disease, indigestion, and laminitis.
602. **b** The rumen pH in animals with subclinical rumen acidosis usually is 5.0 to 5.5.
603. **a** During periods of subclinical rumen acidosis, the proportions of butyric and propionic acids in rumen fluid increase and acetate decreases.
604. **e** *Neospora caninum* is the only agent listed that causes midgestation abortion. The other agents cause abortion in the last trimester.
605. **d** Infection of a pregnant cow during days 40 to 125 of gestation results in a persistently infected calf.
606. **e** *Mycoplasma* causes severe clinical mastitis that is not responsive to antibiotic therapy.
607. **b** *S. agalactiae* is the only obligate udder pathogen listed.
608. **d** Most cases of mastitis caused by *E. coli* resolve spontaneously.
609. **c** *S. uberis* is an environmental pathogen that causes clinical and subclinical mastitis.
610. **a** *S. aureus* is a contagious pathogen that does not respond well to therapy during lactation.
611. **c** The history is consistent with nervous ketosis.
612. **c** Intravenous dextrose is indicated for ketosis.
613. **e** The history suggests that management of dry and recently fresh cows must be improved.
614. **a** Bovine herpesvirus-2 causes ulcerative lesions on the teats. The lesions of pseudocowpox are proliferative.
615. **d** Bulls infected with *T. fetus* are asymptomatic.
616. **d** *P. multocida* is generally sensitive to many broad-spectrum antibiotics.
617. **a** Cows with infectious bovine rhinotracheitis may show peripheral corneal edema, in contrast to the central corneal ulcers associated with *Moraxella bovis* infection.
618. **e** *P. hemolytica* has a nonpathogenic serotype 2 and a more virulent serotype 1.
619. **c** Infection with bovine respiratory syncytial virus generally has high morbidity and a low mortality. Affected animals may demonstrate subcutaneous emphysema.
620. **b** Bovine virus diarrhea is characterized by severe leukopenia and immunosuppression.
621. **b** *M. bovis* causes central corneal ulceration.
622. **c** Thromboembolic meningoencephalitis should be treated with antibiotics. Thiamin is the treatment for polioencephalomalacia.
623. **a** Total plasma protein levels below 5.5 g/dl indicate failure of passive transfer.
624. **d** *C. parvum* is not host specific and not an obligate parasite of calves. Infection is not prevented by adequate passive transfer of maternal antibodies and does not respond to antibiotics.
625. **a** Recessive homozygotes for bovine leukocyte adhesion deficiency are generally severely affected and die before 1 year of age.
626. **a** The other organisms listed may cause septicemia, but not as commonly as *E. coli*.
627. **d** Colostrum provides all of the passive antibodies for neonatal calves. Because of the type of placentation in cows, there is no transfer of maternal antibodies to the fetus in utero. Plasma could be collected from the dam and given to the calf, but this is not the most important or feasible source of passive antibodies.
628. **b** Although the other signs listed could be consistent with septicemia, antemortem confirmation of septicemia should be based upon blood culture.
629. **d** Answer *e* describes stage three milk fever; answer *b* describes ketosis.
630. **c** Cerebrospinal fluid levels of magnesium are most closely correlated with clinical signs. This is important because cows with normal serum levels of magnesium may still exhibit signs of hypomagnesemia because of slower

- equilibration of magnesium levels between blood and cerebrospinal fluid.
631. **b** The clinical signs described are most consistent with hypomagnesemic tetany. The description gives no evidence of lead or salt availability. These are beef cows, not dairy cows, so ketosis would be unlikely. A very commonly used commercially available treatment for hypomagnesemic tetany is a mixture of calcium borogluconate and magnesium hypophosphite.
632. **a** Anaplasmosis does not cause red urine because the hemolysis is due to sequestration and destruction of red cells in the spleen, rather than peripheral intravascular hemolysis.
633. **d** The CMT solution is a detergent, which breaks down the walls of somatic cells and creates a gel. The Babcock test quantifies milk fat.
634. **d** This time for absorption of colostrum antibodies has been firmly established by various investigators and veterinarians.
635. **a** In resting adult cattle, a heart rate above 90 beats/min is considered tachycardia.
636. **c** This test is used in cases of chronic bloat with concomitant bradycardia to determine whether the bloat is due to vagus nerve hyperactivity. The atropine blocks vagal influence on the heart, and the heart rate increases correspondingly.
637. **c** Bovine leukosis of the right atrium is usually manifested as right-sided heart failure. Valvular endocarditis is usually associated with a loud, pounding heart sound or less consistently a murmur. Pericardial transudation is rarely due to hypoproteinemia.
638. **a** Clients usually complain that "the cow is just not doing well."
639. **c** Loud, pounding heart sounds are characteristic of bacterial endocarditis.
640. **c** Oral fluids are not well absorbed when the gastrointestinal tract has reduced or abnormal motility. In cases of stasis, oral fluids can further distend the forestomachs and possibly lead to regurgitation.
641. **d** The other findings may occur in cases of traumatic reticuloperitonitis, but not with as great a frequency. By 72 hours after penetration, the affected area may become sequestered and the circulating neutrophil count may lower.
642. **b** There is no breed and sex predilection for Johne's disease. Colostrum does not confer protection against Johne's disease. All strains of *Mycobacterium paratuberculosis* can cause the disease. The effect of prior antimicrobial treatment has not been defined.
643. **e** All of the other tests listed are preliminary tests and have specificities and sensitivities that render them unacceptable as a confirmatory test in cattle.
644. **a** Leukemia is a usually fatal disease of the blood-forming tissues characterized by a marked leukocytosis, with enlargement and proliferation of lymphoid tissue. Leukosis is a proliferation of leukocyte-forming tissue. Persistent lymphocytosis is abnormally high numbers of lymphocytes in the blood and is a benign lymphoproliferative response. Lymphoma is any tumor made up of lymphoid material.
645. **c** Although all the other statements are correct, those features contribute little to development of atelectasis distal to obstructed small airways. Complete separation of the secondary lobules prevents collateral ventilation from other lung lobules.
646. **a** Abomasal displacement usually causes metabolic alkalosis. The other conditions listed may cause variable metabolic disturbances, depending upon the stage and severity of the disease.
647. **c** These are the most common and dependable of the signs of dehydration in cattle.
648. **a** Ringer's solution (not lactated) provides an excellent replacement source of chloride, which is depleted in animals with left abomasal displacement. The other solutions listed are variably alkalizing and thus contraindicated in left abomasal displacement, which causes metabolic alkalosis.
649. **b** Serum creatinine assay should be used to confirm renal disease in ruminants because a large excess of urea nitrogen can be eliminated through the saliva and the rumen mucosa.
650. **c** Vitamin E-selenium deficiency does not cause crepitation in the muscle groups. Exertional rhabdomyolysis is not likely to occur under the described conditions, and no mention was made of dark urine. *H. somnus* septicemia does not cause focal myositis with crepitation. Coliform myositis usually occurs as an isolated incident.
651. **d** The other diseases listed are not appropriate to the age of these pigs or their clinical signs.
652. **e** The other choices listed are unnecessary as initial diagnostic procedures.
653. **d** Coccidiosis and clostridial enterotoxemia do not affect pigs of this age. Transmissible gastroenteritis does not affect the large bowel. *S. choleraesuis* infection is not primarily a large-bowel disease.
654. **b** These events are characteristic of *Salmonella* enterocolitis.
655. **c** Medication of sow diets has little association with diarrhea in neonates.
656. **c** Proliferative adenomatosis occurs in older animals.
657. **c** Secretory diarrhea suggested by bicarbonate loss and the high fecal pH. This is associated with bacterial enterotoxin.
658. **d** There will be no significant isolates from the stomach. Fluorescent antibody tests cannot be done on formalin-fixed tissues. The other tissues listed are unnecessary. Large bowel is unaffected by most neonatal diarrheas and not a good tissue to select. Frozen samples are poor for bacterial isolation.
659. **a** Colibacillosis, swine dysentery, transmissible gastroenteritis, and rotavirus infection do not produce mucosal necrosis of small bowel in nursing piglets. Proliferative adenomatosis occurs in older animals.
660. **b** There is no vaccine to protect against coccidiosis or proliferative adenomatosis. *Salmonella* and *Serpula* vaccines are not often administered to sows.
661. **a** Pathogenic strains of *E. coli* adhere to the intestinal mucosa.
662. **c** The other diseases listed do not cause central nervous system lesions.
663. **d** Bacterial colonization is not involved, nor is *K. pneumoniae* endotoxemia serotype specific.
664. **a** Coliform bacteria are not sensitive to penicillin.
665. **b** Furazolidone cannot be used legally in food animals. The other drugs listed are not approved for use in this disease.
666. **b** Chronic forms of erysipelas are not prevented with vaccine and are not responsive to therapy. Endocarditis is a chronic sequela and may be due to other agents as well.
667. **a** It does not involve bone, and no therapy is effective.
668. **c** The recommended calcium to phosphorus ratio is from 1.2:1 to 1.5:1. It is not associated with any one breed. It is not related solely to calcium. It is rare in growing pigs.
669. **b** It can cause encephalitis, not meningitis. The other answers listed are not associated with salt.
670. **b** Fat levels never reach 12% in diets. No chronic form is recognized. The other choices listed are not associated with mulberry heart disease.
671. **d** The feces are black as a result of digestion of blood. The glandular portion of the stomach is unaffected. These ulcers are commonly asymptomatic. Anemia is due to blood loss and not iron deficiency.
672. **d** Concurrent use of antibiotics may prevent an immunologic response. The vaccine may be injected or given orally. Concurrent use of antiserum interferes with the response.
673. **b** Vaccinations given depend on diseases prevalent in the geographic area and on the history of the group of pigs in question.
674. **e** None of the other possible causes listed is likely to cause rectal prolapse in two pigs in a group.
675. **e** Injecting only 2 to 4 ml is insufficient. The anesthetic should be injected into the lumbosacral intervertebral space. Epinephrine is contraindicated.
676. **b** None of the other answer choices correctly delineates the area for epidural injection.
677. **a** The large artery dorsal to the rectum should be avoided during surgical repair.
678. **d** Postoperative rectal stricture is a possible sequela.
679. **d** The large litter and timing of these signs suggest starvation. Hypothermia is not associated with the other diseases listed.
680. **b** These piglets are too young to have atrophic rhinitis or *Mycoplasma*, *Pasteurella*, *Actinobacillus*, or ascarid infections.
681. **c** Porcine cytomegalovirus is most likely to affect this tissue.
682. **e** This is characteristic of cytomegalovirus infection.
683. **d** Clotting problems are not associated with eperythrozoonosis. Macrocytosis is due to rapid red blood cell replacement. Generally hemoglobin production is adequate.
684. **b** Fibrin is not present with *Salmonella* septicemia and aflatoxicosis. The piglet's age is not consistent with *M. hyosynoviae* infection.

685. **c** The other parasites listed do not cause blood in the stool.
686. **c** This finding is seen with pigweed (oxalate) toxicity.
687. **b** The other diseases listed cause a cellular response.
688. **a** The other parasites listed either are not associated with the lesion shown or cause relatively low economic losses.
689. **d** Zearalenone does not cause abortion.
690. **d** Infections with *E. coli*, coccidia, *Oesophagostomum*, or rotavirus are asymptomatic in adults. Coronavirus is likely involved, causing transmissible gastroenteritis.
691. **c** *Streptococcus suis* type II does not cause dermatitis. Lesions of the other diseases listed are not suppurative.
692. **d** The normal range is 70 to 150 ml in young boars and over 125 ml in mature boars.
693. **c** Prostaglandin does not induce luteinization until 12 or more days after ovulation.
694. **c** They have no effect on cyclic animals and are approved only for use in gilts.
695. **b** Gastric ulceration is commonly observed at necropsy and slaughter, often unaccompanied by clinical signs.
696. **e** Feed additives must be used only in accordance with label directions; any other use is a violation of the code of Federal Regulations.
697. **b** Only the specific gene-deleted test can identify these sows as vaccinated and not infected.
698. **c** Microcytic hypochromic anemia is typical of iron deficiency.
699. **c** The history, age of affected pigs, and interstitial pneumonia are typical of this syndrome.
700. **d** The primary purpose of exhaust fans is to remove water-laden air.
701. **b** *E. coli* produces an endotoxin that causes secretory diarrhea and water loss. Absorption is not impaired.
702. **b** Trauma accounts for 20% of all preweaning mortality. All infectious diseases together account for another 20%, with gastrointestinal disease representing 10%.
703. **c** Most rhinitis is due to *Bordetella bronchiseptica* and dermonecrotic *Pasteurella multocida*. These organisms are not invasive but they produce toxins that are absorbed and exert an effect on developing bone and other tissues.
704. **a** Immunocompetence develops at 70 days of gestation, though in the absence of antigenic stimulation in utero (the normal case) piglets are born without antibody.
705. **c** There is no transfer of antibody across the placenta. The other methods listed do not produce passive immunity.
706. **b** Maintenance of pregnancy is totally dependent on an intact corpus luteum in the ovaries. Death of the fetuses without placentitis and resultant prostaglandin release does not cause abortion. Corticosteroids are relatively ineffective in inducing abortion in pigs.
707. **e** *M. hyopneumoniae* is the primary agent of mycoplasmal pneumonia. It destroys cilia on respiratory tract mucosa and is immunosuppressive, allowing secondary bacterial invasion.
708. **d** The ear canal is the preferred site for scraping the skin in search of sarcoptic mange mites.
709. **d** Paratyphoid nodules in the liver are clusters of histiocytes amid foci of acute coagulative hepatocellular necrosis caused by salmonellae.
710. **c** The signs described are typical of *E. coli* infections. Coccidiosis produces visible gut lesions and does not occur until 5 days of age. Rotavirus infections cause villus atrophy and are less common at 1 day of age. Overnutrition is unlikely at 1 day of age and in piglets nursing naturally (as opposed to those given milk replacer). Cold per se does not cause scours, but it does reduce piglet resistance.
711. **a** The primary viral diseases listed are not responsive to antimicrobial treatment. There is no effective treatment for coccidiosis or clostridial infection. Colibacillosis generally responds to antibacterial treatment.
712. **e** Swine dysentery and whipworms affect the large intestine. Lesions of salmonellosis and edema disease are seen throughout the gastrointestinal tract.
713. **c** Greasy pig disease causes mortality of 20% to 80%.
714. **b** There is not sufficient time for sows to develop an immune response. Antiserum would have to be given continuously.
715. **d** *Isospora* oocysts in the environment are the major source of infection in nursing pigs.
716. **e** Pigs become infected with *S. typhimurium* by contact with infected pigs and infectious excretions.
717. **a** Bovine rotavirus is not pathogenic in pigs.
718. **a** Coughing is not a sign of rhinitis. Sneezing may be due to many other causes (dust, ammonia, cytomegalovirus, pseudorabies). Because there is a large seasonal impact on the severity of rhinitis lesions, comparisons should only be made between the same seasons each year.
719. **b** *H. parasuis* causes Glasser's disease.
720. **d** These pigs are too young for edema disease, porcine stress syndrome, listeriosis, and Glasser's disease. Thiamin deficiency is not a problem in pigs.
721. **e** These are characteristic of swine influenza.
722. **c** None of the other skin diseases listed causes pruritus.
723. **c** Dermatitis vegetans is invariably fatal. The other choices listed cause varying degrees of mortality.
724. **a** Streptococcal arthritis is most likely to cause joint swelling.
725. **c** These are common with proliferative enteritis.
726. **e** Selenium deficiency is most likely to cause the signs described.
727. **d** It is likely that the water supply was shut off to deworm the pigs and then not turned back on (dry floor).
728. **b** If serotyping is to be done, it should be performed on the isolated bacteria, not on samples from the pigs.
729. **b** Inappropriate management (housing, environment, nutrition, scheduling) produces conditions under which the prevalence of disease increases.
730. **a** Coccidiosis usually occurs at 5 days of age, responds poorly to treatment, and results in many unthrifty pigs. Maternal immunity is not protective (sow vs gilt). Wire floors improve sanitation and reduce the prevalence of disease.
731. **e** Pigs recovering from salmonellosis may develop rectal strictures.
732. **c** Milk spots (lesions of ascarid infection) are large and fibrotic, not necrotic. Fluke infection and contagious hepatitis do not occur in pigs. Selenium deficiency is associated with liver hemorrhage.
733. **e** TGE virus cross-reacts with porcine corona respiratory virus and can confuse serologic diagnosis of TGE.
734. **d** IgA is the major immunoglobulin found in sow's milk.
735. **a** Humans cannot contract pseudorabies from infected pigs.
736. **c** Before embryo implantation at day 13 to 15, the effect of embryonic death is similar to that seen with no fertilized ova.
737. **e** Each week the farmer must achieve pregnancy in two gilts to replace the two culled sows. About 50% to 60% of gilts are cycling by 6 to 7 months of age. In gilts conception rates are about 60% to 70%. Gilts remain in heat only 1 day.
738. **b** Except for observation of return to heat (21 days), none of the procedures is accurate before 30 days.
739. **a** Parvovirus typically moves slowly through the uterus, infecting and killing piglets without causing placentitis, prostaglandin release, luteolysis, or abortion. The other conditions listed would affect the entire litter at the same time (stage of development).
740. **b** Swine dysentery and *Trichuris* infection involve the large intestine. The pars esophagea is in the stomach. Salmonellosis is not associated with massive hemorrhage.
741. **b** Clostridial enteritis is predominantly a disease of unweaned pigs.
742. **e** Anemia and inadequate oxygen-carrying capacity occur in young pigs. The other diseases listed affect older pigs.
743. **e** The other conditions listed require time to develop.
744. **e** Swine dysentery, vitamin D deficiency, organophosphate toxicity, and mycoplasmal pneumonia do not have a peracute onset, so affected pigs would be symptomatic before death.
745. **d** Only *E. suis* causes lysis of red blood cells and consequent icterus.
746. **e** The cause of porcine proliferative enteritis is not known, but *Campylobacter* is often associated with lesions. Therefore typical microscopic lesions are the only method of confirmation.
747. **c** All the other gases listed are odorless.
748. **e** *S. typhimurium* infection is primarily an enteric disease whereas *S. choleraesuis* infection is a serious, potentially devastating, systemic disease of swine.
749. **c** Dichlorvos is an organophosphate.

750. **e** The worm burden would be low but not nonexistent in this environment. Deworming sows before farrowing would minimize exposure of their offspring.
751. **b** Sensitivity is the probability of detecting a positive animal. Specificity is the probability of detecting a known negative. In this herd of 100 pigs, there are 90 true negative and 10 true positive animals (10% prevalence). Of the 10 true positives, nine will be detected as positive (90% sensitivity with one false negative) and 72 of the true negatives will be detected (80% specificity, 18 false positives), for a total of 27 positives.
752. **a** Sensitivity is the probability of detecting a true positive. Specificity is the probability of detecting a known negative. A test with less than 100% specificity yields false positives, and a test with less than 100% sensitivity yields false negatives.
753. **c** Skatole is responsible for 80% of sex odor and androsterone for 20%.
754. **e** Hairballs form in pigs that ingest quantities of hair, usually during floor feeding (typical practice with older animals), and may produce metabolic imbalances through vomiting, irritation of the gastric mucosa, and ulceration.
755. **d** Transmissible gastroenteritis virus can survive for up to a year at -4 F. *S. hyodysenteriae* can survive for 2 months in lagoon waste. *P. multocida* can survive for a few weeks, porcine parvovirus for several months and *Actinobacillus* for only a few days if protected by mucus or other organic material.
756. **d** This painful skin condition causes pigs to walk gingerly. They may arch their backs suddenly and then sink to the ground on their briskets.
757. **a** Second-parity females usually produce 0.5 pig per litter more than first-parity sows. However, in highly productive F1 lines of sows that are bred young and not fed adequately in gestation/lactation, body condition drops so that at weaning the sow is in a negative energy balance and ovulates fewer eggs.
758. **b** For every day before 28 days that a sow's litter is weaned, subsequent litter size drops by 0.05 pigs. With early weaning the uterus has had inadequate time to recover from the previous pregnancy. First-parity sows are not affected because they have not previously weaned a litter.
759. **e** Litter size is proportionately reduced in all parities.
760. **c** An increase in mummies and decrease in live-born pigs in gilt litters are typical manifestations of enzootic parvoviral infection.
761. **a** In swine, prostaglandins have no effect on the developing corpus luteum until day 12 of the estrous cycle. Therefore, by the time they are effective, the normal chain of events to initiate the next estrus is about to occur naturally. After day 12 of gestation, prostaglandins lyse the corpus luteum and produce abortion/ parturition.
762. **b** Gravity and reduction in air speed cause airborne particles to drop out of inspired air into the cranioventral lobes of the lung.
763. **a** *E. suis* is frequently transmitted from the prepuce of the boar to the vestibule of the sow at mating. Under some conditions, *E. suis* survives to ascend the urethra and invade the bladder, resulting in cystitis.
764. **d** Endotoxin suppresses synthesis of prolactin, which is an absolute requirement for lactation.
765. **a** Septic polyarthritis produces lameness from birth to 4 weeks, *M. hyorhinis* infection from 10 to 30 weeks, rickets from 8 weeks and later, epiphyseal separation from 15 weeks and later, and acute erysipelas from 4 to 10 weeks.
766. **c** The proximal duodenum is usually unaffected and provides a good tissue for comparison of villi in the jejunum and ileum. Chronically infected herds would be expected to have less severe lesions because of partial immunity.
767. **d** Vaccinated pigs can still become infected with live virus, but development of latent carriers and shedding are minimized. Tests are available to differentiate antibodies to field virus and gene-deleted vaccines.
768. **c** These signs are typically seen early in an outbreak of hog cholera. Ammonia at this low level and zearalenone mycotoxicosis do not make pigs sick. These signs are not typical of cytomegalovirus infection and clostridial enteritis, and these diseases usually affect much younger pigs.
769. **e** Infection with *P. multocida* requires compromise of the nasal mucosa to effectively colonize that tissue, such as damage caused by primary *B. bronchiseptica* infection or exposure to irritating gases.
770. **b** There is no vaccine for tuberculosis in swine. Because most swine tuberculosis is of the avian type, milk is not the most likely source of the organisms.
771. **c** Swine dysentery could occur but is not likely in pigs consuming carbadox. Clostridial enteritis is not likely in pigs of this age. Carbadox is not an ionophore. *B. coli* infection is asymptomatic.
772. **e** Sows normally have bacteria in their milk (>20,000 colony-forming units/ml milk) and somatic cell counts over 4,000,000 cells/ml milk. Starvation may be due to other factors, such as poor pen design and chilling.
773. **b** Sows do not develop immunity to coliform mastitis, even after natural infection. Tylosin is not very effective against most coliforms and is poorly absorbed orally.
774. **b** Slow growth rules out the acute diseases listed. Hog cholera does not affect joints. Noninfectious bone disease should not produce a purulent (cloudy) reaction in synovial fluid.
775. **e** Creatine kinase originating from muscle would confound the results. Blood levels of calcium and phosphorus are maintained at the expense of other stores in the body. Eosinophils are not a reliable indicator of mild parasitism.
776. **d** Ivermectin is approved in the injectable and pour-on forms for other species, but only in the oral form for sheep.
777. **b** Albendazole is approved for use in sheep, but it may cause fetal anomalies. It is not recommended for use during the first month of pregnancy. Ivermectin and thiabendazole are safe for use during early pregnancy.
778. **a** The other organisms listed either are uncommon in sheep or do not cause chronic wasting in adults.
779. **d** Animals with copper toxicity should be treated with 50 to 100 mg ammonium molybdate and 0.5 to 0.10 g sodium sulfate daily.
780. **a** Addition of ammonium chloride at the rate of 2% of concentrate ration helps prevent urolithiasis.
781. **b** Follicular conjunctivitis is an acute contagious disease characterized by conjunctival hyperemia and corneal opacity. It is caused by a chlamydial organism related to the cause of polyarthritis.
782. **d** Goiter is much more likely to be seen in stillborn fetuses and young lambs than in yearlings and older sheep.
783. **c** Feedlot lambs 3 to 5 months of age and nursing lambs 1 to 3 months old have the highest incidence of clinical coccidiosis. It is not seen in lambs less than 2 weeks of age.
784. **c** Addition of lasalocid to the feed helps control coccidiosis and improves feed efficiency.
785. **e** Commercial vaccines are available in the United States for all these diseases except coccidiosis.
786. **b** Bovine leukemia virus is a lentivirus, but it does not infect sheep.
787. **e** Contagious ecthyma (orf) is zoonotic. The vaccine is live and can infect humans when handled carelessly. The vaccines for the other diseases listed are killed products.
788. **d** Reduced intake of dietary molybdenum increases susceptibility to copper toxicity.
789. **a** Carrier ewes harbor *Campylobacter* organisms in the gastrointestinal tract and contaminate the premises, allowing oral infection of susceptible ewes.
790. **e** The center incisors erupt at 12 months of age, with the more lateral three pairs of incisors erupting sequentially, one pair per year, until all four pairs have erupted at 4 years of age.
791. **d** Animals with the genotype QQ at the 171 position appear to be much more susceptible to scrapie than animals with the genotype QR or RR.
792. **a** The condition commonly called hard bag by producers is a chronic, indurative mastitis attributable to ovine progressive pneumonia virus.
793. **a** Pneumonia losses in newborn lambs are primarily caused by *P. haemolytica*. *Pasteurella multocida* is often a factor in chronic pneumonia of older lambs.
794. **c** Although they are the classic lesions of campylobacteriosis, these lesions are only observed in 10% to 30% of lambs aborted from this disease.
795. **a** The placentas from animals aborting from toxoplasmosis commonly exhibit white, granular lesions on the cotyledons. The other diseases listed do not initiate these lesions.
796. **d** Two or more of the described lesions are usually observed in feedlot lambs dying from enterotoxemia.
797. **d** Bo-Se (Schering Plough Laboratories, Kenilworth, N.J.), a vitamin E-selenium combination, is now labeled as being contraindicated in pregnant ewes.



798. **e** Q fever, caused by *Coxiella burnetii*, is usually asymptomatic in sheep, although it may cause occasional abortions. In people it may cause severe flulike symptoms and sometimes fatal hepatitis.
799. **b** Teaser rams introduced 3 weeks before the breeding season provide a degree of estrus synchronization and stimulate greater fertility early in the breeding season.
800. **e** In pregnancy toxemia, rapid fat catabolism causes accumulation of lipids, with a resultant fatty liver.
801. **e** Oral propylene glycol is a source of quick energy and helps correct the negative energy balance that causes pregnancy toxemia.
802. **a** *P. haemolytica* and *Staphylococcus aureus* are the predominant organisms in severe acute clinical mastitis. Either organism can cause gangrenous mastitis.
803. **c** This common parasite inhabits the abomasum and feeds by sucking blood, causing severe anemia.
804. **d** Phenothiazine was widely used as an ovine and bovine anthelmintic before the 1960s.
805. **a** Most outbreaks of listeriosis are associated with poor-quality ensilage that has been prepared from plants contaminated with soil carrying large numbers of *Listeria* organisms.
806. **e** The other diseases listed can cause abortion in sheep.
807. **d** Polioencephalomalacia is a metabolic disease. The other diseases listed can be transmitted from sheep to humans.
808. **c** Two inoculations of *C. perfringens* types C and D toxoid, administered to pregnant ewes 2 to 4 weeks before lambing, stimulate secretion of colostral antibodies sufficient to protect newborn lambs.
809. **a** White muscle disease may exist at birth or develop at 2 to 4 weeks of age; it occurs less commonly up to 3 months of age.
810. **c** Any feedstuff rich in carbohydrate, such as corn, can cause lactic acidosis. Soybeans, urea, and other common protein sources are more likely to cause ruminal alkalosis.
811. **d** Polioencephalomalacia is thought to be caused by a deficiency of metabolizable thiamin. Signs may completely resolve after treatment if cerebral damage is not extensive.
812. **a** In animals that have died from ovine progressive pneumonia, both lungs are uniformly gray and firm and do not collapse when the thorax is opened.
813. **d** In almost all cases of pseudorabies in sheep, there has been opportunity for exposure to swine. Some cases have occurred following inadvertent use of modified-live virus swine vaccine.
814. **e** Cattle are a principal reservoir of bluetongue virus; the virus can be isolated from many clinically normal cattle.
815. **b** Up to 20% of lambs from ewes infected with bluetongue virus between weeks 4 and 8 of pregnancy show developmental defects.
816. **c** The scab mites infecting sheep include psoroptic, sarcoptic, psorergotic, chorioptic, and demodectic mites.
817. **a** In North America, the only known vector in transmission of bluetongue virus is a gnat, *Culicoides varipennis*.
818. **c** Scrapie occurs in both black-faced and white-faced breeds of sheep, but the Suffolk breed has the highest incidence.
819. **d** *M. ovinus*, often referred to by owners as the sheep tick, is actually a wingless fly.
820. **e** The parents of spider lambs are phenotypically normal. Mating programs using carrier animals result in the expected numbers of affected lambs.
821. **a** Rectal prolapse commonly occurs in animals from weaning to 12 months of age. An increased incidence may be associated with a variety of factors, the most consistent of which is chronic coughing.
822. **a** *T. gondii* and *Sarcocystis* are important pathogens of sheep. Both require an intermediate host.
823. **b** Because of their relatively greater density, fluke eggs do not float in common flotation solutions. Solutions with a heavier specific gravity effect may cause fluke eggs to collapse.
824. **e** Ivermectin is effective against all the parasites listed except the liver fluke, *F. hepatica*.
825. **c** The life cycle may vary depending on the species of *Eimeria* involved; for pathogenic species it takes 3 to 4 weeks.
826. **a** The greatest losses from *B. ovis* infection can be attributed to poor semen quality, with resultant poor conception.
827. **d** A multivalent commercial *Campylobacter* vaccine is recommended for use at the time of breeding. There are no commercial vaccines intended to prevent abortions from the other listed diseases in sheep.
828. **c** Toxoplasmosis is mild or asymptomatic in nonpregnant animals and so is usually undiagnosed.
829. **c** The incidence of *Brucella ovis* infection is high, and the effect on flock fertility justifies testing of breeding rams. Some states have regulations requiring testing of rams imported from other states.
830. **b** A  $\beta$ -toxin produced by *C. perfringens* type C causes hemorrhagic enterocolitis and sudden death, characteristic of neonatal hemorrhagic enterotoxemia.
831. **a** Albendazole is currently approved for sheep and is effective in treating sheep with liver flukes.
832. **b** The cyclopiation malformation, or monkey face syndrome, occurs in lambs from ewes that have ingested *Veratrum californicum* on the fourteenth day of pregnancy.
833. **e** As adults, lambs from ewes exposed to border disease virus during the first half of pregnancy give birth to lambs that are often not immunocompetent and are likely to display the hairy shaker syndrome characteristic of cerebellar hypoplasia. Some lambs may be aborted.
834. **d** Most pneumonia in young lambs is associated with overcrowding and high environmental humidity. Young lambs can tolerate cold temperatures better than high humidity. There are no pneumonia vaccines for sheep.
835. **e** Control of footrot is assisted by use of commercial vaccines. These are best used in infected flocks along with other control practices, not as a substitute for these practices.
836. **e** Phenothiazine and its urinary metabolites can stain wool.
837. **c** Ivermectin is effective against a wide range of parasites, including most benzimidazole-resistant nematodes, *O. ovis*, and itch mites.
838. **a** Albendazole is the only currently approved anthelmintic with activity against nematodes, *Moniezia*, and flukes.
839. **b** Levamisole acts rapidly by affecting the cholinergic receptor sites of worms. Benzimidazoles inhibit polymerization of parasitic tubulin. Ivermectin activity involves blocking the neuronal transmitter,  $\gamma$ -aminobutyric acid.
840. **d** Thiabendazole is a very safe anthelmintic that initially had a broad spectrum of anthelmintic activity against gastrointestinal nematodes. The main limitation to its use today is the problem of widespread resistance of parasites, especially of *H. contortus*.
841. **d** Diarrhea is not a part of this syndrome.
842. **d** Rangeland goats have a lower prevalence, presumably because of reduced exposure.
843. **e** Kids typically become infected by ingesting infectious colostrum and milk.
844. **a** This would prevent exposure of uninfected animals to the greatest degree because the primary mode of transmission is through contaminated colostrum and milk.
845. **b** The lower temperature does not denature immunoglobulins, whereas the longer time is sufficient to destroy infectious organisms.
846. **c** It is difficult to manufacture vaccines against lentiviruses.
847. **a** *Mycoplasma* infection does not commonly cause diarrhea.
848. **e** Currently there is no effective treatment for this condition.
849. **c** Bluetongue virus does not cause clinical signs in goats.
850. **d** *Campylobacter* rarely causes abortion in goats. Brucellosis is rare in goats in the United States.
851. **d** Toxoplasmosis does not typically cause chronic weight loss.
852. **e** Caseous lymphadenitis is caused by *C. pseudotuberculosis*.
853. **a** Though goiter occurs in goats, enlarged thymic glands are commonly misdiagnosed as goiter in young Nubians.
854. **b** The animal should be isolated and the lesions lanced and flushed.
855. **c** *M. conjunctivae* is a common cause of pinkeye in goats.
856. **a** Herds are not routinely vaccinated against contagious ecthyma unless it is enzootic in the herd.
857. **c** Goat milk typically contains more somatic cells than cow milk.

858. **c** Angoras are nutritionally stressed throughout most of their lives.
859. **b** This is a typical pattern at the onset of the breeding season.
860. **d** Goats usually begin cycling normally as the season progresses.
861. **d** It does not cause early udder development in young does.
862. **c** Removal of the retained corpus luteum allows the uterus to empty its contents and recover.
863. **a** This ensures that the offspring will be at least heterozygous for the horned gene, which should prevent the intersex condition.
864. **a** Intersex goats are genetic females but may exhibit male, female, or mixed phenotypes.
865. **a** This causes hemolysis and therefore anemia without hypoproteinemia. The other choices all cause loss of whole blood.
866. **b** Affected goats may have glucose in their urine.
867. **e** Johne's disease is not evident clinically until after 1 year of age in goats. Coccidiosis is a possibility if the history of getting into the food room is of no significance.
868. **e** Seropositivity is common, but clinical disease in goats is not.
869. **b** Unlike cattle, affected goats do not develop diarrhea.
870. **e** This is a common cause of subclinical mastitis in goats.
871. **d** These findings describe udder impetigo.
872. **a** This doe is most likely hypocalcemic.
873. **d** The dose in answer *e* (250 ml) is too much for a goat.
874. **a** Goats with pregnancy toxemia may pass ketones in their urine.
875. **b** The corpus luteum of pregnancy secretes progesterone to maintain the pregnancy.
876. **c** Dexamethasone is effective in goats, but results are not as predictable as with prostaglandin.
877. **b** These signs are typical of pregnancy toxemia.
878. **e** Antimicrobials are not indicated for this metabolic disease.
879. **a** Intersex goats are usually of XX genotype.
880. **e** All the other answer choices might be observed in intersex goats that are phenotypically male.
881. **a** The teats of intersex goats that are phenotypically female are not hypoplastic.
882. **c** Goats are primarily unaffected carriers, though abortion can occur. The agent causes pneumonia-like symptoms in humans.
883. **d** Kids are usually weaned during the time of anestrus for does, but this alone does not initiate cyclic activity in does.
884. **b** Urinary estrone sulfate levels are used to diagnose pregnancy in goats.
885. **a** The most common clinical sign is meningoencephalitis, though abortion can occur.
886. **d** *B. melitensis* causes brucellosis in goats.
887. **e** Birth of dead or premature kids with a scant haircoat and goiter is typical of dietary iodine deficiency.
888. **c** Copper deficiency causes ataxia in young kids.
889. **a** These findings are typical of mycoplasmosis.
890. **a** Tylosin is used in treatment of mycoplasmosis.
891. **c** No vaccine is commercially available.
892. **e** Toxoplasmosis causes cotyledonary placentitis only.
893. **c** Use of large doses of monensin is risky because of monensin's low margin of safety.
894. **b** The other findings indicate presumptive diagnoses but are not conclusive.
895. **b** Mannosides do not accumulate in the blood, but in tissues of the central nervous system.
896. **b** The scrotal diameter of bucks is smaller than that of rams.
897. **c** This is probably related to decreased volume of ejaculates, not to increased sperm production.
898. **a** Sperm granuloma can cause sterility in bucks.
899. **e** Ultrasonography is most accurate in diagnosing pregnancy at 45 to 100 days of gestation.
900. **c** Elevated transketolase activity in erythrocytes is associated with decreased levels of thiamin.

## 7

## Neurology

M.O. Smith

## Recommended Reading

- Braund KG: *Clinical syndromes in veterinary neurology*, ed 2, St. Louis, 1994, Mosby.
- de Lahunta A: *Veterinary neuroanatomy and clinical neurology*, ed 2, Philadelphia, 1983, WB Saunders.
- Mayhew IG: *Large animal neurology*, Baltimore, 1989, Williams & Wilkins.
- Oliver JE, Lorenz MD: *Handbook of veterinary neurologic diagnosis*, Philadelphia, 1983, WB Saunders.

Practice answer sheet is on page 289.

## Questions

1. You collect cerebrospinal fluid from the lumbosacral space of a cow. Results of analysis are as follows:

Gross appearance	Clear, colorless
Total protein	92 mg/dl
Total red blood cell count	6 cells/ $\mu$ l
Total nucleated cell count	44 cells/ $\mu$ l
Differential count	
Bands	19%
Polymorphonuclear neutrophils	44%
Lymphocytes	7%
Monocytes	30%

What is the most accurate interpretation of these data?

- a. normal bovine cerebrospinal fluid
- b. normal total protein content, increased nucleated cell count, and normal differential count
- c. increased total protein content, abnormal nucleated cell count, and abnormal differential count
- d. increased total protein content, increased nucleated cell count, and normal differential count
- e. increased total protein content and nucleated cell count due to blood contamination
2. By what mechanism does the exotoxin of *Clostridium botulinum* causes neurologic disease?
- a. blocks acetylcholine release at the neuromuscular junction
- b. blocks the acetylcholine receptor on the surface of the muscle cell membrane
- c. blocks spread of the action potential within the myofiber
- d. blocks the action of acetylcholinesterase
- e. blocks spread of the action potential into the nerve terminal

3. Which horse breed is affected by congenital cerebellar hypoplasia?
- Peruvian Paso
  - saddlebred
  - Andalusian
  - Arabian
  - quarter horse
4. Which of the following best describes the characteristics of cerebrospinal fluid from horses with equine herpesvirus-1 myeloencephalitis?
- normal total protein content and nucleated cell numbers
  - high total protein content and normal nucleated cell numbers
  - high total protein content and mononuclear pleocytosis
  - high total protein content and neutrophilic pleocytosis
  - high total protein content and mixed pleocytosis, including numerous eosinophils
5. A 3-week-old filly is found recumbent in the stall with her dam. She is bright and alert, but unable to rise. You note the following on neurologic examination: paraplegia; moderately increased patellar, gastrocnemius, and cranial tibial reflexes; and crossed extensor reflex present in the hind limbs when the filly is recumbent. When the filly is supported, forelimb function appears normal. The remainder of the neurologic examination is normal. What is the most likely location of the lesion causing these findings?
- medulla oblongata
  - spinal cord segments C1-C5
  - spinal cord segments C6-T2
  - spinal cord segments T3-L3
  - spinal cord segments L4-S3
6. A 16-year-old quarter horse gelding is presented one day after acute onset of a head tilt. On neurologic examination you note the following: head tilt to the right, horizontal nystagmus with the fast phase to the left, tendency to circle and lean to the right, right facial muscle weakness, decreased sensitivity on the right side of the face, tongue pulled to the left side, and conscious proprioceptive and placing deficits in right forelimb and hind limb. What is the most likely location of the lesion causing these findings?
- right middle and inner ear
  - left middle and inner ear
  - right medulla oblongata
  - left medulla oblongata
  - right cerebral hemisphere
7. Which test is most suitable for specific diagnosis of neurologic disease caused by equine protozoal myeloencephalopathy?
- a single positive serum titer
  - a single positive serum titer with a positive cerebrospinal fluid titer
  - rising titer on paired serum samples collected 2 weeks apart
  - electromyography
  - biopsy of atrophied muscles
8. How are the viruses of eastern and western equine encephalitis transmitted to horses?
- via airborne droplets
  - via fomites, such as water buckets and feeding troughs
  - via insect vectors
  - via contact with bodily secretions and excretions from carrier horses
  - vertically, by in utero transmission
9. One week ago, three steers in a feedlot were bitten by a dog that has since died. The brain of the dog was tested for the presence of rabies virus and was positive. What is the most appropriate course of action?
- Isolate the steers for 10 days and then return them to the feedlot if they remain healthy.
  - Isolate the steers for 3 months and then return them to the feedlot if they remain healthy.
  - Isolate the steers for 6 months and then return them to the feedlot if they remain healthy.
  - Treat the steers with a course of antirabies immunoglobulin.
  - Slaughter all three steers because of the potential health hazard to humans.
10. The epidemiology of thromboembolic meningoencephalitis in cattle, caused by *Haemophilus somnus*, is most accurately described as:
- high seroprevalence, low morbidity, and low mortality
  - high seroprevalence, high morbidity, and low mortality
  - high seroprevalence, high morbidity, and high mortality
  - low seroprevalence, high morbidity, and high mortality
  - low seroprevalence, low morbidity, and low mortality
11. Which clinicopathologic abnormality is diagnostic for thiamin deficiency in cattle?
- increased serum alkaline phosphatase activity
  - decreased serum lactate dehydrogenase activity
  - decreased erythrocyte transketolase activity
  - increased serum lactate dehydrogenase activity
  - increased erythrocyte transketolase activity
12. What is the causative agent of scrapie in sheep?
- a vertically transmitted virus
  - an agent comprised of protein with little or no nucleic acid
  - a horizontally transmitted virus
  - a mycoplasma
  - a protozoan
13. An adult goat exhibits dull mentation, circling to the left, blindness in the right eye with a normal pupillary light reflex, and decreased conscious proprioception in right forelimb and hind limb. The remainder of the neurologic examination is normal. What is the most likely location of the lesion causing these findings?
- right optic nerve
  - right cerebral hemisphere
  - right medulla oblongata
  - left medulla oblongata
  - left cerebral hemisphere
14. Which region of the equine central nervous system is affected by poisoning from ingestion of yellow star thistle (*Centaurea solstitialis*)?
- cerebral cortex
  - basal nuclei
  - cerebellum
  - midbrain
  - caudal brain stem
15. You are called to examine a group of feeder pigs that have been without water for 24 hours due to a break in the water pipe to the building in which they are housed. Several of the animals are dull and ataxic. You suspect "salt poisoning." What is the most appropriate course of action?
- Allow access to copious fresh drinking water to correct hypernatremia.
  - Administer intravenous 5% dextrose solution.
  - Administer intravenous mannitol and furosemide.
  - Allow access to small amounts of drinking water frequently.
  - Order slaughter of all affected animals.

16. One day after two quarter horse geldings collided violently while galloping around a field, one of the two is presented to you with the following signs: dragging the left forelimb toe, inability to fully protract the left forelimb, and "dropped" left elbow. Tactile sensation on the cranial aspect of the pastern appears to be diminished. What is the most likely cause of these findings?
- left brachial plexus avulsion
  - left suprascapular nerve injury
  - left radial nerve injury
  - left axillary nerve injury
  - left ulnar nerve injury
17. What is the spinal origin of the sciatic nerve?
- L3, L4, L5, and L6
  - L4, L5, L6, and L7
  - L5, L6, L7, and S1
  - L6, L7, S1, and S2
  - L7, S1, S2, and S3
18. The tetanospasmin toxin of *Clostridium tetani* acts by:
- competitively inhibiting acetylcholine at synapses in the central nervous system
  - inhibiting release of glycine and  $\gamma$ -aminobutyric acid (GABA) from inhibitory interneurons in the spinal cord
  - stimulating activity of  $\gamma$ -motor neurons in the ventral horn gray matter of the spinal cord
  - competitively inhibiting acetylcholine at neuromuscular junctions
  - blocking release of acetylcholine at neuromuscular junctions
19. Which horse breed is affected by congenital deafness?
- American paint
  - Arabian
  - Friesian
  - Thoroughbred
  - Tennessee walker
20. Which of the following is most appropriate for long-term management of hyperkalemic periodic paralysis in horses?
- avoidance of high-potassium feeds, regular exercise, and treatment with acetazolamide
  - potassium supplementation, regular exercise, and treatment with furosemide
  - potassium supplementation and stall rest
  - avoidance of high-potassium feeds, stall rest, and treatment with glucocorticoids
  - stall rest and treatment with glucocorticoids and furosemide
21. Concerning stringhalt in horses, which statement is most accurate?
- Pathologic changes are worst in the proximal segments of the peripheral nerves.
  - The disease is characterized by an acute inflammatory neuropathy.
  - The pathologic change is primary demyelination without axonal loss.
  - Motor neuron cell bodies within the ventral horn gray matter of the spinal cord undergo ischemic necrosis.
  - Axonal degeneration is frequently found in the recurrent laryngeal nerve, as well as in nerves to the limbs.
22. You are called to examine a feedlot steer that has developed the following signs over the previous 3 days: left head tilt and head deviation, facial drooping on the left side, tongue pulled to the right side, and limb weakness on the left side. The steers are being fed silage. What is the most likely cause of these findings?
- listeriosis
  - hypomagnesemia
  - thiamin deficiency
  - lead poisoning
  - hypocalcemia
23. What are the predominant clinical signs of equine herpesvirus-1 infection in llamas and alpacas?
- deafness and peripheral vestibular disease
  - blindness and encephalitis
  - peripheral neuropathy and muscle atrophy
  - meningitis and transverse myelopathy
  - cauda equina neuritis and urinary incontinence
24. What type of motor innervation maintains tone in the internal sphincter of the urinary bladder?
- muscarinic via the pelvic nerve
  - $\alpha$ -adrenergic via the hypogastric nerve
  - somatic via the pelvic nerve
  - nicotinic via the pelvic nerve
  - $\beta$ -adrenergic via the hypogastric nerve
25. What is the underlying defect in myotonia?
- inability of myofibers to depolarize
  - tendency for myofibers to depolarize repeatedly
  - reduced acetylcholinesterase activity
  - repeated release of acetylcholine from the nerve terminal in response to a single nerve action potential
  - tendency for myofibers to hyperpolarize

## Answers

- c** Normal bovine cerebrospinal fluid has total protein  $\leq 50$  mg/dl and nucleated cell count  $\leq 5$  cells/ $\mu$ l. The normal differential count should include predominantly mononuclear cells and should never include band neutrophils. The minimal amount of blood contamination in this sample (indicated by 6 red blood cells/ $\mu$ l) does not account for the abnormalities present.
- a** The toxin of *Clostridium botulinum* is thought to interfere with calcium entry into the distal nerve terminal, thereby blocking acetylcholine release.
- d** Cerebellar hypoplasia is a congenital disorder of Arabians.
- b** Equine herpesvirus-1 myeloencephalitis is an immune-mediated vasculitis that damages the blood-brain barrier, leading to an elevated cerebrospinal fluid protein content without pleocytosis.
- d** The head and forelimbs are normal; therefore, the lesion is caudal to T2. Increased myotactic reflexes and a crossed extensor reflex in the hind limbs when the animal is recumbent indicate an upper motor neuron lesion, cranial to L4. Thus the lesion is located at T3-L3.
- c** The head tilt, leaning, and circling are toward the side of the lesion. The fast phase of nystagmus is away from the side of the lesion. Proprioceptive deficits indicate central vestibular disease and are on the same side as the lesion. Cranial nerves V, VII, and XII are affected on the same side as the lesion. The tongue is pulled away from the side of the lesion because the normal tone on the side opposite to the lesion is unopposed.
- b** A positive cerebrospinal fluid titer is diagnostic for equine protozoal myeloencephalitis. A positive serum titer alone indicates only exposure. It is not necessary to observe a rising cerebrospinal fluid titer.
- c** The togaviruses that cause the equine encephalitides are transmitted to horses from mammalian and avian intermediate hosts by a variety of insect vectors, including certain mosquitos and ticks.
- e** Animals exposed to rabies virus present a serious hazard to human and animal health; they should therefore be slaughtered. The comparatively low economic value of the steers does not warrant the expense and risks associated with isolating them for 6 months (c). Postexposure vaccination (d) is expensive and of limited efficacy unless carried out immediately after the animal is bitten.
- a** Seroprevalence of *Haemophilus somnus* is 25% to 100% in affected herds. The incidence of thromboembolic meningoencephalitis is less than 10%. Most affected animals survive.
- c** Thiamin is essential for normal erythrocyte transketolase activity; activity of this enzyme is decreased in thiamin deficiency.

12. **b** The causative agent of scrapie in sheep is an agent called a *prion*, which is believed to be an aberrant form of a protein that occurs normally in the brain.
13. **e** A left cerebral hemisphere lesion is indicated by circling toward the side of the lesion (ipsiversive circling), with postural reaction deficits and cortical blindness (blindness with normal pupillary light reflexes) on the side opposite the lesion.
14. **b** In horses, ingestion of yellow star thistle causes encephalomalacia of the substantia nigra and globus pallidus, which are the basal nuclei (basal ganglia).
15. **d** When the suspected problem is hypernatremia, frequent small doses of water given per os may result in recovery, although the prognosis is guarded. Large volumes of water per os or intravenous fluid therapy can cause cerebral edema, cerebrocortical necrosis, worsening of signs, and possible death. Mannitol and furosemide are diuretics that could worsen hypernatremia.
16. **c** The motor innervation to the extensors of the elbow and carpus and the sensory innervation to the cranial aspect of the distal forelimb are derived from the radial nerve.
17. **d** The sciatic nerve originates in spinal cord segments L6, L7, S1, and S2.
18. **b** Tetanospasmin blocks activity of inhibitory interneurons in the spinal cord by blocking release of the neurotransmitters glycine and GABA.
19. **a** Congenital deafness has been reported in American paints and may be similar to the congenital deafness that occurs in many dog breeds with a white or merle coat color.
20. **a** Hyperkalemic periodic paralysis is a congenital disorder in which intermittent hyperkalemia results in muscle dysfunction. Reducing dietary potassium and allowing regular exercise both tend to decrease the incidence of hyperkalemic episodes. Acetazolamide has been reported to be beneficial in some cases.
21. **e** Axonal degeneration is frequently found in the recurrent laryngeal nerve, as well as in nerves of the limbs.
22. **a** Listeriosis is frequently associated with the feeding of silage and predominantly causes signs of brain stem dysfunction, such as vestibular signs and dysfunction of cranial nerves V, VI, VII, VIII, and IX. The other diseases listed predominantly cause signs of cerebral disease, such as seizures and changes in mentation and behavior.
23. **b** Equine herpesvirus-1 infection in llamas produces ocular lesions (hemorrhagic chorioretinitis, vitritis, and optic neuritis) and encephalitis (hemorrhage, edema, nonsuppurative meningitis, and encephalitis with perivascular mononuclear cuffing).
24. **b** Tone in the internal sphincter of the urinary bladder is maintained by sympathetic  $\alpha$ -adrenergic innervation from the hypogastric nerve.
25. **b** Myotonia is believed to be caused by an abnormality in the myofiber membrane, possibly involving chloride channels, that results in repetitive depolarization of the myofiber in response to acetylcholine release at the neuromuscular junction.

## NOTES

# 8

## Ophthalmology

M.B. Glaze

### Recommended Reading

- Gelatt KN: *Veterinary ophthalmology*, ed 2, Baltimore, 1991, Williams & Wilkins.
- Roberts SM: *Ophthalmology. Vet Clin North Am Equine Pract* 8(3):427-668, 1992.
- Severin GA: *Severin's veterinary ophthalmology notes*, ed 3, Fort Collins, Colo, 1996, Veterinary Ophthalmology Notes.
- Smith BP: *Large animal internal medicine*, ed 2, St. Louis, 1996, Mosby.

Practice answer sheet is on page 291.

### Questions

- Which cattle breed is most often affected with ocular squamous-cell carcinoma?
  - Hereford
  - Charolais
  - Holstein
  - Simmental
  - Brahman
- Which organism causes a rapidly progressive, "melting" ulcer, with liquefaction of the corneal stroma?
  - Staphylococcus*
  - Streptococcus*
  - Pseudomonas*
  - Corynebacterium*
  - Pasteurella*
- Which organism is most commonly isolated in horses with fungal keratitis?
  - Phycomyces*
  - Aspergillus*
  - Fusarium*
  - Mucor*
  - Alternaria*
- What is the most common cause of infectious keratoconjunctivitis in goats?
  - Chlamydia*
  - Moraxella*
  - Listeria*
  - Mycoplasma*
  - herpesvirus

5. Which systemic antibacterial is recommended for treatment of infectious bovine keratoconjunctivitis (pink eye)?
- gentamicin
  - ceftiofur
  - chloramphenicol
  - oxytetracycline
  - neomycin
6. In cattle, small white plaques on the conjunctiva are characteristic of:
- infectious bovine rhinotracheitis
  - malignant catarrhal fever
  - infectious bovine keratoconjunctivitis
  - listeriosis
  - tuberculosis
7. What is the most common tumor of the equine adnexa?
- squamous-cell carcinoma
  - fibrosarcoma
  - hemangiosarcoma
  - sarcoid
  - melanoma
8. What is the most common site of ocular squamous-cell carcinoma in cattle?
- upper eyelid
  - lower eyelid
  - nictitating membrane
  - cornea/limbus
  - medial canthus
9. What is the etiologic agent of infectious bovine keratoconjunctivitis (IBK, or pink eye)?
- Branhamella catarrhalis*
  - Mycoplasma bovis*
  - influenza virus type A<sub>2</sub>
  - Moraxella bovis*
  - Haemophilus somnus*
10. The most common congenital abnormality of the equine nasolacrimal system is absence of the:
- nasal punctum
  - upper lacrimal punctum
  - lower lacrimal punctum
  - upper canaliculus
  - lacrimal sac
11. In horses, which nerve block is used to paralyze the orbicularis muscle of the eyelids?
- auriculopalpebral
  - frontal
  - zygomatic
  - infratrochlear
  - lacrimal
12. In horses, 30 to 40 small retinal blood vessels arise from the periphery of the optic disc and extend 1 to 1.5 disc diameters into the surrounding fundus. Which term describes this retinal vascular pattern?
- holangiomatic
  - paurangiomatic
  - anangiomatic
  - subangiomatic
  - merangiomatic
13. In which species does the ocular fundus normally have no tapetum?
- horses
  - cattle
  - sheep
  - goats
  - pigs
14. To which equine ocular problem does the term moon blindness refer?
- cataracts
  - optic nerve hypoplasia
  - recurrent uveitis
  - glaucoma
  - stationary night blindness
15. Which parasite has been incriminated in the pathogenesis of moon blindness?
- Onchocerca cervicalis*
  - Strongylus vulgaris*
  - Habronema muscae*
  - Anoplocephala perfoliata*
  - Parascaris equorum*
16. Which disorder results in multiple ocular anomalies in prenatally infected cattle?
- bovine virus diarrhea (BVD)
  - infectious bovine rhinotracheitis
  - listeriosis
  - infectious keratoconjunctivitis
  - malignant catarrhal fever
17. What is the most common cause of cataracts in horses?
- chronic uveitis
  - genetic predisposition
  - nutritional deficiency
  - trauma
  - senility
18. In which horse breed is stationary night blindness an inherited trait?
- Morgan
  - Appaloosa
  - quarter horse
  - thoroughbred
  - Arabian
19. A dietary deficiency of which vitamin causes night blindness in cattle?
- vitamin A
  - vitamin B<sub>12</sub>
  - vitamin C
  - vitamin D
  - vitamin E
20. What is the most common cause of glaucoma in horses?
- an inherited iridocorneal angle deformity
  - lens luxation
  - trauma
  - chronic uveitis
  - intraocular neoplasia
21. Which disorder is most likely to cause bilateral, progressive exophthalmos in cattle?
- bluetongue
  - malignant catarrhal fever
  - lymphosarcoma
  - infectious bovine rhinotracheitis (IBR)
  - bovine virus diarrhea (BVD)
22. In cattle, which surgical technique is recommended for treatment of advanced ocular squamous-cell carcinoma with orbital involvement?
- evisceration
  - exenteration
  - transpalpebral enucleation
  - transconjunctival enucleation
  - orbital imbrication
23. The circular, black masses normally found along the upper and lower edges of the pupil in herbivores are called:
- iridal cysts
  - Mittendorf's dots
  - granula iridica
  - Koeppe nodules
  - iris collarettes

**Questions 24 and 25**

A 5-year-old Arabian gelding has a rapidly developing ulcerative lesion of the right medial canthus. Several small, yellowish, caseated particles are scattered across the lesion's surface. Cytologic examination of a surface scraping reveals numerous eosinophils and an occasional mast cell.

24. What is the most likely cause of this problem?
- squamous-cell carcinoma
  - sarcoid
  - mast-cell tumor
  - habronemiasis
  - onchocerciasis

25. What is the treatment of choice for this problem?

- a. cryosurgery
- b. intralesional cisplatin

- c. intralesional sterile water
- d. oral ivermectin
- e. topical dexamethasone

## Answers

1. **a** The common practice of maintaining Herefords on range land and their strong genetic trait for a white face account for this breed's frequent involvement.
2. **c** Proteoglycanolytic enzymes produced by *Pseudomonas* cause progressive stromal damage, which can lead to perforation in 24 to 48 hours.
3. **b** *Aspergillus* is most commonly isolated, but the other fungi listed have also been recovered from equine ulcers. Topical miconazole is an effective, broad-spectrum antifungal with good penetrability and reasonable cost. Natamycin is the only antifungal approved for ocular use but is prohibitively expensive.
4. **d** All of the agents listed produce keratoconjunctivitis in at least one large animal species, but only *Mycoplasma* is of clinical significance in goats. *Chlamydia* is an important pathogen in sheep. *Listeria* affects sheep and cattle. *Moraxella* is primarily a cattle pathogen.
5. **d** Two or three intramuscular injections of long-acting oxytetracycline, given 72 hours apart, are effective in resolving clinical signs and may also help eliminate carriers.
6. **a** The absence of corneal ulceration and the peripheral rather than central distribution of corneal lesions in infectious bovine rhinotracheitis help to differentiate it from infectious bovine keratoconjunctivitis. The infectious bovine rhinotracheitis plaques are foci of mononuclear cells within the conjunctiva.
7. **a** Squamous-cell carcinoma is the most prevalent ocular neoplasm of horses. Sarcoïd is the second most prevalent ocular tumor but is the most common tumor of equine skin.
8. **d** The cornea/limbus is affected in 60% of patients, the lower eyelid in 27%, the upper eyelid in 10%, and the nictitans in 7%. Orbital involvement is due to local extension from one of the primary sites.
9. **d** *Branhamella* is a gram-negative diplococcus similar to *Moraxella*, which causes conjunctivitis but rarely keratitis. *Mycoplasma* may predispose to IBK. *Haemophilus* causes predominantly retinal hemorrhage and exudation. Influenza virus infects horses.
10. **a** Nasolacrimal maldevelopment typically involves defects in the distal portion of the system. Treatment consists of incising the skin over the imperforate area and inserting an indwelling catheter.
11. **a** The auriculopalpebral branch of the facial nerve supplies motor innervation to the orbicularis oculi. The other nerves are sensory.
12. **b** In the paurangiotic retina, blood vessels are limited to the area immediately surrounding the optic disc. Ruminants and pigs have a holangiotic pattern, providing a blood supply to the entire retinal surface.
13. **e** Without a tapetum, the porcine fundus appears dark gray. Ruminants and horses have a fibrous tapetum that varies in color from gold to blue-green.
14. **c** Early horsemen believed that recurrent episodes of uveal inflammation were related to phases of the moon. Laymen continue to use the term.
15. **a** Keratoconjunctivitis and uveitis are associated with the local presence of *Onchocerca* microfilariae, most often in the temporal perilimbal conjunctiva and cornea.
16. **a** BVD infection in the first trimester of gestation causes cataracts, retinal dysplasia, and optic nerve hypoplasia.
17. **a** Recurrent inflammation alters lens metabolism to cause generalized cataract development and predisposes toward synechia formation, with cataract development at the adhesion site.
18. **b** The problem is congenital and nonprogressive, with a recessive mode proposed for the Appaloosa. Ophthalmoscopically, the fundus appears normal.
19. **a** Congenital deficiency of vitamin A causes optic nerve hypoplasia. Papilledema is seen in cattle less than 2 years of age due to nerve compression following abnormal sphenoid bone development and thickening of the dura mater, with secondary increases in cerebrospinal fluid pressure.

20. **d** Due to an unconventional uveoscleral outflow tract, horses are relatively resistant to intraocular pressure increases but can develop glaucoma following chronic inflammatory insult. Primary glaucoma is relatively uncommon in horses.
21. **c** Lymphosarcoma is the most common orbital tumor in cattle. Bluetongue causes conjunctivitis. Malignant catarrhal fever causes keratoconjunctivitis, uveitis, and retinal vasculitis. IBR causes keratoconjunctivitis and occasionally uveitis. BVD causes multiple ocular anomalies following prenatal infection.
22. **b** Exenteration refers to removal of the entire orbital contents. Evisceration removes only the intraocular tissues. Enucleation removes the globe and typically the third eyelid. Orbital imbrication is not a valid surgical procedure.
23. **c** Granula iridica (formerly corpora nigra) are extensions of the posterior pigmented iridal epithelium and are thought to augment pupillary

- constriction. Iridal cysts are free-floating cystic structures. Mittendorf's dots are opacities of the posterior lens capsule related to the embryonic hyaloid artery. Koeppel nodules are accumulations of inflammatory cells at the pupillary margin. The iris collarette is the demarcation between the central and peripheral regions of the anterior iris.
24. **d** The location of the ulcerative lesion, the presence of caseous particles, and the presence of eosinophils in the scraping are typical of habronemiasis. Ulcerative lid lesions may also occur with squamous-cell carcinoma and sarcoïd. Leukoderma is a breed-related cutaneous depigmentation syndrome in Arabians 6 to 24 months of age. Onchocerciasis typically spares the eyelid.
  25. **d** Following a single oral dose of ivermectin (0.2 mg/kg body weight), lesions begin to regress in 1 week and are usually healed by 4 to 6 weeks after treatment.

## NOTES

## NOTES

## 9

# Preventive Medicine and Food Hygiene

P.C. Bartlett, G.T. Woods

### Recommended Reading

- Acha PN, Szyfres B: *Zoonoses and communicable diseases common to man and animals*, Washington, DC, 1987, Pan American Health Organization.
- Hubbert WT et al: *Food safety and quality assurance: foods of animal origin*, ed 2, Ames, Iowa, 1996, Iowa State University Press.
- Martin SW et al: *Veterinary epidemiology: principles and methods*, Ames, Iowa, 1987, Iowa State University Press.
- Smith RD: *Veterinary clinical epidemiology*, Boston, 1991, Butterworth-Heinemann.
- Thrusfield M: *Veterinary epidemiology*, ed 2, Ames, Iowa, 1996, Iowa State University Press.

Practice answer sheet is on page 293.

### Questions

P.C. Bartlett

1. *Antemortem inspection is necessary in livestock presented for slaughter because:*
  - a. without antemortem inspection there is no way to determine the nutritional state of the slaughtered animal
  - b. certain diseases are manifested in the live animal but show no gross lesions on necropsy
  - c. antemortem inspection allows inspection personnel to collect specimens (blood, urine, biopsy) from questionable animals to allow for more specific diagnoses
  - d. it is required by certain religious groups
  - e. proper animal identification is needed before slaughter
2. *Traditionally, antemortem inspection is:*
  - a. performed on the day of slaughter
  - b. only performed by registered veterinarians
  - c. performed by packing plant employees on 50% of the animals
  - d. only performed on animals with apparent illness
  - e. performed by plant employees on all animals



3. A cow in good physical condition is presented for slaughter. As you examine the cow, you note that the left eye appears to have been removed, with the eyelid sutured shut. What is the most appropriate course of action?
- If the animal is otherwise normal, classify it as "suspect" and reexamine it after slaughter.
  - Condemn it on antemortem inspection because it probably had ocular squamous-cell carcinoma.
  - Release it for slaughter with the regular stock.
  - Send it back to its point of origin because one-eyed animals cannot be admitted for slaughter.
  - No special handling is needed.
4. Concerning tuberculosis (TB) reactor cattle, which statement is most accurate?
- As a minimum, if they pass postmortem inspection, they must be "passed for cooking only."
  - TB reactor cattle cannot be used for human consumption.
  - If TB reactors pass postmortem inspection, there are no restrictions on the product.
  - When they are presented for slaughter, you should call U.S. Department of Agriculture and follow their instructions.
  - There are no TB reactor cattle in the United States because this disease has been eradicated.
5. At postmortem inspection of a cow with ocular squamous-cell carcinoma, you find that the mass involves the eye and there is a single neoplastic lesion in the parotid lymph node on the same side of the head. All other tissues are normal. What is the most appropriate course of action?
- Remove the involved tissue and pass the remainder unrestricted.
  - Condemn the carcass and parts.
  - Condemn the head and pass the remainder for cooking only.
  - Submit samples to the laboratory and make a decision based on their findings.
  - Pass the entire carcass.
6. Your postmortem inspector asks you about a hog carcass with an abscess in one of the mandibular lymph nodes, polycystic kidneys, and kidney worms in the perirenal fat. There are no other gross lesions. What is the most appropriate course of action?
- Condemn the carcass and parts.
  - Remove the involved tissues and pass the remainder unrestricted.
  - Remove the involved tissues and pass the remainder for cooking only.
  - Submit samples to the laboratory and make a decision based on their results.
  - Pass the entire carcass.
7. Your postmortem inspector asks you about a beef carcass with dark red to black discoloration of the gluteal muscles on the left hindquarter. You examine the carcass and determine that the animal had "blackleg." There are no other apparent lesions. What is the most appropriate course of action?
- Condemn the carcass.
  - Remove the involved tissues and pass the remainder unrestricted.
  - Remove the involved tissues and pass the remainder for cooking only.
  - Submit samples to the laboratory and make a decision based on their results.
  - Pass the entire carcass.
8. You examine a hog carcass with moderately severe lesions of tuberculosis (TB) in the mesenteric lymph nodes. You find no other lesions of TB, but there is a purulent abscess in the right shoulder. All other tissues are unremarkable. What is the most appropriate course of action?
- Condemn the carcass and parts.
  - Remove the involved tissues and pass the remainder unrestricted.
  - Remove the involved tissues and pass the remainder for cooking only.
  - Submit samples to the laboratory and make a decision based on their results.
  - Pass the entire carcass.
9. A disease cluster is defined as:
- numerous cases of a particular disease that occur within a specific geographic area within a certain period
  - an acute outbreak of disease with an identifiable cause
  - several distinct diseases that naturally occur together in the same animal or person
  - numerous cases of disease that have been traced to the same common source
  - numerous cases of disease that are epidemiologically associated with a common risk factor
10. Outbreaks of chronic, noninfectious disease can be difficult to investigate because:
- they have a short incubation period
  - affected subjects cite different sources as the cause of disease
  - affected subjects have usually been exposed to multiple predisposing causes
  - specific diagnostic tests are often not available
  - affected animals or people often die of other, unrelated causes and disease may never be diagnosed
11. Complete cooking of food just before it is eaten by people can prevent all of the following food-borne diseases **except**:
- Campylobacter jejuni* infection
  - Salmonella enteritidis* serotype typhemurium infection
  - Listeria monocytogenes* infection
  - Staphylococcus aureus* intoxication
  - Salmonella anatum* infection
12. Which of the following accurately lists **all** of the quality tests legally required on an individual farm's milk supply before it can be sold commercially?
- total bacterial count, somatic cell count, drug residue, and cooling temperature
  - total bacterial count, somatic cell count, and drug residue
  - total bacterial count and somatic cell count
  - total bacterial count and drug residue
  - none because tests are required on truckloads of milk from several farms, not on milk from an individual farm
13. *Staphylococcus aureus* food intoxication in people is most likely to occur from:
- consumption of poultry contaminated on the farm or at slaughter
  - contamination of raw meat products in the slaughterhouse
  - a cook's sneezing into the food during preparation
  - inclusion of raw milk products in food
  - contamination from infected pets
14. If most poultry sold in supermarkets is contaminated by *Campylobacter* and/or *Salmonella*, why are people who regularly eat poultry **not** continually ill?
- These species do not cause human illness.
  - Chilling or freezing usually inactivates the bacteria.
  - Only small numbers of these bacteria are usually present.
  - The bacteria are normally killed by irradiation.
  - These bacteria are only rarely found on raw poultry in the United States.
15. What possible impact could result from the presence of antibiotic residues in milk consumed by people?
- chemical dependence
  - sterile bowel syndrome in some people
  - more cases of salmonellosis in people
  - decrease in the body's immune defenses
  - decrease in natural nutrients present in milk

16. In the United States what method is recommended for detecting tuberculosis in cattle herds?
- saliva test
  - thoracic radiography
  - culture of pooled fecal samples
  - intradermal tuberculin test
  - conjunctival tuberculin test
17. You diagnose and confirm salmonellosis in 60% of the steers in a large feedlot. You suspect that the source of infection may be the feed. Which ingredient in the ration is most likely to be contaminated with *Salmonella* organisms?
- alfalfa leaf meal
  - ground corn
  - soybean meal
  - bone meal
  - trace mineral mix
18. Concerning anthrax in animals, which statement is **least** accurate?
- It is most prevalent in suburban areas.
  - It may be seasonal in occurrence.
  - It may require annual vaccination for prevention.
  - It may be spread by contaminated feed.
  - It may be spread by eating infected carcasses.
19. Concerning management of a case of anthrax in an animal, what is the most appropriate course of action?
- Do not report the disease to state or federal animal disease authorities by telephone, as that would lead to panic.
  - Always do a complete necropsy if you suspect anthrax.
  - Vaccinate all food animals within a 2-mile radius against anthrax.
  - Promptly notify the rendering company to pick up the carcass.
  - Burn the carcass as soon as possible after diagnosis.
20. You learn that the health department has recently confirmed St. Louis encephalitis in eight local human residents. Coincidentally, you remember that you recently examined several horses with signs of acute encephalitis. What is the most appropriate course of action?
- Obtain blood samples from several sick horses and submit them to a laboratory for antibody testing for the St. Louis encephalitis virus.
  - Alert local health department officials that you have observed horses with signs of St. Louis encephalitis.
  - Alert local health department officials that you have observed horses with signs of acute encephalitis but tell them that the equine cases are probably not St. Louis encephalitis because that virus does not produce clinical signs in horses.
  - Immediately isolate the sick horses because they may have St. Louis encephalitis and therefore could serve as reservoirs of infection for other horses in the area.
  - Advise your clients to have their horses vaccinated against St. Louis encephalitis virus.
21. After confirming that a horse has western equine encephalitis (WEE), what is the most appropriate course of action?
- Warn local health officials because a mosquito may bite the infected horse and transmit the virus to people, causing encephalitis.
  - Isolate the horse immediately because it may serve as a source of infection for other horses in the same area.
  - Alert other veterinarians in the area but do not alert any health officials because the disease is not transmissible from horses to people.
  - Warn health officials because you have proof that the western equine encephalitis virus is in the area.
  - Warn health officials that infected people have been indirectly infecting horses.
22. You accidentally inject yourself with strain 19 *Brucella abortus* vaccine. What is the most appropriate course of action?
- Cleanse the wound thoroughly with soap and water to prevent bacterial infection; no other treatment is indicated because strain 19 does not produce clinical disease in people.
  - Cleanse the wound and consult a physician for prophylactic treatment with broad-spectrum antibiotics.
  - Take no special precautions.
  - Cleanse the wound and consult a physician for prophylactic treatment with large doses of penicillin.
  - Wait until clinical disease is verified before seeking medical treatment.
23. In a rabid cow, in which specimen is rabies virus likely to be found in the highest concentration?
- milk
  - blood
  - urine
  - cerebrospinal fluid
  - hair
24. Growth-promoting implants should be administered to cattle:
- deep into the quadriceps femoris muscle
  - subcutaneously at the tail head
  - per os
  - subcutaneously at the base of the ear
  - intradermally on the caudal tail fold
25. Concerning vaccination of a flock of sheep against contagious ecthyma (orf) using a commercial vaccine approved by the U.S. Department of Agriculture, which statement is **least** accurate?
- The vaccine contains a live virus that is not pathogenic in people.
  - Lesions may be visible on sheep for up to 24 days after vaccination.
  - The owner should not commingle vaccinated and unvaccinated sheep.
  - Only healthy animals should be vaccinated.
  - The sheep should not be vaccinated within 21 days of slaughter, or concurrently dipped or sprayed.

## Answers

- b** Animals are typically surveyed in a holding pen before slaughter.
- a** Inspection just before slaughter increases the likelihood of disease detection.
- a** The eye may have been damaged by trauma; the entire carcass need not be condemned.
- a** Cooking would destroy any mycobacteria present.
- b** Condemn the carcass and parts. Any spread to the lymph nodes indicates systemic involvement, which warrants condemnation.
- b** Remove the involved tissues and pass the remainder unrestricted. These lesions appear to be localized and unrelated to each other, so the entire carcass need not be condemned.
- a** Condemn the carcass and parts. Systemic conditions such as this always warrant condemnation.
- b** Remove the involved tissues and pass the remainder unrestricted. Note that hog TB is handled much differently than cattle TB.
- a** Association with time and space defines a cluster.
- e** It is often very difficult to trace chronic, noninfectious diseases because they are often inapparent at the time of death. This is one of many reasons.
- d** *Staphylococcus aureus* toxin is not easily destroyed by heating.
- a** All of these quality tests are legally required before milk can be marketed.
- c** This organism rarely comes from an animal source.
- c** The few bacteria typically present are usually killed during cooking.

15. **c** Long-term ingestion of antibiotic-contaminated milk can reduce the population of normal enteric flora, allowing overgrowth of pathogens, such as antibiotic-resistant *Salmonella*.
16. **d** Cattle are injected in the skin of the caudal tail fold.
17. **d** Feedstuffs of animal origin, such as bone meal and meat meal, are most likely to be contaminated with *Salmonella*.
18. **a** Anthrax is most likely to occur in rural areas because these areas have the highest numbers of susceptible large animals.
19. **e** The carcass should be burned immediately after diagnosis to reduce the likelihood of disease spread.
20. **c** The virus causing St. Louis encephalitis in people is not pathogenic in horses.
21. **d** Viremia in horses with WEE is of such a low order that mosquitos are unlikely to become infected if they bite an infected horse (*a, b*). All cases of encephalitis in horses (Eastern equine encephalitis, WEE, or Venezuelan equine encephalitis) should be reported to public health officials (*c*). Horses are unlikely to become infected by people (*e*).
22. **b** Strain 19 *Brucella abortus* can cause disease in people. A broad-spectrum antibiotic is likely to prevent infection after accidental self-injection.
23. **d** Rabies virus particles have an affinity for tissues of the nervous system.
24. **d** Implants are usually injected at this site during processing, with the animal restrained in stocks.
25. **a** The virus in the vaccine can cause lesions in people. Personnel should take precautions to prevent human infection.

## NOTES

# 10

## Surgical Diseases

A.N. Baird, K.F. Bowman, J.P. Caron, J.N. Moore, W.G. Queen, C.A. Ragle, D.F. Smith, L.L. Southwood, A.M. Trent, C.E. Wallace

### Recommended Reading

- Auer JA: *Textbook of equine surgery*, Philadelphia, 1992, WB Saunders.
- Colahan PT et al: *Equine medicine and surgery*, ed 5, St Louis, 1998, Mosby.
- Howard JL: *Current veterinary therapy: food animal practice 3*, Philadelphia, 1993, WB Saunders.
- Jennings PB: *The practice of large animal surgery*, Philadelphia, 1984, WB Saunders.
- Kimberling CV: *Jensen and Swift's diseases of sheep*, ed 3, Baltimore, 1988, Williams & Wilkins.
- Knottenbelt DC, Pascoe RR: *Color atlas of diseases and disorders of the horse*, St Louis, 1994, Mosby.
- Kobluk CN et al: *The horse: diseases and clinical management*, Philadelphia, 1995, WB Saunders.
- Leman AD et al: *Diseases of swine*, ed 7, Ames, Iowa, 1992, Iowa State University Press.
- McIlwraith CW: *Diagnostic and surgical arthroscopy in the horse*, ed 2, Baltimore, 1990, Williams & Wilkins.
- McIlwraith CW, Turner AS: *Equine surgery: advanced techniques*, Baltimore, 1987, Williams & Wilkins.
- McKinnon A, Voss JL: *Equine reproduction*, Baltimore, 1992, Williams & Wilkins.
- Nixon AJ: *Equine fracture repair*, Philadelphia, 1996, WB Saunders.
- Radostits OM et al: *Veterinary medicine*, ed 8, Philadelphia, 1994, WB Saunders.
- Rebhun WC: *Diseases of dairy cattle*, Baltimore, 1995, Williams & Wilkins.
- Robinson NE: *Current therapy in equine medicine 4*, Philadelphia, 1997, WB Saunders.
- Smith BP: *Large animal internal medicine*, ed 2, St Louis, 1996, Mosby.
- Smith MC, Sherman DM: *Goat medicine*, Baltimore, 1994, Williams & Wilkins.
- Stashak TS: *Adams' lameness in horses*, ed 4, Baltimore, 1987, Williams & Wilkins.
- Turner AS, McIlwraith CW: *Techniques in large animal surgery*, ed 2, Baltimore, 1989, Williams & Wilkins.
- Varner DD et al: *Manual of equine reproduction*, St Louis, 1998, Mosby.
- White NA: *The equine acute abdomen*, Baltimore, 1990, Williams & Wilkins.
- White NA, Moore JN: *Current practice of equine surgery*, Philadelphia, 1990, JB Lippincott.
- Youngquist RS: *Current therapy in large animal theriogenology*, Philadelphia, 1997, WB Saunders.

# HORSES

A.N. Baird

Practice answer sheets are on pages 295-297.

## Questions

*Surgical stapling devices are used commonly in equine abdominal surgery. Several companies currently produce stapling devices.*

**For Questions 1 through 4, match the surgical procedure below with the appropriate stapling device.**

- device that produces two linear, staggered rows of staples
  - device that transects tissue, leaving two linear, staggered rows of staples on each side of the transection
  - device that produces two circular, staggered rows of staples
  - device that places two staples and transects tissue between them
- Used to ligate and divide mesenteric vessels for small intestinal resection
  - Used for anastomosis of the ventral and dorsal colons after large-colon resection
  - Used to close the blind stump of the ileum after resection
  - Used for end-to-end small-intestinal anastomosis in a pony or small horse
  - Concerning rupture of the gastrocnemius tendon and/or the tendon of the superficial digital flexor muscle, which statement is **least** accurate?
    - These ruptures usually result from extreme hyperflexion of the hock.
    - With complete ruptures the hock is typically less angled and the rear limb more straight when bearing weight.
    - With complete ruptures the horse cannot bear weight on the limb and the hock can be flexed without flexing the stifle.

- Partial ruptures may be treated with a full-limb cast and stall confinement.
- With partial ruptures the prognosis is guarded for recovery of athletic potential.

6. Cell death is most reliably produced by cryosurgery when:

- tissues are slowly cooled to 0° C once
- tissues are slowly cooled to -20° C once
- tissues are rapidly cooled to -20° C twice and slowly thawed after each freeze
- tissues are rapidly cooled to 0° C twice and slowly thawed after each freeze
- tissues are slowly cooled to -20° C once and rapidly thawed

7. The delayed phase of cryonecrosis following cryogen application is due to:

- vascular stasis resulting from endothelial damage
- formation of intracellular ice crystals
- immune response to frozen tissue
- intracellular hypertonicity
- recrystallization during thawing

8. The term laser is an acronym for:

- light acceleration by simultaneous emission of radiation
- light acceleration by stimulated emission of radiation
- light amplification by simultaneous emission of radiation
- light amplification by stimulated emission of radiation
- linear acceleration by simultaneous emission of radiation

9. Concerning the carbon dioxide laser, which statement is **least** accurate?

- It produces electroirradiation in the far infrared range.
- Energy is absorbed primarily through water.
- It is excellent for hemostasis.
- Skin incisions cause less postoperative pain than with scalpel incision.
- It is readily transported through flexible fibers.

10. A portion of skin consisting of all of the epidermis and 75% of the dermis is harvested from the ventral pectoral area with a dermatome and expanded on a stage of staggered razor blades before being sutured to a wound on the same horse's cannon. This type of skin graft is best described as a:

- full-thickness sheet autograft
- full-thickness mesh autograft
- split-thickness sheet allograft
- split-thickness mesh autograft
- split-thickness mesh allograft

11. A skin graft receives nutrition for the first 24 to 48 hours by absorption of a plasmalike fluid from the recipient bed by capillary action. This stage of graft healing is called:

- adherence
- inosculation
- plasmatic imbibition
- capillary ingrowth
- revascularization

12. The bacterium that most commonly causes skin graft failure in horses is:

- Listeria monocytogenes*
- Escherichia coli*
- nonhemolytic *Streptococcus* species
- $\beta$ -hemolytic *Streptococcus* species
- Salmonella* species

## Questions 13 through 16

*A horse sustains a horizontally oriented laceration to the palmar aspect of the metacarpus approximately 7 cm proximal to the sesamoids, exposing the flexor tendons. The owner treats the wound topically and bandages the distal limb. The horse appears to be doing well until 5 days after the injury, when it exhibits severe lameness of the injured limb.*

13. What is the most likely cause of the acute lameness?

- tendon damage caused by improper bandaging technique
- tendon damage caused by the initial injury
- infection of the fetlock joint
- infection of the digital tendon sheath
- painful neuroma formation

14. What would ultrasonographic examination of the affected area likely demonstrate?

- a focal anechoic area in the superficial digital flexor tendon at the proximal metacarpal area
- an anechoic area involving over 50% of the superficial digital flexor tendon at the site of the initial injury
- no abnormalities with the tendon but fetlock joint effusion
- no abnormalities with the tendon but increased fluid filling the digital tendon sheath
- no abnormalities of any kind

15. What is the most appropriate diagnostic and/or therapeutic procedure to perform next?

- Remove the bandage and initiate topical treatment of the limb.
- Apply a cast with the limb in a flexed position.
- Lavage the fetlock joint and submit aspirated fluid for culture and cytologic examination.
- Lavage the tendon sheath and submit aspirated fluid for culture and cytologic examination.
- Anesthetize the lateral and medial palmar nerves.

16. What is the most common long-term complication of this type of injury?
- no complications usually expected
  - thickening of the tendon and increased dorsiflexion of the fetlock joint
  - lameness as a result of degenerative joint disease of the fetlock
  - lameness caused by adhesion of the flexor tendons within the digital sheath
  - anesthesia of the distal limb as a result of neurectomy
17. Which of the following is **not** a property of fiberglass casting material?
- porous
  - stronger than plaster
  - quicker to cure than plaster
  - lighter weight than plaster
  - more radiopaque than plaster
- Questions 18 and 19**
- A 3-month-old Arabian filly is presented to your hospital for evaluation of recent onset of stertorous breathing and dysphagia. The foal appears to be generally healthy. You observe a nonpainful distention of the left parotid region. The owner tells you that the parotid swelling has been present since the foal was very young and now seems to be more noticeable. Radiographs of the foal's head exhibit air-density distention of the left guttural pouch.
18. Based on the history, clinical signs, and radiographs, what is the most likely diagnosis?
- guttural pouch tympany
  - guttural pouch empyema
  - guttural pouch mycosis
  - retropharyngeal abscess
  - soft-palate paresis
19. What is the most appropriate treatment for this foal?
- euthanasia
  - antibiotics
  - antiinflammatories
  - tracheostomy
  - median septum fenestration
20. Which of the following does **not** describe the cecum of an adult horse?
- Average capacity is 33 L.
  - Dorsal and medial bands end at the apex.
  - Ileocecal fold attaches to the dorsal band.
  - Cecocolic fold attaches to the lateral band.
  - A vascular supply is at the dorsal and lateral bands
21. Which of the following does **not** describe the equine large intestine?
- Descending colon has one band and sacculations.
  - Right ventral colon has four bands and sacculations.
  - Left ventral colon has four bands and sacculations.
  - Right dorsal colon has three bands and no sacculations.
  - Pelvic flexure has one mesocolic band and no sacculations.
22. The proximal segment of intestine that invaginates into the lumen of a distal segment of intestine to form an intussusception is referred to as the:
- neck
  - intussusceptum
  - apex
  - intussusciens
  - spiral
23. The distal segment of intestine into which a proximal segment of intestine invaginates to form an intussusception is referred to as the:
- neck
  - intussusceptum
  - apex
  - intussusciens
  - spiral

24. Which type of horse is **least** likely to have an inguinal (scrotal) hernia as an adult?
- standardbred
  - draft horse
  - American saddlebred
  - American quarter horse
  - Tennessee walking horse
25. Concerning reducible nonstrangulating inguinal (scrotal) hernias in neonatal foals, which statement is **least** accurate?
- Most of these hernias spontaneously resolve by 4 months of age.
  - They are usually observed during the first few days of life.
  - Daily manual reduction is recommended.
  - They are usually indirect hernias.
  - They may be congenital but are not considered to be hereditary.
- Questions 26 through 28**
- You are in equine practice in the southeastern United States. You are called to examine a 3-year-old pleasure horse that has been showing mild signs of colic for 6 hours. The pulse is 48 beats/min, respiration is 16 breaths/min, and rectal temperature is 100.6° F. Gastrointestinal motility is decreased, lung sounds are normal, and no gastric reflux is obtained on nasogastric intubation. The horse has not been regularly vaccinated or dewormed. The gelding is on fescue pasture and has free-choice coastal Bermuda hay and some grain supplementation. You palpate the horse rectally and detect a few mildly distended loops of small intestine. You also feel a firm, smooth, cylindrical mass in the right caudal abdomen, approximately 8 cm in diameter and at least 20 cm long. You detect no other abnormalities.
26. What is the most likely cause of these findings?
- gastric impaction
  - small-intestinal volvulus
  - proximal enteritis
  - ileal impaction
  - small-colon fecalith
27. What is the most appropriate treatment for this horse?
- mineral oil, antibiotics, and exercise
  - intravenous fluids, mineral oil, and analgesics
  - celiotomy, antibiotics, and intravenous fluids
  - analgesics, antibiotics, and mineral oil
  - analgesics, exercise, and mineral oil
28. Twelve hours later the horse is exhibiting signs of increased pain despite your treatment. The pulse is now 68 beats/min. You repeat the rectal palpation and find the cylindrical mass unchanged, but now multiple loops of small intestine are more distended with gas and fluid. You obtain 10 L gastric reflux through the nasogastric tube. What is the most appropriate treatment at this point?
- more mineral oil
  - euthanasia
  - celiotomy
  - trocarization
  - more analgesics
29. Herniation of small intestine through the epiploic foramen and subsequent strangulating obstruction occasionally causes colic in older horses. This may occur with enlargement of the potential space as a result of atrophy of the right liver lobe. In which direction does the entrapped intestine most often proceed through the epiploic foramen?
- cranial to caudal
  - caudal to cranial
  - left to right
  - right to left
  - dorsal to ventral
30. An umbilical hernia incarcerating one wall of the ventral colon but not obstructing the flow of ingesta or causing signs of colic is referred to as:
- an omentocele
  - an omphalocele
  - an indirect hernia
  - a colonic hernia
  - a parietal hernia

31. What is the primary composition of most enteroliths found in horses?

- magnesium ammonium phosphate
- magnesium ammonium oxalate
- magnesium calcium sulfate
- magnesium calcium phosphate
- magnesium calcium oxalate

#### Questions 32 through 35

You examine a 7-year-old mare that showed signs of severe colic approximately 6 hours previously. The horse now shows intermittent signs of abdominal pain that responds to gastric decompression by nasogastric tube. Between painful episodes the mare appears depressed. The pulse rate varies from 60 to 72 beats/min. The horse is refluxing approximately 5 L of bloody gastric fluid each hour. The rectal temperature is 103.2° F, and gastrointestinal motility appears absent. The horse has hemoconcentration despite continuous intravenous fluid therapy. Rectal palpation reveals several mild to moderately distended loops of small intestine. Abdominocentesis yields fluid with a normal white blood cell count and increased protein content.

32. What is the most likely cause of these findings?

- gastric dilatation
- pyloric obstruction
- small intestinal volvulus
- proximal enteritis
- ileal impaction

33. What is the most appropriate treatment at this time?

- euthanasia
- peritoneal lavage and analgesics
- continued gastric decompression and intravenous fluids
- immediate exploratory celiotomy
- analgesics and discontinued intravenous fluids

34. What specific surgical procedure has been suggested to relieve gastric reflux in these cases?

- gastroduodenostomy
- esophagostomy
- duodenojejunostomy

- duodenocecostomy
- jejunocecostomy

35. What celiotomy approach should you use to perform the above procedure?

- ventral midline
- right paramedian
- left paramedian
- right flank
- left flank

36. Which finding is **least** likely in a foal with uroperitoneum caused by a ruptured bladder?

- large volume of fluid collected on abdominocentesis
- creatinine concentration in peritoneal fluid two to three times that in serum
- hyponatremia
- hyperchloremia
- hyperkalemia

37. Rectal lacerations that disrupt only the rectal mucosa usually heal with diet modification and cause no long-term complications. What grade of rectal laceration disrupts **only** the rectal mucosa?

- grade 1
- grade 2
- grade 3A
- grade 3B
- grade 4

38. What grade of equine rectal laceration disrupts the mucosa, submucosa, and muscularis dorsally, allowing fecal contamination of the fat-filled mesocolon?

- grade 1
- grade 2
- grade 3A
- grade 3B
- grade 4

39. If you diagnose a grade 3 or 4 equine rectal laceration at a farm, which of the following does **not** constitute appropriate initial treatment to prepare the horse for transport to a surgical facility for definitive treatment?

- caudal epidural anesthesia
- feeding hay to calm the horse
- packing the rectum
- giving systemic antibiotics
- giving mineral oil by stomach tube

40. Concerning rectal lacerations in horses, which statement is **least** accurate?

- Recent veterinary graduates are more likely to tear a rectum than are experienced practitioners.
- Arabian horses appear predisposed to rectal lacerations.
- Dehydration may contribute to rectal lacerations in horses with colic.
- Adequate restraint helps to prevent rectal lacerations.
- The most serious complication of grade 3 rectal lacerations is progression to grade 4.

41. Which term best describes the intestinal lesion that causes bowel to rapidly become thick and black?

- strangulation obstruction
- nonstrangulating infarction
- simple obstruction
- intraluminal infarction
- arterial obstruction

#### Questions 42 and 43

42. A horse has had a nasal discharge and cough for several weeks. Thoracic radiographs reveal a radiopacity consistent with thoracic abscess. You also notice a bilateral swelling of the distal forelimbs. Radiographs of the distal forelimbs show periosteal bone growth in a palisade pattern perpendicular to the cortices of the long bones. The forelimb abnormality is most likely:

- phsitis
- hypertrophic osteopathy
- a lesion of borreliosis

- osteomyelitis
- osteopetrosis

43. What is most appropriate to resolve the distal forelimb abnormality in this horse?

- Decrease the protein content of the diet.
- Administer tetracyclines.
- Administer antiinflammatories.
- Treat the thoracic lesion.
- Initiate hydrotherapy.

#### Questions 44 through 49

A 5-year-old mare has been showing signs of colic for 6 hours. The mare is scheduled to compete in an important championship cutting horse event in 3 weeks. The horse shows mild pain between short intermittent episodes of severe pain. The pulse rate is 52 beats/min, packed cell volume is 40%, and total serum protein concentration is 6.8 g/dl. No gastric reflux is present. Abdominocentesis yields blood with a packed cell volume of 63%. Rectal palpation reveals a moderately distended large colon traversing the left dorsal abdominal region. There is a 180-degree rotation of the pelvic flexure, so that the ventral colon is dorsally positioned, and mild edema of the colon wall. The colon is found in the left dorsal region, traversing between the left kidney and the ventromedially displaced spleen. You detect no other abnormalities.

44. What is the most likely cause of colic in this horse?

- volvulus of the large colon
- sand impaction of the large colon
- right dorsal displacement of the large colon
- renosplenic entrapment of the large colon
- cranial displacement of the large colon

45. What treatment would you recommend to the owners if you repeated the rectal palpation and were confident that your initial diagnosis was correct?

- mineral oil and analgesics
- mineral oil and intravenous fluids
- rolling, followed by celiotomy if needed
- immediate celiotomy
- analgesics and intravenous fluids

46. What is the most important advantage of the treatment chosen in Question 45 if it is successful?
- less expense
  - shorter period of hospitalization required
  - fewer potential complications
  - avoidance of general anesthesia
  - ability of horse to compete in 3 weeks
47. The treatment chosen in Question 45 is **least** successful when:
- the duration of signs has been 8 hours or more
  - the white blood cell count is less than 1300 cells/ $\mu$ l
  - the packed cell volume is 45% or more
  - gastric reflux is present
  - the abdomen is grossly distended
48. All the following are potential **disadvantages** of the treatment selected in Question 45 **except**:
- not visualizing potentially compromised colon
  - not detecting another cause for colic
  - creation of rectal tears
  - possible requirement of two episodes of general anesthesia
  - significantly higher mortality after treatment
49. Why did the fluid collected on abdominocentesis have a higher packed cell volume than did the blood collected from the jugular vein?
- There was red blood cell diapedesis through compromised bowel wall.
  - The fluid was obtained from erroneous splenic puncture.
  - The fluid contained concentrated blood from ruptured splenic vessels.
  - The fluid was collected from abdominal wall vasculature.
  - The fluid contained solute left from dialysis of whole blood in the abdominal cavity.
50. Adhesions can be a serious complication of abdominal surgery in horses. All the following are ways to decrease postoperative adhesion formation **except**:
- reduction of initial inflammatory response
  - inhibition of exudate coagulation
  - promotion of removal of deposited fibrin
  - mechanical separation of fibrin-covered surfaces
  - enhancement of fibroblast proliferation

#### K.F. Bowman

51. The epiploic foramen is a potential opening allowing communication between the omental bursa and the peritoneal cavity. In horses the borders of the epiploic foramen include all the following structures **except** the:
- caudate process of the liver
  - caudal vena cava
  - pancreas
  - duodenum
  - portal vein
52. Concerning anatomic landmarks used during exploratory laparotomy in horses, which statement is **least** accurate?
- The dorsal band of the cecum is continuous with the ileocecal fold, which can be used to locate the ileum.
  - The right ventral colon is connected to the cecum via the cecocolic fold.
  - The cecum and the right and left ventral colons have four bands (teniae).
  - The small colon has two bands (teniae).
  - The junction between the terminal duodenum and the proximal jejunum can be identified by palpation of the mesodiverticular band.

53. During exploratory surgery for colic, you are unable to exteriorize a portion of the small intestine. On further palpation you find a pedunculated lipoma, and its stalk is wrapped around the bowel. You cut the stalk, retrieve the lipoma, and exteriorize the small intestine. Approximately 1 meter of distal jejunum and proximal ileum is devitalized. What is the most appropriate surgical treatment?
- insufflation of the bowel with oxygen
  - resection and end-to-end anastomosis of the jejunum and ileum
  - resection and side-to-side anastomosis of the jejunum and ileum, using staple suture methods
  - jejunocecal anastomosis
  - jejunocolic anastomosis
54. Which condition of the large colon is **least** likely to require surgical treatment?
- volvulus of the large colon
  - left dorsal displacement of the large colon
  - impaction of the ventral large colon
  - sand impaction of the large colon
  - enterolith obstruction
55. Which intestinal suture pattern has the following characteristics: the suture bite is made parallel to the wound margin; it does not penetrate the bowel lumen; the suture crosses the incision at a right angle; the suture is tied to itself at the beginning and at the end of the suture line; and the suture results in an inverting wound closure?
- Lembert pattern
  - Halsted pattern
  - Connell pattern
  - Cushing pattern
  - Gambie pattern
56. Concerning use of an emasculator, which statement is **least** accurate?
- The crushing component of the emasculator should be oriented distal to the cutting blade (closer to the testicle).
  - The cutting blade should be slightly dulled so that the cord must be torn, with minimal effort, from the blade.
  - The scrotal skin should not be incorporated in the jaws of the emasculator.
  - The emasculator should be applied at right angles to the spermatic cord.
  - The spermatic cord should not be stretched at the time of emasculation.
57. Concerning the Caslick's procedure, which statement is most accurate?
- The Caslick's procedure is the most common method for reconstruction of the perineal body.
  - The Caslick's procedure involves closure of the vulvar cleft from the level of the ventral commissure to just ventral to the ischial arch.
  - At the time of suture removal the closure should be inspected for small openings because such defects can have a negative effect on the outcome.
  - Following a Caslick's procedure, the mare will not need an episiotomy just before foaling.
  - Fibrosis associated with excessive tissue removal has no effect on subsequent Caslick's procedures that may be performed on the mare.
58. A foaling injury resulting in disruption of the perineal body, anal sphincter, floor of the rectum, and ceiling of the vestibule is classified as a:
- first-degree perineal laceration
  - second-degree perineal laceration
  - third-degree perineal laceration
  - rectovestibular fistula
  - grade 3B rectal tear
59. What is the most common ovarian tumor in mares?
- papillary adenoma
  - cystadenoma
  - undifferentiated carcinoma
  - teratoma
  - granulosa-cell tumor

60. A 10-year-old mixed-breed gelding is admitted to your clinic for evaluation of "problems during urination." You notice that the gelding stretches to urinate for extended periods and voids only small quantities of urine. The skin on the medial aspect of both hind limbs is soiled and scalded. Palpation of the abdominal contents per rectum is unremarkable, except for a hard mass approximately 5 cm in diameter on the midline, adjacent to the cranial pelvic brim. What is the likely cause of these findings?

- seminal vesiculitis
- cystic calculus
- impaction of the ventral large colon
- perirectal abscess
- patent urachus

61. Prosthetic laryngoplasty (tie-back) is performed in horses with laryngeal hemiplegia to simulate the action of the paralyzed cricoarytenoideus dorsalis muscle. During this procedure the prosthesis (suture) is anchored in the:

- caudodorsal aspect of the cricoid cartilage and the muscular process of the arytenoid cartilage
- caudodorsal aspect of the cricoid cartilage and the corniculate process of the arytenoid cartilage
- ventral aspect of the cricoid cartilage and the muscular process of the arytenoid cartilage
- ventral aspect of the cricoid cartilage and the corniculate process of the arytenoid cartilage
- muscular process of the arytenoid cartilage and the lateral aspect of the thyroid cartilage

62. The facial crest, infraorbital foramen, and medial canthus of the eye are used by equine surgeons as landmarks for a direct surgical approach to the:

- frontal sinus
- ventral conchal sinus
- sphenopalatine sinus
- maxillary sinus
- middle conchal sinus

63. Concerning epiglottic entrapment, which statement is **least** accurate?

- During endoscopy the shape of the epiglottis cannot be discerned because the epiglottis is entrapped ventral to the soft palate.
- Horses with epiglottic entrapment may have coexistent epiglottic hypoplasia.
- Epiglottic entrapment is treated by axial division of the aryepiglottic fold.
- Dorsal displacement of the soft palate can occur following correction of epiglottic entrapment.
- Epiglottic entrapment results when the aryepiglottic folds become abnormally located above the dorsal aspect of the epiglottis.

64. Which upper respiratory tract condition can cause severe, fatal hemorrhage?

- ethmoid hematoma
- subepiglottic cyst
- dorsal displacement of the soft palate
- guttural pouch mycosis
- epiglottic entrapment

65. During routine postpartum examination of a 24-hour-old foal, you note a bilateral nasal discharge during and after nursing. What is the likely cause of these findings?

- laryngeal hemiplegia
- cleft palate
- intermittent dorsal displacement of the soft palate
- epiglottic entrapment
- paranasal sinus cyst

66. From dorsal to palmar, which of the following accurately lists the orientation of the tendons and ligaments in the proximal metacarpus?

- superficial digital flexor tendon, deep digital flexor tendon, distal check ligament, suspensory ligament.
- superficial digital flexor tendon, distal check ligament, deep digital flexor tendon, suspensory ligament.
- superficial digital flexor tendon, deep digital flexor tendon, suspensory ligament, distal check ligament.
- suspensory ligament, deep digital flexor tendon, distal check ligament, superficial digital flexor tendon.
- suspensory ligament, distal check ligament, deep digital flexor tendon, superficial digital flexor tendon.

**For Questions 67 through 71, match the clinical condition below with a surgical procedure that can be used for its treatment.**

- proximal (superior) check desmotomy
- hemicircumferential transection/periosteal stripping
- arthroscopic surgery of the tarsocrural joint
- arthroscopic surgery of the medial femorotibial joint
- arthroscopic surgery of the femoropatellar joint

67. *Carpus valgus*

68. *Osteochondritis dissecans involving the distal intermediate ridge of the tibia*

69. *Osteochondritis dissecans involving the lateral trochlear ridge of the femur*

70. *Subchondral cystic lesion involving the medial condyle of the femur*

71. *Superficial digital flexor tendinitis*

72. A 6-month-old Thoroughbred colt has just sustained a closed, short oblique, middiaphyseal fracture of the radius. You decide to refer the horse for fracture repair and prepare the horse for transport. What external support applied to the limb is most appropriate to stabilize the fracture?

- no immobilization is necessary
- dorsal splint-cast combination applied over minimal padding, extending from the bearing surface of the hoof to the proximal metacarpus
- full-limb (elbow-to-ground) Robert-Jones bandage, with caudal and lateral splints
- full-limb Robert-Jones bandage, with a caudal splint and an extended lateral splint
- full-limb cast applied under general anesthesia

73. Concerning hemicircumferential transection/periosteal stripping for treatment of angular limb deformity, which statement is **least** accurate?

- The surgical procedure is performed on the concave aspect of the affected limb.
- Periosteal stripping is considered to be a growth retardation procedure.
- The duration of its effect is approximately 60 days.
- Overcorrection of an angular limb deformity does not occur with this surgical procedure.
- Surgical implants (screws, cerclage wire, etc.) are not used in this surgical procedure.

74. While observing a horse that is trotting in a straight line on asphalt, you note subtle ventral movement of the head as the right forelimb is bearing weight and increased vertical displacement of the left tuber coxae as compared with the right tuber coxae. Concerning these observations, which statement is most accurate?

- These clinical signs are consistent with lameness involving the right forelimb.
- These clinical signs are consistent with lameness involving the left forelimb.
- These clinical signs are consistent with lameness involving the right hind limb.
- These clinical signs are consistent with lameness involving the left hind limb.
- This horse is not showing clinical signs of lameness.



75. Intraarticular anesthesia of the distal interphalangeal joint is likely to reduce the degree of lameness associated with all of the following structures **except** the:

- distal phalanx (internally)
- dorsal portions of the collateral sesamoidean ligaments

- distal sesamoidean impar ligament
- navicular bone
- deep digital flexor tendon

### J.P. Caron

76. In general which of the following fractures is considered **irreparable** in a horse weighing 450 kg?

- open (compound) tibial fracture
- intraarticular fracture of the olecranon
- closed midshaft fracture of the third metacarpal bone
- sagittal fracture of the third phalanx
- slab fracture of the third carpal bone

- overcorrection
- bony exostoses
- incisional dehiscence

77. Closure of a limb wound 6 days after injury is most accurately described as:

- delayed primary closure
- delayed secondary closure
- primary closure
- second-intention healing
- delayed second-intention healing

80. After castration of his yearling colt, the owner, a neophyte equestrian, is concerned about postoperative problems. You would be correct to inform him that the most common complication after equine castration is:

- serious hemorrhage
- evisceration
- peritonitis
- scirrhous cord
- incisional and preputial swelling

78. When performing a palmar digital neurectomy in a horse, it should be remembered that the correct orientation of structures in the neurovascular bundle from dorsal to palmar is:

- vein, artery, nerve
- nerve, artery, vein
- artery, nerve, vein
- nerve, vein, artery
- vein, nerve, artery

79. Potential complications of periosteal transection and stripping for treatment of angular limb deformities in foals include all the following **except**:

- incisional infection
- incomplete correction

81. While gelding a 2-year-old quarter horse colt, you incise the common vaginal tunic and a modest volume of yellow fluid oozes from the incision. The most likely explanation for this is that the fluid is:

- normal serous fluid produced by the rete testis
- probably a result of low-grade trauma (inflammatory fluid)
- peritoneal fluid, and the area should be packed with sterile gauze to preclude evisceration
- peritoneal fluid but does not require any special procedures during castration
- urine, and would suggest inadvertent perforation of the penile urethra

82. Cryptorchidectomy is a procedure that can be done in private practice. Concerning evaluation and care of cryptorchidectomy candidates, which statement is **least** accurate?

- Rectal palpation of the ductus deferens entering the vaginal ring means that the testicle has descended at least as far as the inguinal canal.
- The treatment of choice for cryptorchidism is castration because the condition is heritable.
- A horse with an abdominally retained testicle at birth is unlikely to have the testicle descend later in life.
- Conjugated estrogen assays can help differentiate geldings with stallionlike behavior from cryptorchids.
- When a cryptorchidectomy is undertaken it is prudent to prepare as for any aseptic surgery, including appropriate sterile gowns, drapes, and autoclaved instruments.

83. On the morning of an elective surgery of a foal (inferior check desmotomy), you notice that the foal's temperature is 103.6° F; the respiratory rate is 42 breaths/min, and the pulse rate is 90 beats/min. The foal is somewhat depressed, and the mare's udder is distended. The most prudent action is to:

- perform a California mastitis test on the mare
- perform a digital rectal examination and abdominocentesis on the foal
- call the owners, advise them of the foal's problem, and postpone surgery until further tests are performed
- proceed with the surgery, as it is of short duration; the rectal temperature of foals is notoriously labile and will benefit from the intraoperative fluids
- obtain a blood sample for a complete blood count and proceed with the surgery if the results are normal.

For Questions 84 through 87, match the musculoskeletal lesions listed with the joint.

- osselet
- bog spavin
- gonitis
- low ringbone

84. It involves the metacarpophalangeal joint.

85. It involves the femoropatellar/femorotibial joint.

86. It involves the tibiotarsal joint.

87. It involves the distal interphalangeal joint.

### Questions 88 and 89

A 9-year-old Morgan gelding has had left forelimb lameness for 2 weeks. The horse was discovered limping at pasture, and a swelling was noticed in the region of the left shoulder. On examination the spine of the scapula is more prominent on the left side than on the right, and there appears to be modest instability of the left scapulohumeral joint.

88. The most likely diagnosis is:

- fracture of the scapula
- dislocation of the scapulohumeral joint
- septic arthritis of the scapulohumeral joint
- osteocondrosis of the humeral head
- suprascapular nerve injury

89. A possible surgical treatment for this problem is:

- scapular wedge resection
- semitubular bone plating of the scapula
- arthroscopic removal of osteochondral fragments from the proximal humerus
- through-and-through needle lavage of the scapulohumeral joint
- open reduction and imbrication of the scapulohumeral joint capsule

**Questions 90 through 93**

A 3-year-old quarter horse mare had an episode of profuse epistaxis but now appears clinically normal. The hematocrit is 25% and the total plasma protein concentration is 6.2 g/dl. The mare appears mildly dysphagic and has a serosanguineous discharge from the left nostril.

90. An appropriate diagnostic test in this mare is:

- thoracic radiography
- thoracic ultrasonography
- skull radiography
- upper airway endoscopy
- serum chemistry profile

91. The most likely diagnosis is:

- guttural pouch mycosis
- paranasal sinusitis
- progressive ethmoid hematoma
- exercise-induced pulmonary hemorrhage
- ruptured pulmonary abscess

92. Appropriate surgical management for this mare would consist of:

- exploration of the paranasal sinus
- partial pneumonectomy
- ethmoid labyrinth exploration via facial flap
- internal carotid artery ligation
- occipital artery ligation

93. In this mare a potential postoperative development of considerable concern is:

- hypovolemia and multiple organ failure
- progressive cranial neuropathy
- incisional infection
- pleuritis
- poor performance

**Questions 94 and 95**

A 7-year-old standardbred stallion shows signs of abdominal pain after breeding a mare. On rectal examination, several loops of gas-filled viscera are palpable at the cranial brim of the pelvis. Each loop is approximately 7 to 8 cm in diameter. There is modest swelling of the left half of the scrotum, and the left testicle is firm and cold.

94. This stallion's signs are compatible with a diagnosis of:

- inguinal hernia
- testicular torsion
- colonic volvulus
- iliac thrombosis
- penile hematoma

95. Appropriate surgical management of this case would include:

- inguinal herniorrhaphy
- bilateral castration
- exploration of the corpus cavernosum penis
- resection of the large colon
- testicular biopsy

96. Acute, severe, unrelenting pain and marked abdominal distention in a horse suggest which of the following intestinal accidents?

- small-colon impaction
- obstruction of the transverse colon by an enterolith
- small-intestinal incarceration in the epiploic foramen
- large-colon volvulus
- cecal impaction

97. Rectal tears are a serious problem for an affected horse and a frequent cause of litigation in equine practice. The **least** appropriate choice for management of a horse with a grade 3 rectal tear (penetrating the mucosa, submucosa, and muscularis layers) is:

- temporary diverting colostomy
- suture repair of the defect per rectum
- benign neglect
- placement of a rectal liner
- euthanasia

98. The most common location for osteochondrosis lesions in the equine tibiotarsal joint is the:

- medial trochlear ridge of the talus
- lateral trochlear ridge of the talus
- distal intermediate ridge of the tibia
- medial malleolus of the tibia
- lateral malleolus of the tibia

99. Maxillary sinusitis (and empyema) in horses most commonly occurs:

- as a primary bacterial infection
- secondary to viral infection
- secondary to dental disease
- secondary to facial fractures
- secondary to nasal polyps

100. Pain associated with which condition is **not** alleviated by a palmar digital nerve block?

- navicular disease
- bruising of the frog
- septic navicular bursitis
- puncture wounds of the bar
- distal interphalangeal joint arthritis

**For Questions 101 through 104, match the musculoskeletal disorder with the surgical procedures below.**

- stringhalt
- fibrotic myopathy
- upward fixation of the patella
- flexural deformity of the metacarpophalangeal joint

101. Treated by superficial digital flexor accessory ligament (inferior check ligament) desmotomy

102. Treated by semitendinosus tenotomy

103. Treated by medial patellar ligament desmotomy

104. Treated by lateral digital extensor tenectomy

**For Questions 105 through 108, match the respiratory disorder with the surgical procedures below.**

- dorsal displacement of the soft palate
- laryngeal hemiplegia
- epiglottic entrapment
- arytenoid chondritis

105. Treated by sternothyrohyoid myectomy

106. Treated by subtotal arytenoidectomy

107. Treated by prosthetic laryngoplasty

108. Treated by resection of the aryepiglottic fold

109. The most common neoplasm involving the penis of stallions is the:

- mastocytoma
- melanoma
- sarcoma
- squamous-cell carcinoma
- angioma

**Questions 110 through 113**

A 2-day-old Thoroughbred colt foal shows depression, straining, and dribbling of urine. The foal was normal at birth and passed meconium.

110. The most appropriate initial course of action is to:

- obtain abdominal radiographs
- perform ultrasonography on the umbilicus
- perform a physical examination
- euthanize the colt
- give intravenous fluids

111. The foal shows progressive abdominal distention, and fluid can be auscultated and ballotted within the peritoneal cavity. The most likely diagnosis is:

- colonic volvulus
- umbilical arteritis
- meconium impaction
- atresia coli
- uoperitoneum

112. A useful test to confirm the diagnosis is:

- peritoneal fluid creatinine concentration
- complete blood count
- urinalysis
- abdominal radiography
- alkaline phosphatase determination

113. Foals with this condition may have clinically significant serum electrolyte imbalances, including:

- a. hyperchloremia
- b. hyperkalemia
- c. hypernatremia
- d. hypokalemia
- e. hyper- $\gamma$ -globulinemia

#### Questions 114 through 116

A 4-year-old Arabian filly has a verrucous 8 x 10 cm mass on the dorsum of the left metacarpus. There is no history of a previous wound, and no other horses on the farm are affected.

114. The most likely diagnosis is:

- a. sarcoid
- b. melanoma
- c. squamous-cell carcinoma
- d. fibroma
- e. mastocytoma

115. A definitive diagnosis can be obtained by:

- a. Gram staining smears of the mass
- b. histopathologic examination
- c. radiographic examination
- d. Coombs' testing
- e. fluorescent antibody testing

116. The mass has a circular base approximately 4 cm in diameter. Of those listed below, the most appropriate treatment for this lesion is:

- a. benign neglect
- b. sharp excision
- c. cryotherapy
- d. surgical debulking and cryotherapy
- e. intralesional corticosteroid injection

117. A disease of growing horses typified by a failure of maturation of cartilage in the epiphysis and physis is:

- a. osteoarthritis
- b. septic arthritis

- c. osteochondrosis
- d. pulmonary osteodystrophy
- e. flexural deformity

118. When examining radiographs of the stifle of a horse with a suspected subchondral cystic lesion, one should pay close attention to the area of the:

- a. medial trochlear ridge
- b. head of the fibula
- c. tibial tubercle
- d. lateral femoral condyle
- e. medial femoral condyle

#### Questions 119 through 121

A 7-year-old working quarter horse mare is lame in the right forelimb; however, there is no detectable heat or swelling at any location. There is no response to hoof testers, and a palmar digital nerve block produces no improvement in the lameness. The mare resents flexion of the digit, and this procedure exacerbates the lameness.

119. The next logical step in the lameness examination is:

- a. obtaining radiographs of the navicular bone
- b. obtaining radiographs of the metacarpal phalangeal (fetlock) joint
- c. local anesthesia of the palmar and palmar metacarpal nerves (low volar block)
- d. local anesthesia of the common digital nerves (abaxial nerve block)
- e. nuclear scintigraphy of both forelimbs

120. The results of the lameness examination localize the lameness to the digit. Radiographs of the digit show periarticular osteophytosis of the distal first phalanx and proximal second phalanx, with narrowing of the corresponding joint space. In horsemen's terms, the mare's lameness is associated with:

- a. pyramidal disease
- b. high ringbone
- c. bone spavin
- d. navicular disease
- e. buttress foot

121. An accepted surgical treatment for the mare's condition, one that optimizes her prospects of resuming athletic endeavors, is:

- a. desmotomy of the proximal suspensory ligament of the navicular bone
- b. desmotomy of the suspensory ligament
- c. arthroscopic lavage of the metacarpophalangeal joint
- d. arthrodesis of the proximal interphalangeal joint
- e. resection of the extensor process of the distal phalanx

122. The most frequent complication of superficial distal limb lacerations in horses is:

- a. septic arthritis
- b. exuberant granulation tissue
- c. transection of extensor or flexor tendons
- d. abnormal hoof growth
- e. bony sequestra

#### Questions 123 through 125

A 3-year-old Thoroughbred colt is presented because of poor racing performance. The colt runs well during the early portions of each race but slows dramatically after 4 to 5 furlongs. The jockey says he notices a snoring noise when the colt slows.

126. Cryosurgical techniques have been used successfully in horses for treatment of:

- a. sarcoids
- b. arteriovenous anastomoses
- c. oral melanomas
- d. adamantinomas
- e. mast-cell tumors

127. The cryogen most commonly used in equine practice is:

- a. nitrous oxide
- b. nitric oxide
- c. carbon dioxide
- d. liquid nitrogen
- e. liquid propane

123. Considering this colt's history, the most likely problem is:

- a. atrial fibrillation
- b. forelimb lameness
- c. exercise-induced pulmonary hemorrhage
- d. idiopathic laryngeal hemiplegia
- e. iliac artery thrombosis

124. The most appropriate test to confirm the diagnosis is:

- a. upper airway endoscopy
- b. thoracic radiography
- c. arterial blood gas analysis
- d. serum chemistry and enzyme assays
- e. electrocardiography

125. The most appropriate treatment to restore the athletic capacity of this colt is:

- a. prosthetic laryngoplasty
- b. carpal arthroscopy
- c. lateral laryngeal ventriculectomy
- d. quinidine sulfate given intravenously
- e. furosemide given intravenously

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128. The efficacy of cryonecrosis is enhanced by:

- a. rapid freezing and slow thawing
- b. injection of the cryogen into the tissue at the base of the lesion
- c. slow freezing to minimize formation of intracellular ice crystals
- d. preoperative administration of vasodilator drugs
- e. daily application of the cryogen to the lesion

129. Osteochondral chip fractures in race horses most commonly involve the:

- a. distal aspect of the radial carpal bone
- b. proximal aspect of the third carpal bone
- c. distal aspect of the ulnar carpal bone
- d. proximal aspect of the intermediate carpal bone
- e. distomedial aspect of the radius

130. Application of arthroscopic surgical procedures to the equine carpus has:

- increased the incidence of postoperative septic arthritis
- reduced the severity of postoperative pain
- resulted in more prolonged anesthetic periods
- increased the clinician's reliance on radiographic findings
- reduced the performance capabilities of horses after surgery

131. Arthroscopic surgical techniques are used commonly to:

- remove osteochondritis dissecans lesions from the medial trochlear ridge of the talus
- remove osteochondritis dissecans lesions from the distal intermediate ridge of the tibia
- guide the placement of internal fixation devices
- direct curettage of the articulations involved in bone spavin
- reduce intraarticular administration of fluids commonly used during arthrotomy

132. Antibiotic prophylaxis is administration of antimicrobial agents to surgical patients lacking evidence of established infection. A potential advantage of antibiotic prophylaxis is:

- decreased length of hospitalization
- relaxation of strict adherence to aseptic techniques
- bacterial resistance to antimicrobial agents
- altered gut flora
- enhanced neutrophil function, reducing the chance of infection

For Questions 133 through 136, select the correct answer from the five choices listed below.

- clean
- clean-contaminated
- contaminated
- dirty
- dirty-contaminated

133. A surgical procedure involving a minor break in aseptic technique or controlled entry into viscera

134. A surgical procedure involving devitalized tissue and foreign bodies

135. A surgical procedure that involves a major break in aseptic technique, such as a fresh traumatic wound

136. A surgical procedure without a break in aseptic technique

137. Concerning prophylactic use of antibiotics, which statement is most accurate?

- Antibiotics should be administered immediately after surgery.
- Antibiotics should be administered for a minimum of 3 days after surgery.
- The duration of antibiotic therapy should be determined by the length of hospitalization.
- Antibiotics should be given immediately before surgery.
- Considering the predictable absorption of orally administered drugs, all prophylactic antibiotics should be given per os if possible.

138. Surgical lasers recently have become accepted in treating certain conditions in horses. Concerning surgical laser therapy, which statement is most accurate?

- The neodymium-yttrium-aluminum-garnet (Nd:YAG) laser involves transmission of the light beam by a series of mirrors within the articulating arm of the instrument.
- The energy generated by the Nd:YAG laser is absorbed by tissue protein, allowing this laser to be used in fluid- or blood-filled cavities.
- The energy generated by the carbon dioxide laser is absorbed by tissue protein, causing cells to explode.
- Because laser light can be focused, there are very few risks for patients undergoing laser surgery.
- Because of the wavelength of the light emitted by the Nd:YAG laser, Nd:YAG laser can be used as a bare fiber.

139. Which suture material is *not* absorbable?

- polydioxanone
- polyglactin 910
- polyglycolic acid
- polypropylene
- polyglyconate

140. Sutures that lose their tensile strength within 60 days after implantation are considered absorbable. Which absorbable suture material persists in the tissues for the longest time?

- polyglycolic acid
- chromic catgut
- polyglactin 910
- polydioxanone
- plain catgut

141. Horses commonly require administration of preanesthetic agents. Which of the following is *not* a valid reason for administering a preanesthetic agent to a horse?

- to enhance cooperation of the patient during induction of anesthesia
- to enhance the degree of muscle relaxation obtained during surgery
- to reduce systemic arterial blood pressure during maintenance of anesthesia
- to reduce the concentration of inhalant anesthetic drugs required during anesthesia
- to minimize excitement during the recovery period

For Questions 142 through 146, select the correct answers from the five choices listed below.

- $\alpha_2$ -adrenergic agonist
- phenothiazine tranquilizer
- chloral hydrate
- neuroleptanalgesic
- opioid

142. This is *contraindicated* in hypovolemic and hypotensive horses because of the effects on the peripheral vasculature.

143. This is a combination of an opioid with a tranquilizer or sedative.

144. Though sedative doses have little effect on arterial blood pressure and cardiac output, ataxia may be common.

145. Detomidine and xylazine are examples.

146. Administration without other agents may produce excitement and inappropriate motor activity.

147. Which drug can interfere with neuromuscular transmission, enhance the blockade produced by neuromuscular-blocking agents, and potentiate the muscle-relaxation properties of inhalation agents?

- neomycin
- cloxacillin
- phenylbutazone
- oxytocin
- phenytoin

For Questions 148 through 151, select the correct answer from the five choices listed below.

- thiamylal
- ketamine hydrochloride
- thiopental with guaifenesin
- methohexital
- etorphine with acepromazine

148. Provides good muscle relaxation and relatively smooth recovery

149. Provides poor muscle relaxation and causes tachycardia and hypertension.

150. Barbiturate commonly used to induce anesthesia after the horse has been given xylazine, guaifenesin, or acepromazine.

151. Ultrashort-acting barbiturate, rapidly redistributed to the tissues and detoxified in the liver, producing an extremely short duration of action in horses.

152. Concerning inhalant anesthetic agents, which statement is most accurate?

- MAC refers to the alveolar concentration of an inhalation agent that will prevent 50% of anesthetized animals from moving in response to a stimulus.
- Increasing depth of halothane anesthesia is characterized by decreases in systemic arterial blood pressure, cardiac output, and stroke volume.
- Respiratory alkalosis is a common effect of halothane anesthesia in horses.
- Because of isoflurane's lower solubility in blood, recovery from isoflurane anesthesia is more prolonged than recovery from halothane anesthesia.
- Nitrous oxide may be used as the sole inhalant anesthetic to produce general anesthesia in horses.

- Blood flow in the skeletal muscles during anesthesia may be influenced greatly by the position of the limb.
- Anesthetizing a horse on foam pads or a water bed may increase intracompartmental muscle pressures above pressures seen in horses anesthetized on a surgery table.
- Because of the acute nature of the condition, serum activities of muscle-related enzymes are rarely increased in horses with postanesthetic lameness.

For Questions 155 through 159, select the correct answer from the five choices listed below.

- split-thickness graft
- autograft
- full-thickness graft
- allograft
- xenograft

153. Development of arterial hypoxemia during general anesthesia is to be avoided at all costs. Which of the following is **not** a major determinant of the degree of arterial oxygenation?

- partial pressure of inspired oxygen
- adequacy of alveolar ventilation
- magnitude of arteriovenous shunting of blood within the pulmonary system
- balance between alveolar ventilation and pulmonary capillary perfusion
- changes in the hematocrit caused by intravenous fluid administration during anesthesia

155. A graft taken from another species (e.g., pigskin) and applied to a horse

156. A graft that includes the epidermis and all of the dermis

157. A graft taken from one site on an individual and applied to a different site on the same individual

158. A graft taken from one horse and applied to another horse

159. A graft that includes a portion of the dermis and all of the epidermis

154. Concerning postanesthetic lameness (radial nerve paralysis) in horses, which statement is most accurate?

- Postanesthetic lameness is most often a result of nerve damage incurred during recovery from anesthesia.
- Postanesthetic lameness is unrelated to systemic arterial pressure during anesthesia.

160. Concerning skin grafts, which statement is **least** accurate?

- During the first 48 hours after a skin graft is applied, the graft receives its nourishment by absorption of a plasmalike fluid from the recipient bed.
- Immediately after a skin graft is applied, fibrin accounts for adherence of the graft to the recipient bed.
- Blood circulation within the graft initially occurs as capillary buds from the recipient bed connect with existing vessels in the graft.
- Major causes of skin graft failures include hematomas, seromas, and accumulation of wound exudate beneath the graft.
- Because of the inherent properties of dermal tissue on granulation tissue, it is not necessary to debride a mature granulation tissue bed before skin grafting.

161. Palmar digital neurectomy is one of the most common surgical procedures performed on horses. Concerning this procedure, which statement is **least** accurate?

- Palmar digital neurectomy may be indicated in treatment of some fractures involving the palmar process of the distal phalanx.
- Palmar digital neurectomy should not be performed proximal to the dorsal branch of the palmar digital nerve.
- After palmar digital neurectomy, at least 60% of treated horses remain sound for 1 year.
- The most common complication of palmar digital neurectomy is infection of the navicular bursa.
- Recurrence of lameness, absence of painful neuroma, and elimination of the lameness with local anesthesia indicate postoperative regeneration of the palmar digital nerves.

162. Surgical treatment of aerophagia includes removal of portions of all the following tissues **except** the:

- sternohyoideus muscle
- sternothyroideus muscle

- omohyoideus muscle
- ventral branches of the spinal accessory nerve
- brachialis muscle

163. Concerning cervical vertebral malformations (wobbler syndrome) in horses, which statement is **least** accurate?

- clinical signs may be due to spinal cord damage secondary to stenosis of the vertebral canal.
- Stenosis generally affects horses between 2 and 4 years of age and occurs at C5-6, C6-7, or C7-T1.
- Surgical treatment of horses with cervical static stenosis may involve dorsal laminectomy or ventral fusion techniques.
- Cervical vertebral instability can be diagnosed with plain radiographs alone.
- The prognosis after surgical treatment of cervical vertebral instability is generally guarded.

164. Which neoplasm most commonly affects the orbital and periorbital tissues of horses?

- melanoma
- squamous-cell carcinoma
- fibrosarcoma
- lipoma
- mesothelioma

165. Several clinical conditions in horses require creation of a maxillary sinus bone flap. The boundaries of the equine maxillary sinus include all the following **except** the:

- infraorbital canal
- facial crest
- medial canthus
- dorsal midline over the nasal bones
- rostral extent of the facial crest

166. *Surgical treatment of dorsal displacement of the soft palate may include all the following except:*

- resection of the free border of the soft palate via a ventral laryngotomy
- resection of portions of the sternohyoideus and sternothyroideus muscles
- resection of portions of the omohyoideus, sternohyoideus, and sternothyroideus muscles
- transendoscopic laser resection of the free border of the soft palate
- imbrication of the soft palate via ventral laryngotomy

167. *Concerning epiglottic entrapment, which statement is least accurate?*

- Affected horses usually are examined because of exercise intolerance.
- The condition may occur intermittently in some affected horses.
- Entrapment of the epiglottis reduces the size of the rima glottidis, thereby decreasing the resistance to air flow.
- The epiglottis is entrapped by the aryepiglottic fold.
- The condition frequently is associated with hypoplasia of the epiglottis.

**For Questions 168 through 171, select the correct answer from the five choices listed below.**

- Viborg's triangle
- streptococcal infection
- guttural pouch tympany
- guttural pouch mycosis
- Farquharson's approach

168. *The most common preexisting condition leading to guttural pouch empyema in adult horses*

169. *A condition affecting the guttural pouch in horses less than 1 year old*

170. *The most common cause of profuse and spontaneous hemorrhage from the nasal cavity*

171. *The area bordered by the tendon of the sternocephalicus muscle, the vertical ramus of the mandible, and the linguofacial vein*

**For Questions 172 through 175, select the correct answers from the five choices listed below.**

- arytenoidectomy
- laryngoplasty
- laryngeal sacculotomy
- tracheotomy
- laryngostomy

172. *Surgical procedure in which the muscular process of the arytenoid cartilage is sutured to the cricoid cartilage*

173. *Surgical procedure for treatment of arytenoid chondropathy*

174. *Surgical procedure for treatment of acute upper respiratory tract obstruction*

175. *Surgical procedure of choice for treatment of laryngeal hemiplegia in draft horse breeds*

**For Questions 176 through 179, select the correct answer from the five choices listed below.**

- junction of the muscular and tendinous portions
- aortic hiatus
- external trauma or strenuous exercise
- varying degrees of abdominal distress
- postcaval hiatus

176. *Most common presenting sign associated with diaphragmatic hernia in horses*

177. *Presumed cause of most cases of acquired diaphragmatic hernia*

178. *Most common location of a diaphragmatic hernia*

179. *Most dorsal natural opening in the equine diaphragm*

180. *Concerning diaphragmatic hernias in horses, which statement is least accurate?*

- Diagnosis can be difficult and may be made at exploratory celiotomy.
- This diagnosis should be considered in horses with colic and a recent history of trauma, foaling, or exercise.
- Fluid obtained by abdominocentesis accurately reflects the degree of intestinal devitalization.
- Preoperative diagnosis may be aided by thoracic radiography.
- Successful surgical correction of the condition requires positive-pressure ventilation.

181. *A potential complication of general anesthesia and surgery is pleuropneumonia. Concerning postoperative pleuropneumonia, which statement is least accurate?*

- Early clinical signs of pleuropneumonia are nonspecific and include inappetence, fever, and listlessness.
- Most affected horses are young, apparently healthy race horses that have undergone elective surgery for correction of an orthopedic problem.
- The most common hematologic findings associated with this condition are neutrophilia and increased plasma fibrinogen concentration.
- Thoracostomy is indicated if the fluid within the thoracic cavity is extremely viscous or if an accessible abscess cavity can be identified.
- Resection of affected lung lobes has been a successful method of treatment in affected horses.

**For Questions 182 through 185, select the correct answer from the five choices listed below.**

- aspiration pneumonia
- nasal regurgitation of milk

- inadequate exposure of affected tissue
- dehiscence of reconstructed tissue
- failure of passive transfer

182. *The most common clinical sign of cleft palate in horses*

183. *A characteristic complication of cleft palate that must be addressed in treating foals*

184. *The most common reason for euthanasia after surgical treatment for cleft palate in foals*

185. *The most common reason for less than optimal correction of cleft palate*

**Questions 186 through 188**

*You are called to examine a 6-year-old quarter horse gelding because of acute onset of regurgitation of food, saliva, and water through its nostrils. The gelding makes repeated attempts to swallow and then makes retching movements immediately thereafter.*

186. *The most likely cause of these signs is:*

- rabies
- moldy corn poisoning
- yellow star thistle poisoning
- esophageal obstruction
- gastric squamous-cell carcinoma

187. *The most appropriate initial diagnostic procedure is to:*

- perform a physical examination
- obtain a blood sample for a complete blood cell count
- examine the horse's feed for yellow star thistle
- make plain radiographs of the cervical esophagus and head
- administer acepromazine

188. An important part of managing this case is obtaining an accurate history from the owner. Which question is most likely to yield important information?

- "Has this horse been dewormed recently?"
- "Have you noticed any evidence of upper respiratory tract problems in this horse or other horses on the premises?"
- "When did this horse last defecate and urinate?"
- "Is this horse fed alone, or is he fed in the same area with other animals?"
- "Has this horse had a fever recently?"

For Questions 189 through 193, select the correct answer from the five choices listed below.

- longitudinal mucosal folds
- sedation and gentle lavage
- postobstruction dilatation
- traction diverticulum
- pulsion diverticulum

189. Endoscopic evidence of a normal esophageal lumen

190. Most common reason for reobstruction 24 to 48 hours after initial correction of an esophageal obstruction

191. Acceptable initial method of treating a horse with an esophageal obstruction

192. An outpouching of the esophageal mucosa through a defect in the esophageal musculature, tending to cause clinical problems

193. An outward tenting of all layers of the esophageal wall, rarely causing clinical problems

194. Concerning gastroduodenal obstruction in foals, which statement is most accurate?

- The most common cause of gastroduodenal obstruction in foals is strangulation of the jejunum through the gastroduodenal ligament.
- Gastroduodenal obstruction occurs most commonly in foals that are 5 to 7 months old and that have been weaned within the previous 30 days.
- Passage of a nasogastric tube in foals with gastroduodenal obstruction frequently yields sour, fetid milk.
- Because the obstruction is located proximally in the gastrointestinal tract, contrast radiographs are of minimal value in diagnosing the condition.
- Because the obstruction involves the gastroduodenal region, there is little chance of concurrent hepatitis or cholangitis in affected foals.

For Questions 195 through 199, select the correct answer from the five choices listed below.

- gastroduodenostomy
- esophagogastrostomy
- gastrojejunostomy and jejunojejunostomy
- choledochojejunostomy
- esophagostomy

195. Surgical treatment for refractory esophageal obstruction that permits the animal to receive nutrients after surgery and allows the damaged mucosa to heal by second intention

196. Used to treat foals with duodenal obstruction at the hepatopancreatic ampulla and concurrent obstruction of the common bile duct

197. Used to treat foals with pyloric stenosis

198. Used to treat foals with an obstruction at the cardiac sphincter

199. Performed to bypass an area of extensive duodenal ulceration and stricture, beginning immediately distal to the pylorus and extending to the caudal flexure of the duodenum

#### Questions 200 through 202

You are called to examine a 5-year-old quarter horse gelding with acute abdominal pain of 6 hours' duration. The horse's heart rate is increased, borborygmi are reduced, and passage of a stomach tube yields 6 L gastric reflux. There is no obvious distention of the horse's abdomen, as assessed by external palpation of the paralumbar fossae.

200. Likely causes of these signs include all the following **except**:

- pelvic flexure impaction
- proximal enteritis-jejunitis
- ileal impaction
- small intestinal volvulus
- strangulation of small intestine through a mesenteric rent

201. The most appropriate diagnostic procedure to perform next is:

- abdominal radiography
- abdominocentesis
- rectal examination
- complete blood cell count and differential count
- serum chemistry profile

202. If this horse resides in the southeastern United States, the most likely cause of the problem is:

- pelvic flexure impaction
- proximal enteritis-jejunitis
- ileal impaction
- small-intestinal volvulus
- strangulation of small intestine through a mesenteric rent

203. You decide to perform an exploratory celiotomy. Because anesthesia and surgery time must be kept to a minimum, you must rapidly examine the abdominal organs during surgery. Which technique would permit most rapid examination of the small intestine for lesions causing abdominal pain?

- Exteriorize a loop of jejunum and trace in either direction to locate the lesion.
- Exteriorize the duodenum through the ventral midline incision and trace distally to locate the lesion.
- Exteriorize the cecum, follow the lateral cecal band on to the ileum, and trace proximally to locate the lesion.
- Exteriorize the cecum, follow the dorsal cecal band on to the ileum, and trace proximally to locate the lesion.
- Exteriorize the cecum and large colon, and then examine the small intestine through the ventral midline incision to identify the lesion.

204. Concerning inguinal hernias in horses, which statement is **least** accurate?

- Indirect hernias, in which abdominal viscera pass through the vaginal ring to enter the hernial sac, are the most common type of hernia in horses.
- Direct hernias, in which abdominal viscera enter the inguinal canal through a defect in the peritoneum adjacent to the vaginal ring, occur infrequently in horses.
- Most congenital inguinal and scrotal hernias in male foals resolve spontaneously by 4 months of age.
- The segment of intestine most commonly involved in inguinal or scrotal hernias in adult horses is the ileum or distal jejunum.
- The prognosis for survival of stallions undergoing surgical correction of an acquired inguinal or scrotal hernia is excellent, with survival rates ranging from 85% to 95%.

For Questions 205 through 209, select the correct answer from the five choices listed below.

- a. ileocecal intussusception
  - b. cecal impaction
  - c. large colon volvulus
  - d. uroperitoneum
  - e. pedunculated lipoma
205. Most commonly affects male foals 3 to 4 days of age
206. Occurs commonly in broodmares less than 3 months after foaling
207. Causes acute abdominal pain and gastric reflux in horses over 12 years of age
208. Most commonly causes abdominal pain in horses less than 3 years of age; may cause acute abdominal pain or chronic intermittent pain
209. Tends to cause mild to moderate abdominal pain in horses over 7 years of age
210. Which condition generally occurs in weanling foals recently dewormed for the first time
- a. ileocecal intussusception
  - b. cecal impaction
  - c. ascarid impaction
  - d. sand impaction
  - e. uroperitoneum
211. Which condition tends to occur in horses over 7 years of age and is characterized by acute abdominal pain and gastric reflux?
- a. ileocecal intussusception
  - b. ascarid impaction
  - c. uroperitoneum
  - d. large-colon volvulus
  - e. epiploic foramen entrapment

212. Concerning enterolithiasis in horses, which statement is **least** accurate?
- a. There is no apparent geographic distribution of enterolithiasis in the United States.
  - b. Enteroliths are composed primarily of magnesium ammonium phosphate.
  - c. Enteroliths most commonly obstruct the junction of the right dorsal colon and the transverse colon.
  - d. The prognosis after surgical intervention for enterolithiasis is excellent, with reported survival rates often exceeding 85%.
  - e. Horses are rarely affected before 4 years of age.
213. Which condition is **least** likely to cause small-colon obstruction in horses?
- a. impaction
  - b. foreign body
  - c. fecalith
  - d. intramural hematoma
  - e. intussusception

214. Concerning rectal lacerations, which statement is **least** accurate?
- a. Rectal lacerations are usually iatrogenic.
  - b. Grade 3 rectal lacerations perforate the mucosa, submucosa and muscularis, leaving only the serosa (or serosa and mesentery) intact.
  - c. Most rectal lacerations occur on the dorsal aspect of the rectum, between the 10 and 2 o'clock positions.
  - d. A diverting colostomy may be used to allow the rectal laceration to heal by second intention.
  - e. The prognosis with grade 3 and 4 rectal lacerations is very good, with reported survival rates approaching 80%.

215. Concerning acute laminitis in horses, which statement is most accurate?
- a. Acute laminitis has been produced in healthy horses by administration of bacterial endotoxin.
  - b. Severe (Obel grade 3) laminitis generally occurs within 12 hours after carbohydrate overload.
  - c. The primary aims of treating horses with impending acute laminitis are to counteract endotoxemia, minimize pain, and improve circulation within the digits.
  - d. Clinical conditions commonly associated with acute laminitis are retained placenta, pelvic flexure impaction, and gastric impaction.
  - e. Results of recent clinical studies indicate that transection of the common digital extensor tendon provides relief for horses with acute laminitis.

For Questions 216 through 220, select the correct answer from the five choices listed below.

- a. navicular disease
  - b. chronic laminitis
  - c. nonarticular wing fracture of the distal phalanx
  - d. degenerative joint disease involving the proximal interphalangeal joint
  - e. annular ligament constriction
216. This is characterized by unilateral lameness that is exacerbated by flexion of the metacarpophalangeal joint. Distention of the flexor tendon sheath is evident on palpation.
217. This is characterized by intermittent forelimb lameness and sensitivity to hoof testers, especially in the heel region. Lameness and sensitivity are alleviated by injection of local anesthetic over the medial and lateral palmar digital nerves.

218. This is characterized by forelimb lameness and sensitivity to hoof testers, especially over one heel. Lameness and sensitivity are alleviated by injection of local anesthetic over the palmar digital nerve innervating that heel region.
219. This is characterized by lameness that is exacerbated by flexion of the metacarpophalangeal joint. The gait improves after injection of local anesthetic over the nerves at the base of the proximal sesamoid bones.
220. This is characterized by bilateral forelimb lameness and a reluctance to bear weight on the forelimbs. Often there are repeated episodes of abscessation in the feet. Lameness improves after injection of local anesthetic over the nerves at the base of the proximal sesamoid bones.
221. Concerning septic tenosynovitis in horses, which statement is **least** accurate?

- a. Septic tenosynovitis predominantly involves the flexor tendon sheath and occurs secondary to a penetrating injury.
- b. Septic tenosynovitis is usually characterized by acute lameness, swelling of the affected tendon sheath and adjacent soft-tissue structures, and severe pain on flexion of the fetlock joint.
- c. It is not uncommon for the concentration of white blood cells in affected synovial fluid to exceed 40,000 cells/ $\mu$ L.
- d. Initial treatment of a horse with suspected septic tenosynovitis should include administration of a nonsteroidal antiinflammatory drug, debridement of any wounds, and topical application of dimethyl sulfoxide.
- e. The prognosis for horses with septic tenosynovitis depends on the rapidity of diagnosis, initiation of treatment with appropriate antimicrobial drugs, and lavage of the affected tendon sheath with sterile fluids.



222. Concerning brachygnathia in horses, which statement is most accurate?
- Diagnosis of brachygnathia requires lateral radiographs of the rostral mandibular and maxillary regions.
  - The maxillary incisors of affected horses are positioned caudal to the mandibular incisors.
  - Though the imperfect alignment of the incisors may be very evident in a horse with brachygnathia, alignment of the premolars and molars is normal.
  - Surgical correction of brachygnathia in an affected foal should not be instituted before the animal is 6 weeks of age.
  - Application of temporary wire braces is rarely successful in correcting a difference greater than 0.75 cm between the mandibular and maxillary incisors.

For Questions 223 through 227, select the correct answers from the five choices listed below.

- flexural deformity of the distal interphalangeal joint
  - transection of the distal check ligament
  - flexural deformity of the metacarpophalangeal joint
  - transection of the proximal check ligament
  - carpal flexural deformity
223. Surgical procedure that may be used in treatment of contracture of the superficial digital flexor tendon in young animals and also in treatment of bowed tendons
224. Generally affects young horses, 8 to 18 months of age, and causes the leg to be extremely upright or even flexed at the fetlock joint
225. Invariably occurs as a congenital abnormality and presumably occurs as a result of uterine malpositioning or teratogenic factors affecting the mare
226. Generally affects foals 2 to 8 months of age and is characterized by abnormal shape of the hoof

227. Surgical procedure that may be used in treatment of contracture of the deep digital flexor tendon and in mild cases of contracture of the superficial digital flexor tendon

For Questions 228 through 232, select the correct answer from the five choices listed below.

- Salter-Harris type V fracture
  - valgus deformity
  - varus deformity
  - incomplete ossification
  - hemicircumferential periosteal transection and elevation
228. This angular deformity involving the carpal bones themselves must be differentiated from other potential causes for the deformity.
229. This is medial deviation of the limb, distal to the location of the deformity.
230. This treatment for angular limb deformities in foals requires sufficient potential growth remaining in the ipsilateral side of the physis.
231. This is lateral deviation of the limb, distal to the location of the deformity.
232. This results in epiphysiodesis, which halts growth on one side of the bone.
233. Which procedure is used to correct angular limb deformities in foals and requires sufficient potential growth remaining in the contralateral side of the epiphysis?
- hemicircumferential periosteal transection and elevation
  - transection of the proximal check ligament
  - transection of the distal check ligament
  - fetlock arthrodesis
  - growth retardation with screws and wires

234. Which treatment should be used in a foal with varus deformity at the fetlock region and radiographic evidence of closed physes?
- hemicircumferential periosteal transection and elevation
  - immobilization of the limb in a full-limb cast
  - growth retardation with screws and wires
  - wedge osteotomy
  - transection of the fibrous joint capsule
235. Concerning osteochondrosis in horses, which statement is **least** accurate?
- Osteochondrosis typically affects young, rapidly growing horses.
  - A diet containing excessive amounts of protein and energy can produce physeal abnormalities in young horses.
  - In animals with osteochondrosis, cartilage of the epiphyseal and metaphyseal physes fails to mature properly.
  - Osteochondrosis may be manifested by subchondral cystic lesions, osteochondral flaps, or phytitis.
  - Treatment of animals with osteochondrosis includes feeding a diet containing minimal amounts of copper.
236. Which joint is **least** commonly affected by osteochondrosis?
- shoulder
  - stifle
  - hock
  - hip
  - elbow
237. Treatment of osteochondrosis in horses frequently includes surgical removal of affected tissue. Which lesion warrants the best prognosis with surgical intervention?
- osteochondritis dissecans of the lateral trochlear ridge of the femur
  - osteochondritis dissecans of the sagittal ridge of the third metacarpal bone

- osteochondritis dissecans of the glenoid cavity
  - osteochondritis dissecans of the distal intermediate ridge of the tibia
  - subchondral cystic lesion in the proximal aspect of the radius
238. Concerning interphalangeal degenerative joint disease in horses, which statement is most accurate?
- Low ringbone involves the articulation between the proximal and middle phalanges.
  - Horses with degenerative joint disease involving the proximal interphalangeal joint have a 25% chance of returning to full use after arthrodesis of the affected joint.
  - In general, the prognosis for return to full use after arthrodesis of the proximal interphalangeal joint is better for the hind limb than for the forelimb.
  - Degenerative joint disease in the distal interphalangeal joint is more common in the hind limbs than in the forelimbs.
  - There is no effective treatment for fracture of the extensor process of the distal phalanx.
239. Concerning villonodular synovitis in horses, which statement is **least** accurate?
- The enlarged synovial pad can be identified using ultrasonography.
  - Villonodular synovitis most commonly affects Thoroughbred race horses.
  - Horses with villonodular synovitis typically have chronic joint effusion, lameness, and a history of poor performance.
  - Flattening of the dorsal surface of the third metacarpal bone is present in all horses with villonodular synovitis.
  - Treatment of horses with villonodular synovitis often includes removal of the affected synovial pad.

For Questions 240 through 243, select the correct answer from the five choices listed below.

- apical sesamoid fracture
- nonarticular abaxial sesamoid fracture
- midbody sesamoid fracture
- basilar sesamoid fracture
- articular axial sesamoid fracture

240. Best treated with cancellous bone grafts

241. Best treated by fragment removal

242. Best treated by internal fixation with a compression screw

243. Best treated conservatively with stall rest

For Questions 244 through 247, select the correct answer from the four choices listed below.

- hematogenous spread of infection
- traumatic joint puncture
- time since disease onset and the number of joints involved
- organism and duration of infection before treatment

244. Major determinant of the prognosis in foals with septic arthritis

245. Most common cause of septic arthritis in adult horses

246. Major determinant of the prognosis in adult horses with septic arthritis

247. Most common cause of septic arthritis in foals

248. Concerning fractures of the distal phalanx in horses, which statement is most accurate?

- Affected horses usually are lame, are sensitive to hoof testers over the sole, and have an increased digital pulse.
- Because of the concave shape of the distal phalanx, fractures rarely extend into the distal interphalangeal joint.

- Therapeutic shoeing of a horse with a midsagittal fracture includes application of a slipper shoe to encourage expansion of the heels.
- Fractures of the distal phalanx generally heal within 6 weeks using stall rest.
- Yearling horses with a midsagittal fracture of the distal phalanx require internal fixation of the fracture.

249. Concerning fractures of the proximal phalanx, which statement is most accurate?

- Horses with a comminuted fracture in which an intact portion of bone extends from the metacarpophalangeal joint to the proximal interphalangeal joint should be treated with a cast.
- Horses with a comminuted fracture in which an intact portion of bone extends from the metacarpophalangeal joint to the proximal interphalangeal joint should be treated with internal fixation.
- Most proximal phalanx fractures occur in horses used for jumping.
- Diagnostic regional anesthesia should be used to confirm an oblique fracture of the proximal phalanx.
- The prognosis for horses with noncomminuted fractures of the proximal phalanx is poor, regardless of the type of therapy.

250. Concerning fractures of the small metacarpal and metatarsal bones in horses, which statement is least accurate?

- Fractures of the small metacarpal or metatarsal bones occur only as a consequence of direct external trauma.
- In older standardbred horses fractures of the distal end of a small metatarsal or metacarpal bone may be associated with an insidious onset of clinical signs.
- Fractures of the proximal portion of the small metacarpal and metatarsal bones may develop sequestra.
- Fractures involving the proximal portion of the small metacarpal and metatarsal bones may require internal fixation with a bone plate.
- When repairing proximal fractures of the small metacarpal and metatarsal bones using internal fixation, the bone screws should fully engage the cortex of the third metacarpal or metatarsal bone.

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251. Clinical signs associated with postoperative intraabdominal adhesion formation in horses are most common:

- following pelvic flexure enterotomy
- in weanlings and yearlings
- following small intestinal resection and anastomosis
- in horses with colitis
- in female horses

252. Omphalophlebitis in foals most commonly involves the:

- external umbilical remnant
- internal umbilical remnant
- umbilical arteries
- umbilical vein
- umbilical arteries and internal umbilical remnant

253. Fractures of the distal splint bones:

- are rarely associated with suspensory ligament desmitis
- occur most commonly in young quarter horses
- should be surgically treated by removal of the proximal portion of the splint bone
- should be treated conservatively because surgical removal is associated with a high complication rate
- are associated with suspensory ligament desmitis and should be surgically treated by removal of the distal portion of the splint bone

254. Fractures of the middle one third of the splint bone are best treated:

- conservatively
- by removal of the fragment only
- with a narrow dynamic compression plate
- with screws and wire
- by removal of the entire splint bone

255. Concerning carpal chip fractures, which statement is most accurate?

- They are most common in Western performance horses.
- They are most common in the proximal radial carpal bone and distal third carpal bone.
- They are best treated by fragment removal via arthroscopy.
- They are best treated by fragment removal via arthrotomy.
- They are most common in the proximal radial carpal bone and proximal intermediate carpal bone.

256. Approximately what proportion of horses with a carpal chip fracture and minimal articular cartilage damage return to performance (at same level or higher) following arthroscopic removal of fracture fragments?

- 90% to 95%
- 80% to 90%
- 70% to 80%
- 60% to 70%
- less than 60%

257. A 15-year-old quarter horse gelding has a grade 3/5 carpal lameness, with reduced range of motion and marked pain on carpal flexion. Radiographs reveal several large osteophytes and joint space narrowing consistent with degenerative joint disease. What is the most appropriate treatment for this horse?

- arthroscopic removal of the osteophytes
- carpal arthrodesis
- rest, corrective shoeing, phenylbutazone, intraarticular polysulfated glycosaminoglycans, and corticosteroids
- rest, corrective shoeing, phenylbutazone, and intraarticular hyaluronate
- carpal arthrotomy and removal of the osteophytes

258. Horses with severe high articular ringbone (pastern joint degenerative joint disease):
- have a poor prognosis for soundness, regardless of treatment
  - have a good prognosis for soundness following pastern arthrodesis
  - have a poor prognosis for soundness following pastern arthrodesis
  - have a good prognosis for soundness with conservative treatment
  - usually develop pastern joint ankylosis within 1 year of onset of lameness
259. Pastern arthrodesis is a suitable treatment for:
- high ringbone, fracture of the first phalanx, and pastern joint luxation
  - pastern joint luxation, low ringbone, and fracture of the second phalanx
  - fracture of the second phalanx, fracture of the first phalanx, and pastern joint luxation
  - low ringbone and pastern joint luxation
  - high ringbone, pastern joint luxation, and fracture of the second phalanx
260. Concerning type I (apophyseal) olecranon fractures, which statement is **least** accurate?
- They occur most commonly in foals less than 3 months old.
  - They should be repaired with screws and wire only.
  - They are difficult to repair surgically.
  - They should be repaired with hook plates (Synthes plates) or contoured narrow dynamic compression plates.
  - They have a fair (50% to 70%) prognosis for soundness.
261. Closed third metacarpal bone fractures in adult horses should be repaired with:
- intramedullary pins
  - cerclage wires
  - lag screws
  - transfixation pins
  - dynamic compression plates
262. Which suture material and pattern are suitable for bladder closure in a foal?
- 2-0 polyglycolic acid in a single layer of simple-interrupted sutures
  - 2-0 polyglycolic acid in inverting layers of simple-continuous and continuous sutures
  - 2-0 polypropylene in inverting layers of simple-continuous and continuous sutures
  - 2-0 polypropylene in a single layer of simple-interrupted sutures
  - 2-0 silk in inverting layers of simple-continuous and continuous sutures
263. Treatment of chronic septic tenosynovitis may include:
- tenoscopic debridement of the tendon sheath, local injection of Lugol's iodine, and systemic antibiotics and nonsteroidal antiinflammatory drugs
  - annular ligament desmotomy, local injection of Lugol's iodine, and systemic antibiotics and nonsteroidal antiinflammatory drugs
  - tenoscopic debridement of the tendon sheath, tendon splitting, and systemic antibiotics and nonsteroidal antiinflammatory drugs
  - annular ligament desmotomy, local injection of nonsteroidal antiinflammatory drugs, and systemic antibiotics
  - tenoscopic debridement of the tendon sheath, annular ligament desmotomy, and systemic antibiotics and nonsteroidal antiinflammatory drugs
264. Lacerations of the superficial digital flexor should be repaired with:
- no. 2 polydioxanone in a single locking loop
  - no. 2 polydioxanone in a three-loop pulley
  - no. 1 nylon in a single locking loop
  - no. 1 polyglactin 910 in a double locking loop
  - 2-0 silk in a simple-continuous pattern
265. What is the recommended treatment for a closed comminuted third metacarpal fracture in a foal?
- dynamic compression plate
  - intramedullary pin
  - full-limb cast
  - screws
  - cerclage wires
266. Approximately what proportion of horses with a displaced lateral condylar fracture return to performance (at same level or higher) following surgical repair?
- 75% to 80%
  - 60% to 70%
  - 40% to 50%
  - 20% to 30%
  - less than 10%
267. Persistent, severe upward (proximal) fixation of the patella should be treated with:
- rest
  - exercise up an incline
  - injection of the patellar ligaments with a sclerosing agent
  - desmotomy of the medial patellar ligament
  - desmotomy of the middle patellar ligament
268. In ileocolic anastomosis, the anastomosis is formed between the ileum and the:
- right ventral colon
  - right dorsal colon
  - left ventral colon
  - left dorsal colon
  - right or left dorsal colon
269. The cecocolic ligament is located between what two structures?
- the lateral band of the cecum and the lateral free band of the right ventral colon
  - the medial band of the cecum and the lateral free band of the right ventral colon
  - the lateral band of the cecum and the medial free band of the left ventral colon
  - the dorsal band of the cecum and the lateral free band of the right ventral colon
  - the dorsal band of the cecum and the medial free band of the left ventral colon
270. Concerning volvulus of the large colon, which statement is most accurate?
- The large colon typically is twisted in a clockwise direction.
  - The prognosis following surgical correction is excellent.
  - Intestinal viability can easily and accurately be assessed with intravenous fluorescein dye.
  - It is most common in young Thoroughbred racehorses.
  - It rapidly causes extreme pain and severe physiologic compromise.
271. What are the most common postoperative complications of small-intestinal resection and anastomosis?
- intestinal abscessation and adhesion formation
  - ileus and peritonitis
  - adhesion formation and ileus
  - intestinal abscessation and ileus
  - ileus and adhesion formation
272. What is the most common cause of colic in miniature horses?
- epiploic foramen entrapment
  - right dorsal displacement
  - large-colon impaction
  - small-colon impaction
  - enterolithiasis
273. What is the most common cause of surgical colic in aged horses (older than 18 years)?
- nephrosplenic entrapment
  - large-colon volvulus
  - strangulating lipoma
  - large-colon displacement
  - colitis
274. Approximately what proportion of horses fully recover following small intestinal resection and anastomosis?
- less than 15%
  - 20% to 40%
  - 50% to 70%
  - 80% to 90%
  - greater than 90%

275. Concerning sarcoids, which statement is most accurate?
- The rate of recurrence is less than 10% following resection with 1 cm margins.
  - Immunotherapy is the treatment of choice.
  - They occur most commonly in the flank area.
  - They are locally invasive, do not metastasize, and recur commonly.
  - They commonly become fibrosarcomas following cryotherapy.
276. Most perineal lacerations:
- are considered third-degree lacerations and require no treatment
  - result from "excessive" Caslick's vulvoplasty
  - result in myositis
  - occur at the time of foaling and are most severe in primiparous mares
  - should be repaired only after the mare is rebred
277. Why is perineal urethrotomy usually performed in male horses?
- permanent urinary diversion
  - repair of urethral laceration
  - temporary urinary diversion
  - removal of urethral calculi
  - removal of a urethral neoplasm
278. When performing a laparotomy using an incision through the paralumbar region, which layers are incised, from exterior to interior?
- integument, superficial fascia (including cutaneous trunci), external abdominal oblique muscle, and parietal peritoneum
  - integument, superficial fascia (including cutaneous trunci), external abdominal oblique muscle, transversalis fascia, and parietal peritoneum
  - integument, cutaneous fascia, superficial fascia, deep fascia, external abdominal oblique muscle, internal abdominal oblique muscle, transverse abdominal muscle, and visceral peritoneum
  - integument, superficial fascia, cutaneous fascia, deep fascia, internal abdominal oblique muscle, transversalis fascia, and visceral peritoneum
  - integument, superficial fascia, cutaneous fascia, deep fascia, external abdominal oblique muscle, internal abdominal oblique muscle, transversalis fascia, and parietal peritoneum
279. Concerning castration of horses, which statement is most accurate?
- The cremaster muscle, an extension of the internal abdominal oblique muscle, may contract during castration and impair proper placement of emasculators.
  - The cremaster muscle, an extension of the external abdominal oblique muscle, courses through the inguinal canal along with the spermatic cord and testicular arteries, veins, and nerves.
  - An open method of castration requires laparotomy.
  - Horses should be strictly confined to a small stall and not even handwalked for 7 to 10 days following castration.
  - Orchitis is a common complication of castration.
280. Cystorrhaphy is the surgical technique of choice for management of:
- urolithiasis
  - patent urachus
  - transitional-cell carcinoma
  - ruptured bladder
  - ectopic ureter
281. Joint fracture fixation techniques have allowed considerable improvement in all the following **except**:
- reduction but not fixation of fractures
  - increased recognition of development of osteoarthritis
  - the effect of osteoarthritis on prognosis and athletic outcome
  - reduced fibrosis and joint capsule stiffness
  - means of assessing fractures
282. In what instance would arthroscopy appropriately be used in place of arthrotomy?
- when it is necessary to control internal fixation of fractures that require gross manipulation
  - in circumstances in which the joint is infected and fibrin filled
  - for surgical treatment of subchondral bone cysts of the medial femoral condyle
  - for repair of complete, displaced condylar fractures of the third metacarpal bone
  - arthrodesis of the pastern joint
283. Surgical treatment to eliminate infectious debris and metabolic byproducts in such diseases as infectious arthritis can be accomplished by:
- internal fixation
  - soft tissue debulking and debridement
  - arthrodesis
  - arthroscopic lavage
  - osseous forage
284. Advantages of arthroscopic surgery over arthrotomy include all the following **except**:
- diagnostic accuracy
  - less tissue damage
  - better cosmetic appearance
  - decreased postoperative pain
  - less need for complete irrigation of the joint and elimination of debris
285. In performing Caslick's vulvoplasty, removal of perineal skin results in:
- excessive fibrosis
  - pneumovagina
  - incision dehiscence
  - keloid formation
  - cranial diversion of urine and subsequent urovagina
286. Concerning perineal lacerations, which statement is **least** accurate?
- First-degree lacerations involve only the vestibular mucosa and skin of the dorsal vulvar commissure.
  - Second-degree lacerations involve the vestibular mucosa and submucosa and muscles of the perineal body.
  - Third-degree lacerations disrupt the perineal body, anal sphincter, rectal floor, and vestibular ceiling.
  - First-degree lacerations result in fecal contamination of the vestibule and vagina.
  - Pneumovagina, vaginitis, cervicitis, and endometritis are sequelae of third-degree lacerations.
287. Surgical repair of perineal lacerations:
- requires the mare be under general anesthesia and in dorsal recumbency
  - involves eversion of the urinary bladder
  - requires preoperative corticosteroid therapy
  - may require preoperative alteration of the diet to ensure soft feces
  - is correctly termed an *episioplasty*
288. Vesicovaginal reflux is based on demonstration of urine in the cranial portion of the reproductive tract. Speculum examination usually reveals accumulation of urine in the vaginal fornix. Concerning vesicovaginal reflux, which statement is most accurate?
- Surgical repair should only be attempted if the ovaries are proved to be functional.
  - Correction relies on the mare's being in estrus at the time of surgery for improved uterine tone.
  - Surgical repair involves moving transverse vaginal folds into a more cranial position to prevent urine reflux.
  - It can be alleviated by sexual rest and weight gain if it is associated with poor physical condition
  - Corrective surgery cannot be performed on mares without an episiotomy.

289. Concerning tracheotomy, which statement is most accurate?
- It involves incision through the paired sternothyroideus muscles.
  - It involves incision through the cutaneous colli muscle.
  - It involves a vertical incision through two or three annular ligaments and the interposed one or two tracheal cartilages.
  - It involves an incision parallel to the tracheal cartilages, extending approximately two thirds of the circumference of the trachea.
  - It often involves a lateral approach between the brachiocephalicus and sternocephalicus muscles.
290. Most cases of laryngeal hemiplegia are considered to be:
- idiopathic
  - congenital
  - the result of neurotoxicity
  - the result of hyperplasia
  - the result of hypoplasia
291. A prosthetic laryngoplasty tie-back mimics permanent contraction of which muscle?
- arytenoideus transversus
  - cricoarytenoideus dorsalis
  - cricoarytenoideus lateralis
  - thyroarytenoideus
  - ventricularis
292. Which of the following is **not** an acceptable surgical approach to the guttural pouches?
- hypovertebrotomy
  - Viborg's approach
  - Whitehouse approach
  - transtracheal approach
  - modified Whitehouse approach
293. Which of the following is a surgical disease of the small intestine?
- sand colic
  - colitis
  - torsion
  - ascarid impaction
  - nephrosplenic entrapment
294. What is the most common site for enterotomy in horses?
- dorsal colon
  - ventral colon
  - pelvic flexure
  - transverse colon
  - descending colon
295. What is a typhlotomy?
- cecal enterotomy
  - large-colon resection
  - small-colon anastomosis
  - large-colon derotation
  - large-colon enterotomy
296. All the following are surgical diseases of the small colon and rectum **except**:
- enterolithiasis
  - submucosal hematoma
  - mesocolic rupture
  - inguinal hernia
  - meconium retention
297. In colic surgery the ileum is found by:
- grasping the dorsal tenia and following it to the ileocecal fold
  - grasping the ventral tenia and following it to the ileocecal fold
  - grasping the lateral tenia and following it to the ileocecal fold
  - grasping the medial tenia and following it to the ileocecal fold
  - grasping the ventral tenia and following it to the ileocecal fold

298. Concerning skin grafts, the highest priority in the recipient area is:
- reestablishing innervation
  - reestablishing lymphatic drainage
  - establishing intimate contact of the donor and recipient germinal epithelium
  - reestablishing vascularization
  - keeping the tissue well hydrated to eliminate contraction
299. An atheroma is:
- a laryngeal cyst
  - an adenocarcinoma of the guttural pouch
  - a congenital disorder involving the false nostril
  - a pharyngeal cyst
  - a cutaneous malignant melanoma of dark-skinned horses
300. Concerning fibrotic myopathy, which statement is most accurate?
- It involves primary degeneration of the quadriceps muscle group.
  - It is secondary to femoral nerve neuropathy.
  - It causes a goose-stepping gait.
  - It is most common in draft horses.
  - Treatment involves resection of the entire affected muscle.

## CATTLE

C.E. Wallace

Practice answer sheets are on pages 295-297.

### Questions 301 and 302

A fat beef cow is presented for examination. One week previously the cow had been treated for prolapse of the vagina. The prolapse had been replaced and retention sutures were used. A couple of days ago the cow apparently went into labor, which was not observed. Now the cow is depressed and has a distended abdomen. Fetal membranes remain in the uterus and the cervix is nearly closed. There is a foul, suppurative vulvar discharge.

301. What surgical procedure is indicated at this time?
- fetotomy
  - episiotomy
  - cervicotomy
  - hysterotomy
  - hysterectomy

### 302. What surgical approach should be used?

- transvulvar
- perivulvar
- transcervical
- flank
- ventral midline

### Questions 303 through 305

A champion Hereford cow has a necrotic, ulcerated mass on the right upper eyelid. There is also a smaller ulcerated lesion on the lower left eyelid.

### 303. The lesions in this cow are most likely:

- sarcoid
- squamous-cell carcinoma
- fibrosarcoma
- lymphosarcoma
- papilloma

304. The cryogen most often used in treatment of such ocular lesions in cattle is:

- carbon dioxide
- ethyl chloride
- liquid nitrogen
- liquid oxygen
- nitrous oxide

305. A successful treatment for small lesions, such as the one on this cow's left eye, involves thermal therapy using:

- $\alpha$ -rays
- $\beta$ -rays
- $\gamma$ -rays
- x-rays
- radio waves

#### Questions 306 and 307

A Brahman bull is presented because of lameness of the right rear leg. Several days previously the bull was very lame with a noticeably abnormal gait, but now he walks almost normally. There is no obvious swelling in the leg or foot.

306. The most likely cause of this bull's lameness is:

- hoof abscess
- upward fixation of the patella
- interdigital fibroma
- fracture of the coffin bone
- laminitis

307. If you find that the toe has been worn short on the right rear foot, as compared with the left one, what condition would you suspect?

- upward fixation of the patella
- laminitis
- typical sole ulcer
- hoof abscess
- fracture of the coffin bone

#### Questions 308 and 309

A 2-year-old Hereford bull is unable or unwilling to breed. The bull follows cows in estrus but does not mount them. A firm swelling is present just cranial to the sigmoid flexure area, along with eversion of the preputial mucosa.

308. The most likely cause of nonbreeding in this bull is:

- penile hematoma
- urethral rupture
- preputial stenosis
- persistent penile frenulum
- preputial abscess

309. Six months after successful therapy, the bull returns for a prebreeding examination. All the following should be evaluated at that time **except**:

- sensitivity of the glans penis
- full active protrusion of the penis
- full erection of the penis
- semen quality
- retraction ability of the preputial muscles

310. Which of the following conditions is **not** a usual cause of colic in dairy cows?

- intussusception
- uterine torsion
- cecal volvulus
- abomasal torsion
- urolithiasis

311. A 3-year-old Holstein cow has decreased milk production, sudden onset of depression, and scant feces. You auscultate a gas cap on the right side of the abdominal cavity. Which of the following is **not** a likely differential diagnosis in this case?

- intussusception
- cecal dilatation
- abomasal displacement
- traumatic reticulitis
- retroperitoneal abscess

312. At right flank laparotomy on a cow with gaseous distention of the cecum, colon, and intestinal tract associated with a volvulus, what procedure should be performed **first** to allow resolution of the problem?

- decompression
- derotation
- fistulization
- stabilization
- revolution

313. What is a common cause of iatrogenic pharyngeal abscessation in cattle?

- septicemia
- rumenitis
- reflux of gastric juices
- trauma from a headgate
- improperly administered oral medication

314. On rectal examination enlargement of the lymph nodes found at the juncture of the dorsal and ventral sacs of the rumen can be a sign of:

- simple indigestion
- lymphosarcoma
- inflammation in the cranial abdomen
- functional obstruction to outflow from the rumen
- excessive ingestion of poor-quality forage

315. Cows with traumatic reticulitis often show neutrophilic leukocytosis on a complete blood count. Another sign of this condition is:

- melena
- diarrhea
- vomiting
- expiratory grunt
- ping auscultated in the area of the last 3 ribs on the left flank

316. Spontaneous recovery is common in cattle with:

- abomasal volvulus
- hepatic lipidosis
- simple indigestion
- frothy bloat
- abomasal displacement

317. Cud-dropping in cattle indicates lack of control of the normal regurgitation process. This sign may accompany:

- left abomasal displacement
- simple indigestion
- traumatic reticulitis
- fat necrosis
- gastric ulcers

318. Hypochloremic, hypokalemic metabolic alkalosis is most common in cattle with:

- left abomasal displacement
- abomasal volvulus
- cecal dilatation
- fat necrosis
- frothy bloat

319. When making an incision into a cow's right paralumbar fossa, care must be taken to avoid accidental incision of the:

- uterus
- cecum
- right kidney
- duodenum
- abomasum

320. The most appropriate surgical site for ventral abomasopexy in a dairy cow restrained in dorsal recumbency is:

- left paramedian, between the umbilicus and sternum
- right paramedian, between the umbilicus and sternum
- left paramedian, caudal to the umbilicus
- right paramedian, caudal to the umbilicus
- on the midline, between the umbilicus and sternum

321. Torsion of the cecum or colon, intussusception, and uterine torsion are diseases with a common clinical sign of:

- melena
- colic
- distention of the jugular veins
- enlargement of the prefemoral lymph nodes
- distention of the left flank

322. Obstruction of a cow's esophagus caused by a turnip lodged at the cardia can often be practically treated by:
- passing a stomach tube or probang
  - thoracotomy
  - esophagomyotomy
  - manual removal with a snare
  - oral administration of lytic enzymes
323. Cecal torsion in cattle is usually treated by:
- detorsion only
  - decompression and detorsion
  - decompression, detorsion, and cecopexy
  - detorsion and cecopexy
  - resection after decompression and detorsion
324. The first step in treatment of a freshly lacerated streak canal of a Jersey cow's teat involves:
- adequate restraint
  - physical examination
  - analgesia and/or anesthesia
  - thorough wound cleansing
  - debridement of the wound
325. A useful instrument to aid removal of a lactolith from a cow's teat is:
- a Stoll teat bistoury
  - a Lichty teat knife
  - a Hudson teat spiral
  - an alligator forceps
  - a Hug tumor extractor
326. Most cases of penile hematoma in bulls:
- occur in bulls with Brahman bloodlines
  - require surgical drainage and repair
  - respond well to medical therapy
  - have a very poor prognosis for return to useful function
  - are not seen soon enough to be treated effectively
327. Which animal has the best prognosis following uncomplicated surgery?
- cow with traumatic reticuloperitonitis associated with penetration of the reticulum by a large wire
  - cow with left abomasal displacement, ketosis, and hypocalcemia
  - steer with reticulo-omasal-abomasal volvulus
  - cow with left abomasal displacement, leukopenia, and diarrhea
  - bull with a strangulated small intestine associated with an inguinal hernia
328. Which animal has the **worst** prognosis for return to function following uncomplicated surgery?
- 4-year-old brown Swiss cow with cecal volvulus
  - 6-year-old Guernsey cow with left displacement of the abomasum
  - 2-year-old Ayrshire bull with a fractured first incisor
  - 3-year-old Holstein cow with vagus indigestion
  - yearling Jersey heifer with a trichobezoar in the abomasum
329. The most common postoperative complication of dehorning in cattle is:
- hemorrhage
  - sinusitis
  - tetanus
  - fracture of the frontal bone
  - sequestrum formation
330. The usual site of incision to remove a urethral calculus in a bull or steer is the:
- urethral process
  - urethral diverticulum
  - midventral aspect of the bladder
  - area caudal to the sigmoid flexure of the penis
  - area cranial to the sigmoid flexure of the penis

### Questions 331 through 333

A purebred Guernsey heifer has a large granuloma on the plantar aspect of the right hind leg. The animal injured the leg about a month previously by kicking a metal feed trough.

331. Granulomas on the plantar aspect of the leg are often associated with:
- tendon trauma
  - ligament rupture
  - parasitic infestation
  - mycotic infection
  - lymphangitis
332. Following debridement of the wound, what principle of wound therapy must be employed to facilitate healing?
- frequent trimming of the granulation tissue
  - antimycotic therapy
  - antiparasitic therapy
  - antibacterial therapy
  - immobilization
333. If the toe of the lateral claw tilts dorsally when the heifer places weight on the foot, this could indicate:
- superficial flexor tendon rupture
  - suspensory ligament rupture
  - deep flexor tendon rupture
  - collateral ligament rupture
  - fracture of the third phalanx

### Question 334

Venous blood gas analysis on a Hereford cow with depression, anorexia, and shock shows the following results:

pH	7.454	base excess	+11.1 mEq/L
carbon dioxide tension	49.4 mm Hg	bicarbonate	32.9 mEq/L
oxygen tension	37.6 mm Hg	total carbon dioxide	34.2 mEq/L

334. These findings indicate:
- normal blood gas values
  - respiratory acidosis
  - metabolic acidosis
  - respiratory alkalosis
  - metabolic alkalosis
335. What simple test can usually differentiate an umbilical abscess or scar tissue from an umbilical hernia?
- detection of heat in the swelling
  - aspiration of the swelling
  - reducibility of the swelling
  - complete blood cell count
  - serum fibrinogen determination
336. A 10-year-old Guernsey cow is weak and depressed and has difficulty breathing, bilateral jugular vein distention, and brisket edema. The heart sounds are muffled by splashing sounds, but no murmur is detected. The most likely cause of these findings is:
- traumatic pericarditis
  - congestive heart failure
  - hemopericardium
  - valvular endocarditis
  - lymphosarcoma
337. A Jersey bull calf is castrated at 1 month of age by cutting off the ventral aspect of the scrotum and pulling the testicles off. About 1 week later the calf is febrile, walks stiffly, and has a swollen scrotum. The most likely cause of these findings is:
- hematoma
  - scirrhous cord
  - clostridial infection
  - peritonitis
  - normal postcastration behavior
338. What causes a granulomatous reaction on the ventral aspect of the scrotum after castration?
- bacterial infection
  - postoperative hemorrhage
  - mycotic infection
  - parasitic myiasis
  - prolapse of fatty tissue

339. An instrument useful for crushing the spermatic cord in castration of calves without cutting the skin is called an:

- écraseur
- emasculator
- emasculatome
- effeminator
- elastrator

340. A 4-month-old Simmental calf has been lame for 1 week. The calf is very lame on the right rear leg and has swelling in the semimembranosus muscles of both legs, associated with antibiotic injections. Radiographs show a physeal fracture of the second phalanx involving the articulation between P1 and P2. What method of treatment is most appropriate for this valuable bull calf?

- Apply a cast to the limb, from the foot proximally to the hock joint.
- Perform open reduction, repair with K-pins, and apply a cast.
- Perform closed reduction, repair with K-pins, and apply a cast.
- Relieve weight bearing on the affected claw by applying a wooden block to the ventral aspect of the normal claw.
- Amputate the affected claw.

#### Questions 341 and 342

A 3-year-old Holstein cow has a swollen right rear foot. There is a draining tract on the lateral aspect, just distal to the dewclaw.

341. The most likely cause of these signs is:

- suppurative arthritis
- suppurative tenosynovitis
- footrot
- subsolar abscess
- plantar wart

342. What surgical procedure, if any, should be performed?

- Surgery is not required; allow the abscess to drain and heal.
- Perform corrective hoof trimming.
- Perform drainage and digital tenectomy.

- Perform cryotherapy of the affected area.
- Amputate the affected claw.

343. An appropriate treatment for chronic laminitis in a lame dairy bull is:

- periodic intravenous regional analgesia
- periodic corrective hoof trimming
- application of wooden blocks to the ventral aspect of the unaffected claws
- stabling in a stall with soft, spongy bedding
- digital neurectomy

344. A major cause of laminitis in cattle is:

- rumenitis/lactic acidosis
- mastitis-metritis complex
- retained fetal membranes
- vagus indigestion
- chronic hoof trauma from concrete surfaces

345. What suture pattern is recommended to close a uterine incision following cesarean section?

- everting continuous
- everting interrupted
- inverting continuous
- inverting interrupted
- appositional simple interrupted

346. In cows, caudal paralysis or paresis associated with calving is often related to damage of the:

- obturator nerve
- sciatic nerve
- cauda equina
- peroneal nerve
- tibial nerve

347. A principle of therapy for fracture of the third phalanx, a typical sole ulcer or a sole abscess in cattle, is to:

- amputate the affected claw
- trim the lesion on the affected claw
- relieve weight bearing on the affected claw by applying a wooden block to the ventral aspect of the normal claw
- provide a copper sulfate footbath
- immobilize the affected claw in a cast

348. Concerning lameness in cattle, which statement is most accurate?

- Rusterholz ulcer, the typical sole ulcer of cattle, is related to pressure necrosis and often leads to infection of the coffin joint.
- Most weight is borne by the lateral claws of the front feet and medial claws of the rear feet.
- Fracture of the tibial crest in calves usually has a good prognosis.
- The hooves of cattle should be trimmed so that weight is supported on the axial part of the sole rather than on the wall or heel.
- The prognosis for return to function in a dairy cow with coxofemoral luxation is very good.

349. In a newborn calf slight contracture of the flexor tendons that does not interfere with weight bearing is best treated by:

- applying a cast with the leg in extension
- tenotomy in the midmetacarpal region and application of a splint

- tenotomy in the midmetacarpal region
- applying a splint with the leg in extension
- allowing adequate exercise

350. A 6-year-old Holstein cow that has been used as an embryo donor is unable to rise. The cow slipped on a concrete surface and fell about 10 days previously. The cow regained her feet and appeared normal, but 2 days ago the cow went down and now cannot rise. Crepitation is evident in both stifle joints. The most likely cause of recumbency in this cow is:

- septicemia
- lymphosarcoma
- hypocalcemia
- ruptured stifle ligaments
- coxofemoral dislocation

## FOOD ANIMALS

W.G. Queen

Practice answer sheets are on pages 295-297.

351. Concerning closed correction of a left-displaced abomasum (roll and tack or toggle procedure) in cattle, which statement is most accurate?

- The animal should first be placed in left lateral recumbency.
- The animal should first be placed in right lateral recumbency.
- It is generally considered of no importance on which side the animal is first cast.
- Such complications as abscessation are very rare.
- The goal is to perform an omentopexy.

352. Which of the following is **not** considered a likely contributing factor to left displacement of the abomasum in cattle?

- enlargement of the gravid uterus as pregnancy progresses
- increased exercise
- pain or swelling in the left side of the udder
- placement of animals in right lateral recumbency for such procedures as hoof trimming
- genetic factors, such as a larger and deeper abdominal cavity, that are generally associated with higher-producing or larger cows



353. *Projectile vomiting rarely occurs in cattle. When it does occur, the list of differential diagnoses should include all the following except:*
- traumatic gastritis
  - mesenteric torsion
  - left-displaced abomasum
  - uterine torsion
  - digestive tract obstruction
354. *Right flank exploratory laparotomy is commonly performed in cattle to investigate all the following potential problems except:*
- liver disease
  - intestinal disease
  - genital tract disease
  - kidney disease
  - disease of the reticulum
355. *Concerning left-displaced abomasum in dairy cows, which statement is most accurate?*
- It is most common in first-calf heifers 2 to 3 weeks before calving.
  - It is most common in the last third of lactation.
  - It does not appear to be related to dietary fiber intake.
  - It occurs more in midsummer, when vegetation is lush and has a high moisture content than during other seasons.
  - It occurs mostly in 4- to 6-year-old cows within the first few postpartum weeks.
356. *Of the following laboratory findings, which is most likely to occur with severe abomasal volvulus?*
- hyperchloremia and hyperkalemia
  - decreased packed cell volume
  - decreased pulse rate
  - hypochloremia and hypokalemia
  - hyperchloremia and hypermagnesemia
357. *Concerning intestinal surgery, which statement is most accurate?*
- Of the layers of the intestine, the mucosa is best able to retain sutures.
  - Of the layers of the intestine, the submucosa is best able to retain sutures.
  - A mass of mesenteric blood vessels should not be blindly ligated in cattle.
  - Heavy fat deposits in the mesentery of swine necessitates blind mass ligation of mesenteric vessels.
  - Internal herniation is not a concern when encountering omental tears in cattle.
358. *Concerning anesthesia in food animals, which statement is most accurate?*
- As a general rule physical restraint and local anesthesia are the safest procedures when performing surgery on medium-sized to large ruminants
  - For local anesthesia of the horn the cornual nerve, which is a branch of the lacrimal portion of the ophthalmic division of the facial nerve, is blocked.
  - For incision in the paralumbar fossa, simple infiltration slightly caudal to the incision line provides sufficient anesthesia.
  - The two most common areas for epidural anesthesia in cattle are between L1-2 and Cd1-2.
  - When xylazine is used alone, sheep develop better analgesia than do goats.
359. *Concerning ocular squamous-cell carcinoma (cancer eye) in cattle, which statement is most accurate?*
- Angus cattle have a predilection because of their darker skin, which absorbs more carcinogenic UV rays.
  - It is most common in cattle 1 to 2 years old.
  - As a rule squamous-cell carcinomas metastasize very early in cattle.
  - It occurs at the corneal-bulbar conjunctival junction in over 50% of the cases.
  - As a general rule squamous-cell carcinomas have fingerlike projections that sharply protrude from the gross lesion.
360. *Concerning surgical decisions related to the udder, which statement is most accurate?*
- An occluded teat is best opened surgically only during the dry period.
  - A severely damaged teat sphincter often completely regains normal function because of the healing capability of the abundant vascular supply in the area.
  - Minute communicating canals between quarters allow spread of bacteria between quarters.
  - When surgically opening a contracted teat sphincter with a Lichty teat knife, the cuts should be made internally into the sphincter (from the inside out) to allow dripping of the milk from the teat orifice.
  - A contracted teat sphincter need not be treated, as this condition does not affect milk flow when modern milking machines are used.
361. *Concerning dehorning baby goats, which statement is least accurate?*
- Many fairs and goat shows prohibit showing animals with horns because of the possibility of injury from butting.
  - Alpine goats should be dehorned at 30 to 60 days of age to minimize surgical complications.
  - Polled goats usually have intersex recessive genes.
  - In young and adult goats the dehorning site should be bandaged after dehorning.
  - Disbudding* is the term used for dehorning a baby goat less than 10 days of age.
362. *Concerning factors related to wound healing, which statement is least accurate?*
- Bandaging a wound with nonadherent dressings appears to enhance migration of epithelial cells across the wound.
  - Normovolemic anemia appears to impair wound healing.
  - Infection impairs healing by increasing the cellular response, which prolongs the debridement phase of healing.
  - The suturing technique selected influences the rate of wound healing.
  - Wounds heal faster at ambient temperatures of 30° C than at normal room temperatures (20° to 22° C).
363. *Which of the following is not an advantage of continuous suture patterns over a simple-interrupted pattern?*
- a speed of application
  - minimal amount of suture required
  - ease of removal
  - more complete tissue apposition
  - decreased edema of the healing wound
364. *Concerning atresia coli, which statement is least accurate?*
- In calves, it most commonly involves the spiral loop of the ascending colon.
  - Atresia coli does not occur in sheep and swine; anal stricture does occur in those species.
  - In cattle it has been associated with rectal palpation during early pregnancy (before day 42 of gestation).
  - It is fatal unless surgically corrected.
  - In calves surgical correction is best attempted using a right flank approach.
365. *Swine with rectal stricture are commonly presented for surgical intervention. Which organism most commonly predisposes to the proctitis that precedes rectal stricture?*
- enterotoxigenic *E. coli*
  - smooth, mucoid, nonpiliated *E. coli*
  - Campylobacter hyointestinalis*
  - Salmonella typhimurium*
  - Cryptosporidium parvum*

366. Concerning digit amputation in cattle, which statement is most accurate?
- Removal of the lateral front digit has a better prognosis than does removal of the medial digit.
  - Removing a diseased digit does not inhibit infection from ascending the leg.
  - The only indication is septic arthritis, as all other infectious problems in this area quickly resolve with aggressive antibiotic therapy.
  - It is a moderately complex procedure performed only under conditions of strict asepsis.
  - It should be performed only if the amputation is not proximal to the coronary band on the affected claw.
367. Concerning femoral fractures in food animals, which statement is **least** accurate?
- Crepitation in fractures of the proximal capital femoral epiphysis may be referred to the stifle joint.
  - Use of excessive traction is unrelated to fracture of the capital femoral epiphysis in calves pulled from the dam.
  - When possible a rectal examination should be performed on affected animals to check for associated pelvic fractures.
  - In swine femoral fractures are commonly associated with breeding accidents.
  - In calves and pigs intramedullary pinning is the treatment of choice when economically justifiable.
368. In calves with fractures of the capital femoral epiphysis, which nerve is most commonly injured, causing inability to bear weight and decreased tone of the quadriceps femoris muscle?
- sciatic
  - pudendal
  - femoral
  - caudal cutaneous femoral
  - fibular
369. Concerning penile hematomas in bulls, which statement is **least** accurate?
- Awkwardness during breeding as a result of excessive weight is speculated to be a contributing factor.
  - Partial desensitization of the penis is considered a contributing factor.
  - Deviations of the penis can predispose to hematomas.
  - Penile hematomas generally result from rupture of the tunica albuginea in the area of the proximal sigmoid flexure.
  - Horned English breeds of beef cattle have a higher incidence than do other cattle breeds.
370. Concerning urolithiasis and urethral obstruction in cattle, which statement is **least** accurate?
- The obstructing calculi are most commonly lodged at the distal flexure of the penis.
  - For attempted surgical removal of a calculus lodged in the urethra, the animal usually should be placed in dorsal recumbency.
  - If the obstruction causes the urinary bladder to rupture, the treatment of choice is laparotomy and bladder repair by suturing.
  - If penile amputation with urethral fistulization is elected, this is best done under epidural anesthesia.
  - Peritonitis is rarely a sequel to bladder rupture in cattle.
371. Concerning castration in pigs, which statement is **least** accurate?
- The scrotal incisions should be made as ventral as possible to allow for drainage.
  - General anesthesia is necessary for castration of older boars.
  - If an inguinal hernia is encountered, it is not advisable to repair the apparently uninvolved side as with the herniated side.
  - Young pigs are best restrained by suspension by the hind legs for routine castration.
  - Pigs tolerate surgical gut suture material better than do other species.
372. Which kidney is more commonly affected with pyelonephritis and which surgical approach is most commonly used for its removal?
- right kidney, right flank
  - right kidney, right paramedian
  - left kidney, right flank
  - left kidney, left flank
  - left kidney, ventral midline
373. Concerning vaginal prolapse in ewes, which statement is most accurate?
- It usually occurs 2 to 4 weeks before lambing.
  - It is associated with feeds containing high levels of progesterone.
  - The bladder is rarely involved in the prolapse.
  - It can occur simultaneously with rectal prolapse; both can be controlled by application of a purse-string suture or other similar suture patterns that allow normal urination.
  - A high-roughage diet and confinement to a pen minimize the potential for recurrence after replacement of prolapsed tissue.
374. Concerning ophthalmic surgery in food animals, which statement is **least** accurate?
- Retrobulbar injection of local anesthetic is used to immobilize the globe and anesthetize the eye and orbit.
  - Sensory innervation of the eye, conjunctiva, nictitating membrane, and most of the eyelid is provided by the ophthalmic division of the facial nerve and its branches.
  - Before considering surgery for proptosis in cattle, one should realize that retrobulbar lymphosarcoma is the most common cause.
  - The nictitating membrane of cattle can be sutured over the cornea to provide an effective "bandage" in treatment of infectious keratoconjunctivitis (pinkeye).
  - Entropion may be relatively common in some sheep flocks, approaching an incidence of 60% to 80%.
375. In pigs, which teeth are especially dangerous, necessitating detusking?
- maxillary incisors
  - maxillary molars
  - mandibular canines
  - mandibular molars
  - maxillary incisors and canines
- D.F. Smith
376. Which of the following **best** describes the appearance of a mature cow with complete unilateral rupture of the gastrocnemius tendon?
- rising first on the forelimbs instead of the rear limbs
  - grade 3/4 lameness on the affected limb
  - dorsal (upward) deflection of both digits (P3) on the affected limb
  - inability to rise (get up) past the midpoint using the rear limbs
  - abduction of the affected limb
377. A 4-year-old dairy cow in a production dairy herd develops a hygroma on the lateral aspect of the tarsus. What is the recommended treatment?
- Administer systemic antibiotics for 3 weeks.
  - Aspirate fluid from the lesion and inject antibiotics into it.
  - Aspirate fluid from the lesion and inject corticosteroids into it.
  - Do not treat the lesion unless other clinical signs are present.
  - Perform complete excision, avoiding the joint capsule.

378. *Young bulls can be castrated by applying Burdizzo emasculatomes:*
- across the distal surface of the scrotum
  - at two sites spanning each spermatic cord
  - longitudinally across the proximal aspect of the scrotum
  - across each testis
  - across both spermatic cords simultaneously.
379. *Tail amputation is gaining prominence among some dairy farmers because it is believed to:*
- increase the economic value of the cows
  - prevent cows from stepping on each other's tails
  - reduce the risk of necrotic tail disease following septicemia
  - reduce the risk of vaginitis and metritis
  - improve udder health and reduce the milk somatic cell count
380. *Anesthesia for electric or heat dehorning is usually accomplished by:*
- general anesthesia
  - local infiltration of the cornual nerve
  - regional anesthesia applied intravenously
  - high epidural block
  - topical anesthesia
381. *Electric or heat dehorning of heifer calves should be performed:*
- shortly after the heifer reaches puberty
  - when the horn bud is first palpable
  - during the first week of life
  - when the horn is 4 to 6 cm long
  - just before the horn erupts
382. *Untreated calves with atresia ani often live for several weeks because:*
- the colon can absorb excess water to compensate for the obstruction
  - affected calves selectively eat a low-residue diet
  - affected calves voluntarily consume less food and water
  - the rumen develops more rapidly than usual
  - a rectovaginal fistula may be present, allowing passage of feces to the exterior

383. *Closure of the mesentery following small-bowel resection and end-to-end anastomosis is necessary to:*
- ensure an optimal blood supply to the anastomosis site
  - ensure that the bowel ends are aligned and not rotated
  - minimize the risk of postoperative herniation of a segment of intestine
  - restore lymphatic drainage
  - minimize the risk of anastomosis leakage and peritonitis
384. *Cecectomy is sometimes performed in cows with recurring cecal volvulus. The cecal vessels that are ligated before cecal resection are located:*
- along the dorsal band of the cecum
  - along the lateral bands of the cecum
  - in the ileocecal ligament
  - in the cecocolic ligament
  - along the antimesenteric surface of the cecum

#### Questions 385 and 386

*A 2-year-old Holstein heifer calved 3 days ago and now has a left displacement of the abomasum. The heifer has extensive subcutaneous edema along the ventral aspect of the abdominal wall, from the xiphoid to the cranial portion of the udder.*

385. *Which surgical procedure is most appropriate to repair the abomasal displacement?*
- left paralumbar fossa abomasopexy
  - left paralumbar fossa omentopexy
  - toggle-pin abomasopexy
  - right paramedian abomasopexy
  - right paralumbar fossa omentopexy
386. *Assuming the heifer does not have ketosis or other significant metabolic abnormalities, blood chemistry assays are most likely to reveal:*
- normochloremic metabolic alkalosis
  - hypochloremic metabolic alkalosis
  - normochloremic metabolic acidosis
  - hypocalcemic metabolic acidosis
  - hypochloremic metabolic acidosis

#### Questions 387 through 390

*You examine a mature dairy cow that has been anorectic and agalactic for two days. The cow is moderately volume depleted (dehydrated) and has a large area of tympanitic resonance (ping) extending from the right ninth rib to the cranial portion of the right paralumbar fossa. Laboratory tests reveal a packed cell volume of 46%, plasma chloride level of 76 mEq/L, and anion gap of 15 mEq/L.*

387. *What is the most likely cause of these findings?*

- volvulus of the omasum
- volvulus of the cecum
- volvulus of the abomasum
- volvulus of the jejunioleum
- volvulus of the ascending colon

388. *What is the plasma potassium level most likely to be?*

- 3.2 mEq/L
- 6.8 mEq/L
- 10.4 mEq/L
- 8.6 mEq/L
- 0.8 mEq/L

389. *What is the acid-base profile most likely to be?*

- metabolic acidosis with respiratory compensation
- metabolic alkalosis without respiratory compensation
- metabolic alkalosis with respiratory compensation
- respiratory acidosis with metabolic compensation
- respiratory acidosis without metabolic compensation

390. *Which intravenous fluid treatment would be most appropriate for this cow?*

- 0.90% sodium chloride (NaCl) solution with potassium chloride (KCl) at 20 mEq/L
- 0.90% NaCl solution with sodium bicarbonate at 12 mEq/L

- 0.45% NaCl solution with half-strength dextrose
- 0.90% NaCl solution with half-strength KCl
- 0.45% NaCl solution with isotonic dextrose

391. *Which area of the abomasum is sutured to the ventral abdominal wall during right paramedian abomasopexy?*

- lesser curvature of the body of the abomasum
- greater curvature of the body of the abomasum
- pyloric part distal to the body of the abomasum
- junction of the body and pyloric part of the abomasum
- lesser curvature of the pyloric part of the abomasum

392. *Which area of omentum is sutured to the right paralumbar fossa incision during omentopexy for repair of displacement of the abomasum?*

- greater omentum adjacent to the body of the abomasum
- lesser omentum adjacent to the cranial part of the duodenum
- lesser omentum adjacent to the fundus of the duodenum
- greater omentum adjacent to the pylorus
- lesser omentum adjacent to the descending part of the duodenum

393. *You examine a 7-year-old Holstein cow with decreased appetite, decreased milk production, and melena. The mucous membranes are pale. What is the most likely cause of the gastrointestinal hemorrhage and anemia?*

- traumatic reticuloperitonitis
- chronic abomasal displacement
- abomasal lymphosarcoma
- bovine virus diarrhea
- Johne's disease

394. Hypertonic saline solution (8% tonicity) is sometimes used to treat cattle with severe volume depletion (dehydration). Which of the following best describes the movement of fluid across physiologic membranes after administration of therapeutic volumes of hypertonic saline solution to a volume-depleted cow?
- expansion of plasma volume at the expense of intracellular fluid volume
  - expansion of interstitial fluid volume at the expense of plasma volume
  - expansion of intracellular fluid volume at the expense of extracellular fluid volume
  - expansion of intracellular fluid volume at the expense of plasma volume
  - expansion of plasma volume at the expense of extracellular fluid volume
395. Rumenotomy for treatment of traumatic reticuloperitonitis is best performed through an incision on the left side:
- between ribs 11 and 12
  - cranial to the tuber coxae
  - between ribs 5 and 6
  - caudal to rib 18
  - in the cranial part of the paralumbar fossa
396. In adult dairy cattle, intussusception usually occurs in the:
- pylorus
  - jejunoileum
  - proximal jejunum
  - ascending colon
  - duodenum
397. A mature dairy cow has acute onset of anorexia and abdominal pain (colic). Over the next 48 hours the colic subsides, but the cow becomes increasingly depressed and develops bilateral abdominal distention. You palpate multiple loops of tightly distended small intestine per rectum. Which celiotomy approach is most appropriate?
- left paralumbar fossa, with the cow in sternal recumbency
  - ventral midline, with the cow in dorsal recumbency
  - right paralumbar fossa, with the cow in sternal recumbency
  - left paralumbar fossa, with the cow in right lateral recumbency
  - right paralumbar fossa, with the cow in left lateral recumbency
398. You plan to operate on a 4-day-old calf to repair atresia of the spiral loop of the ascending colon. The preferred surgical procedure is resection of the proximal blind end, followed by:
- end-to-end anastomosis of the proximal blind end to the distal blind end
  - side-to-end anastomosis of the proximal blind end to the distal blind end
  - side-to-side anastomosis of the proximal blind end to the descending colon
  - end-to-side anastomosis of the proximal blind end to the descending duodenum
  - end-to-end anastomosis of the proximal blind end to the ascending colon
399. Which intestinal accident requires immediate surgical intervention?
- small-intestinal intussusception
  - abomasal volvulus
  - volvulus of the cecum and proximal colon
  - torsion of the root of the mesentery
  - volvulus of the jejunoileum
400. Which site for celiotomy (laparotomy) is most appropriate for unilateral left nephrectomy in adult cattle?
- left 12th intercostal space
  - ventral midline
  - right paralumbar fossa
  - left paracostal
  - left 10th intercostal space

#### Questions 401 through 403

An adult Holstein cow has mild colic and a large area of tympanitic resonance (ping) centered over the right paralumbar fossa. The right side of the abdomen is distended, most notably over the right paralumbar fossa. Palpation per rectum reveals an enlarged and tightly distended 20- to 30-cm-diameter viscus extending cranially from the right tuber coxae. The cow is not pregnant and is of average size and body condition for a milking Holstein. She shows clinical evidence of moderately severe volume depletion (dehydration), as evidenced by sunken eyes and decreased skin turgor.

401. What is the most likely cause of these findings?

- volvulus of the omasum
- volvulus of the cecum and proximal colon
- volvulus of the abomasum
- volvulus of the jejunoileum
- volvulus of the ascending colon

402. What is the preferred celiotomy approach for surgical treatment of this cow?

- right paramedian
- right paracostal
- ventral midline
- right paralumbar fossa
- 12th rib resection

403. How much isotonic fluid should be administered during the first 12 hours to replenish extracellular fluid volume?

- 48 ml
- 480 ml
- 4800 ml
- 48 L
- 480 L

404. What is a common cause of frontal sinusitis in cattle?

- migrating parasites
- severe pneumonia
- septicemia
- allergic reaction to moldy feeds
- dehorning cattle when mature

405. Which portion of the gastrointestinal tract is most likely to be present in the hernial sac of a 4-month-old calf with an umbilical hernia?

- abomasum
- rumen
- ileum
- duodenum
- jejunum

406. A 4-month-old dairy heifer has a swollen, inflamed umbilicus that intermittently drains purulent exudate. During surgical exploration through a ventral midline incision, you identify an infected urachal stalk connecting the umbilicus and the apex of the urinary bladder. The lumen of the urachal stalk does not appear to be contiguous with the lumen of the bladder. Which procedure is recommended to correct this problem?

- marsupialization of the infected urachal stalk
- ligation of the infected urachal stalk midway between the umbilicus and the bladder apex
- transection and removal of the infected urachal stalk, followed by marsupialization of the bladder
- resection of the infected urachal stalk, including the bladder apex
- resection of the infected urachal stalk midway between the umbilicus and the bladder apex

407. What is the most appropriate site for administration of epidural anesthetic in an adult cow?

- between S2 and S3
- between Cd2 and Cd3
- between S5 and Cd1
- between L7 and S1
- between S3 and S4

408. Which procedure could be safely performed after injecting 10 ml lidocaine into the caudal epidural space of a cow?

- cesarean section
- paralumbar fossa ovariectomy
- debridement of abscess in gluteal muscles
- teat surgery
- Caslick's procedure

409. Which vessel is most appropriate for collection of 10 ml of blood from a healthy, mature sow?

- cranial vena cava
- saphenous vein
- auricular vein
- tail vein
- jugular vein

410. The wire or chain end of a hog holder, a device used to restrain adult pigs, is applied around the:

- neck caudal to the ears
- head, between the eyes and the ears
- rear fetlocks
- front fetlocks
- upper jaw

411. Which nerves are desensitized during a paravertebral block in cattle in preparation for paralumbar fossa celiotomy?

- L1 to L3
- T12 to L3
- L3 to L5
- T13 to L4
- L1 to L5

412. Which of the following is commonly observed after paravertebral anesthesia in a cow?

- desensitization of the tail
- scoliosis appearance
- approximately 20% increase in heart rate
- urination
- spontaneous dripping of milk

413. Which of the following is commonly observed after intravenous administration of xylazine for sedation of a cow?

- approximately 10% decrease in respiratory rate
- significant decrease in rectal temperature
- approximately 20% increase in heart rate
- urination
- spontaneous dripping of milk

#### Questions 414 and 415

An adult cow has a large perireticular abscess in the region of the omasum.

414. The abscess is most likely a sequela of:

- chronic traumatic reticuloperitonitis
- bovine virus diarrhea
- a perforating abomasal ulcer
- a ruptured omasum
- latent omphalophlebitis

415. What is the most appropriate treatment for the perireticular abscess in this cow?

- celiotomy and drainage of the abscess during surgery
- drainage of the abscess percutaneously, guided by ultrasonography
- culture and sensitivity tests on the abscess contents, followed by long-term treatment with appropriate antibiotics
- rumenotomy and drainage of the abscess into the rumen
- marsupialization of the abscess, leaving the fistula open to the outside

#### Questions 416 and 417

A beef breeding bull develops a large, firm swelling surrounding the penis, just cranial to the scrotum. The bull is unable to extend the penis.

416. What is the most likely cause of these findings?

- hematoma involving rupture of the tunica albuginea
- squamous-cell carcinoma in the region of the fornix
- urethral rupture and leakage of urine into tissues surrounding the penis
- seroma associated with lymphatic blockage
- granulomatous response to a foreign body in the fornix

417. Which secondary condition is this bull likely to have?

- paraphimosis
- inability to retract the penis
- inability to urinate
- preputial prolapse
- pus in the semen

#### Questions 418 and 419

An 18-month-old Holstein bull, housed in a common pen with approximately 20 other young bulls awaiting progeny testing, develops a 4-cm-diameter cauliflower-like mass near the tip of the penis. The mass is attached by a small stalk to the mucosa and bleeds easily from its surface.

418. What is the most likely cause of these findings?

- squamous-cell carcinoma
- fibropapilloma
- sarcoid
- granulomatous tissue
- transitional-cell carcinoma

419. What is the preferred therapy for this bull?

- long-term broad-spectrum antibiotics
- surgical removal of the mass, followed by chemotherapy
- slaughter because of the poor prognosis, unless the bull is valuable
- surgical removal of the mass
- cryotherapy

420. Where is the uterine wall incision usually made during routine cesarean section in cows?

- gravid uterine horn, midway between the body and the ovary
- nongravid uterine horn, near the body

- body of the uterus, adjacent to the intercornual ligament
- gravid uterine horn, near the ovarian end
- nongravid uterine horn, midway between the body and the ovary

421. You make an incision through the right paralumbar fossa of a goat for abdominal exploration. Which of the following represents the correct order of muscle layers incised during the surgical approach (starting externally and cutting toward the abdominal cavity)?

- internal abdominal oblique, transversus abdominis, external abdominal oblique
- internal abdominal oblique, external abdominal oblique, transversus abdominis
- external abdominal oblique, internal abdominal oblique, transversus abdominis
- external abdominal oblique, transversus abdominis, internal abdominal oblique
- transversus abdominis, external abdominal oblique, internal abdominal oblique

422. Which of the following represents the correct dental formula for an adult cow?

- 2 (incisors 3/3, canines 1/1, premolars 3/3, molars 3/3)
- 2 (incisors 0/4, canines 1/1, premolars 3/3, molars 3/3)
- 2 (incisors 0/4, canines 0/0, premolars 3/3, molars 3/3)
- 2 (incisors 2/2, canines 1/1, premolars 3/3, molars 3/3)
- 2 (incisors 0/3, canines 0/1, premolars 3/3, molars 3/3)

423. An adult goat has a large, caseous lymph node causing intestinal obstruction near the central portion of the spiral loop of the ascending colon. Because of the many adhesions in the area, you are unable to resect the node and adjacent intestine. To reestablish intestinal integrity, you decide to perform a side-to-side anastomosis, uniting the bowel proximal to the blockage with that distal to the blockage. Which of the following best describes the portions of intestine you would anastomose?

- proximal loop of the ascending colon to the outside turn of the spiral loop of the ascending colon
- outside turn of the spiral loop of the ascending colon to the distal loop of the ascending colon
- proximal loop of the ascending colon to the descending colon
- proximal loop of the ascending colon to the outside turn of the spiral loop of the ascending colon
- proximal loop of the ascending colon to the centripetal portion of the spiral loop of the ascending colon

424. Areas of tympanitic resonance (ping) over the left abdominal wall in adult dairy cattle are most likely to be caused by:

- left displacement of the abomasum and abomasal volvulus
- left displacement of the abomasum and a rumen gas cap
- volvulus of the abomasum and a rumen gas cap
- left displacement of the abomasum and cecal dilatation
- a rumen gas cap and cecal dilatation

425. In an adult dairy cow, a positive response to pressure exerted in the area of the xiphoid is most likely to be attributable to:

- traumatic reticuloperitonitis or diffuse peritonitis
- traumatic reticuloperitonitis or vagal indigestion
- vagal indigestion or abomasal ulcer disease
- abomasal ulcer disease or diffuse peritonitis
- traumatic reticuloperitonitis or abomasal ulcer disease

#### A.M. Trent

426. You are presented with a 4-year-old Suffolk ewe with a 3-week history of progressive dyspnea and weight loss. The ewe is thin and has a rectal temperature of 100.8° F, pulse rate of 84 beats/min, and respiratory rate of 60 breaths/min. There is a thick, mucoid nasal discharge from the right naris, with decreased air flow from that side. You note facial asymmetry, with enlargement of the right side distal to the medial canthus. Radiographs reveal a solid, lobulated mass extending rostrally in the right nasal passage from the ethmoid turbinates. What is the most likely cause of these findings?

- nasal bot infestation
- chronic rhinitis
- chronic tooth root infection
- nasal adenocarcinoma
- ethmoid hematoma

For Questions 427 through 431, select the correct answer from the five choices below.

- roll
- blind tack
- left flank abomasopexy
- right flank omentopexy
- right paramedian abomasopexy

427. Most appropriate procedure for treatment of left displacement of the abomasum in a pregnant 4-year-old Holstein in the eighth month of gestation

428. Most appropriate procedure for treatment of left displacement of the abomasum in a very thin 5-year-old Holstein with recurrence of abomasal displacement 1 year after treatment by right flank omentopexy

429. Most appropriate procedure for treatment of left displacement of the abomasum in a 7-year-old open (nonpregnant) cow in the fourth month of lactation when the owner would like the cow to finish lactation with minimal cost before culling

430. Most appropriate procedure for treatment of left displacement of the abomasum in a cow with elevated respiratory rate and mucopurulent nasal discharge, with the displacement diagnosed during right flank exploration of a localized adhesion between the abomasum and left body wall

431. Most appropriate procedure for treatment of left displacement of the abomasum in a cow with severe udder edema and a suspected mobile, firm mass in the caudoventral abdomen

432. Which structure is most likely the source of a 30-cm-diameter ping of uniform tympany in the right middorsal paralumbar fossa extending from the 12th rib to the tuber coxae?

- spiral colon
- cecum
- abomasum
- uterus
- small intestine

433. A standing right flank approach provides the best surgical approach for access to the:

- right kidney, distal jejunum, and reticulum
- cecal apex, abomasal fundus, and left kidney
- proximal ileum, omasoabomasal orifice, and cervix
- pyloric antrum, dorsal rumen sac, and ascending colon
- descending duodenum, spiral colon, and distal jejunum

434. You identify an adhesive obstruction of the spiral colon in a cow. Anastomosis of which structures would bypass the lesion?

- cecum to the descending colon
- centripetal loop of the spiral colon to the centrifugal loop of the spiral colon

- ileum to the first turn of the ascending colon
- centrifugal loop of the spiral colon to the centripetal loop of the spiral colon
- ileum to the centripetal loop of the spiral colon

For Questions 435 through 439, select the correct answer from the five choices below.

- pyloric antrum
- descending duodenum
- distal phalanges
- jejunum
- cecum

435. Most commonly involved in intussusceptions in adult cattle

436. Most likely to be damaged by an excessively deep incision during a standing cranial right flank approach to the abdomen in a cow

437. Most likely to be present in an umbilical hernia in a calf

438. Segment of intestine supported by the longest portion of mesentery

439. Least mobile of the structures listed

440. A 2-month-old Holstein calf has a 12-cm-diameter umbilical swelling. The swelling is warm, painful, and nonreducible. You detect no abnormalities on abdominal palpation deep to the umbilicus. What is the most likely cause of these findings?

- umbilical hernia
- umbilical infection (localized)
- umbilical and urachal infection
- umbilical and umbilical vein infection
- combined umbilical hernia and infection

441. A 2-month-old Holstein calf has a 12-cm-diameter umbilical swelling. The swelling is fluctuant, and you can palpate a distinct ring around the circumference of the mass at its juncture with the body wall. What is the most likely cause of these findings?
- umbilical hernia
  - umbilical infection (localized)
  - umbilical and urachal infection
  - umbilical and umbilical vein infection
  - combined umbilical hernia and infection
442. A 2-month-old Holstein calf has a 12-cm-diameter umbilical swelling. The swelling is firm, painful, and nonreducible. Deep palpation of the abdomen reveals a firm, thick stalk extending craniodorsally from the external mass. What is the most likely cause of these findings?
- umbilical hernia
  - umbilical infection (localized)
  - umbilical and urachal infection
  - umbilical and umbilical vein infection
  - combined umbilical hernia and infection
443. You are presented with a 3-month-old embryo-transfer Hereford heifer with a history of intermittent drainage from the umbilicus since birth. Using ultrasonography you confirm an enlarged umbilical stalk extending from a 5-cm-diameter fluctuant, nonreducible swelling at the umbilicus to a 6-cm-diameter fluid-filled cavity in the liver parenchyma. What is the most appropriate single therapeutic approach?
- Initiate long-term antibiotic therapy based on culture of the umbilical drainage.
  - Lance the fluctuant swelling at the umbilicus and lavage with sterile isotonic saline solution to encourage drainage.
  - Lance the fluctuant swelling at the umbilicus and infuse with Lugol's solution to cauterize the stalk.
  - Dissect around the umbilical mass and transect and oversew the stalk as close to the liver as possible.
  - Dissect around the umbilical mass and stalk and marsupialize the stalk through a separate incision.

**Questions 444 through 446**

You are presented with a 6-month-old castrated lamb with a 5-day history of progressive depression, anorexia, and abdominal distention. Fecal production has been decreased. Urination has not been observed. Abdominocentesis produces a large quantity of clear yellow fluid that when heated has an ammonia-like odor. The creatinine concentrations are 9.4 mg/dl in the peritoneal fluid and 3.0 mg/dl in the serum. The lamb has a rectal temperature of 99.9° F, pulse rate of 100 beats/min, and respiratory rate of 36 breaths/min. The lamb is 5% to 8% dehydrated.

444. What is the most likely cause of these findings?
- umbilical hernia
  - umbilical abscess
  - intestinal obstruction
  - urethral rupture
  - bladder rupture
445. Which solution is most appropriate for initial fluid therapy for volume replacement?
- lactated Ringer's solution
  - 50% dextrose solution
  - hypertonic saline solution
  - isotonic saline solution
  - isotonic bicarbonate solution
446. Which treatment is the **least** appropriate for this lamb?
- prophylactic antibiotics
  - retrograde urethral catheterization and urethral lavage
  - ischial urethrotomy
  - amputation of the urethral process
  - celiotomy for placement of a de Pezzer catheter in the bladder

447. You are presented with a 6-month-old intact (not castrated) bull calf, intended for breeding, with a 4-day history of stranguria. You palpate pulsations along the ischial urethra. Ultrasonographic examination reveals a grossly enlarged bladder. Which treatment would provide the best chance of resolving the urethral obstruction while preserving bull's breeding potential?
- prophylactic antibiotics
  - retrograde urethral catheterization
  - ischial urethrotomy
  - amputation of the urethral process
  - celiotomy for placement of a de Pezzer or Foley catheter in the bladder

**Questions 448 through 450**

You are presented with a 3-month-old Simmental heifer calf with a 12-hour history of colic, anorexia, and abdominal distention. The calf has a temperature of 100° F, pulse rate of 120 beats/min, and respiratory rate of 48 breaths/min. The abdomen is tautly distended, with a 15-cm-diameter ping on the right side, extending from the eighth rib to the caudal paralumbar fossa on a line from the tuber coxae to the elbow. The calf is approximately 10% dehydrated and has cold ears, tail, and peripheral limbs.

448. Which solution would be most appropriate for initial fluid therapy for volume replacement pending confirmation of acid-base and electrolyte status?
- 5% dextrose solution
  - 50-50 mixture of lactated Ringer's solution and 50% calcium borogluconate solution
  - lactated Ringer's solution
  - isotonic saline solution
  - isotonic saline solution with potassium chloride added at 10 mEq/L
449. What is the most likely cause of these findings?
- intestinal volvulus
  - cecal volvulus
  - abomasal volvulus
  - intussusception
  - pneumoperitoneum

450. Which abdominal approach would provide the best exposure for surgical treatment with the least risk of complications?
- right paracostal approach with the calf in left lateral recumbency
  - right flank approach with the calf standing
  - right paramedian approach with the calf in dorsal recumbency
  - left flank approach with the calf standing
  - ventral midline approach with the calf in dorsal recumbency
451. You are performing a standing left flank cesarean section in an adult Charolais cow with dystocia. The calf is in normal presentation. To manipulate the uterus to the incision, which structure should you identify and apply manual traction to?
- the head
  - a forelimb between the elbow and carpus
  - a hind limb between the hock and fetlock
  - the tail
  - a forelimb between the carpus and fetlock
452. You are presented with a 4-year-old Holstein cow carrying an embryo-transfer calf. The cow was observed in labor 6 hours ago. The calf is alive and in anterior presentation, with one foreleg bent back and one foreleg and the head protruding through the partially dilated cervix. The cow repeatedly falls down during examination. Her ears are cool and pupillary response is slow. Which surgical approach for cesarean section is most likely to save both cow and calf?
- left flank approach with the cow standing
  - right flank approach with the cow standing
  - left paramammary approach with the cow in right lateral recumbency
  - right paramammary approach with the cow in left lateral recumbency
  - caudal ventral midline approach with the cow in dorsal recumbency

## Questions 453 and 454

You are preparing to perform a rumenotomy to determine the cause of and possibly treat suspected vaginal syndrome in a 6-year-old Angus bull.

453. What is the most appropriate antibiotic regimen for surgical prophylaxis?

- Begin antibiotic therapy immediately and continue for 3 days before surgery.
- Administer one dose of antibiotics intramuscularly 1 hour before surgery and one dose postoperatively.
- Administer as many doses of antibiotics as possible before surgery and continue at least 3 days after surgery.
- Infuse the abdomen with antibiotics before incision closure and give one dose of antibiotics intramuscularly immediately after completion of surgery.
- Infuse the abdomen with antibiotics before incision closure and administer antibiotics intramuscularly for at least 3 days after surgery.

454. What is the appropriate order of procedures following incision of the peritoneum?

- Perform a rumenotomy, explore the abdomen transruminally, explore the reticulum and adjacent orifices, close the rumen, and explore the abdomen.
- Explore the abdomen, perform a rumenotomy, explore the reticulum and adjacent orifices, close the rumen, and explore the abdomen.
- Explore the abdomen, perform a rumenotomy, explore the abdomen transruminally, explore the reticulum and adjacent orifices, and close the rumen.
- Perform a rumenotomy, explore the reticulum and adjacent orifices, explore the abdomen transruminally, and close the rumen.
- Perform a rumenotomy, explore the abdomen, explore the reticulum and adjacent orifices, and close the rumen.

455. All the following procedures can be used for management of vaginal prolapse in cattle **except**:

- Caslick's operation
- Minchev's procedure
- Zepp operation
- cervicopexy
- Bühner's stitch

456. Concerning vaginal prolapse in cows, which statement is **least** accurate?

- It occurs most commonly within one month postpartum.
- It is likely to occur in subsequent lactations.
- It can result in decreased fertility.
- Obesity is a risk factor.
- Some breeds are predisposed.

457. You are asked to examine a 2-week-old Maine Anjou calf with progressive right hind limb lameness since birth. The calf was born in anterior presentation but experienced hip lock and required traction with a calf-jack for delivery. The calf touches the toe of the right hind limb to the ground but is unwilling or unable to fix and hold the right stifle in extension and bear full weight. What is the **least** likely cause of lameness in this calf?

- slipped capital femoral epiphysis
- femoral nerve paresis
- distal femoral epiphyseal fracture
- femoral neck fracture
- cranial cruciate rupture

458. All the following conditions of the forelimb can be treated by claw amputation **except**:

- osteomyelitis of P1 of the lateral digit
- septic arthritis of the coffin joint of the medial digit
- osteomyelitis of P3 of the medial digit
- septic tenosynovitis of the deep digital flexor tendon of the lateral digit
- osteomyelitis and septic arthritis of the pastern joint

459. All of the following joints are accessible for large-volume joint lavage **except** the:

- tibiotarsal joint
- fetlock joint
- radiocarpal joint
- coxofemoral joint
- medial femoropatellar joint

## Questions 460 and 461

A 2-week-old Holstein calf has a swollen right carpus and progressive lameness of 2 days' duration. The swelling is fluctuant and centered over the dorsal aspect of the radiocarpal joint. The calf has a rectal temperature of 102.8° F, pulse rate of 88 beats/min, and respiratory rate of 40 breaths/min. The calf bears no weight on the limb while standing and only a limited amount while ambulating.

460. Which of the following is the **least** essential initial diagnostic step?

- complete blood cell count
- palpation of all joints
- cytologic examination of radiocarpal fluid
- serum electrolyte panel
- total plasma protein assay

461. The white blood cell count in the radiocarpal joint fluid is 110,000 cells/ $\mu$ l, predominantly neutrophils with a few degenerate neutrophils. What is the most appropriate initial therapeutic approach?

- Initiate systemic antibiotic therapy without cultures.
- Initiate systemic antibiotic therapy and lavage the radiocarpal joint with sterile isotonic saline solution.
- Culture a sample of joint fluid and begin systemic antibiotic therapy pending culture results.
- Culture a sample of joint fluid, begin systemic antibiotic therapy pending culture results, and lavage the radiocarpal joint with sterile isotonic saline solution.
- Culture a sample of joint fluid and lavage the radiocarpal joint with buffered antibiotic solution.

## Questions 462 through 464

462. Penile hematoma is most common in:

- young breeding bulls
- mature breeding bulls
- castrated feedlot steers
- epididymectomized teaser bulls
- immature breeding calves

463. Which site is most commonly affected in penile hematoma?

- ventral corpus cavernosum at the level of the distal sigmoid flexure
- dorsal corpus cavernosum at the level of the attachment of the retractor penis muscle
- dorsal corpus spongiosum at the level of the proximal sigmoid flexure
- ventral corpus spongiosum at the level of the distal sigmoid flexure
- dorsal penile artery at the level of the proximal sigmoid flexure

464. What are the most valid surgical and nonsurgical treatment options for penile hematoma in an animal intended for breeding?

- preputial transection and hydrotherapy for 3 to 4 weeks
- resection of the hematoma, with closure of the fascial tear, and hydrotherapy for 3 to 4 weeks
- urethrostomy and administration of muscle relaxants and systemic antibiotics
- resection of the hematoma and administration of muscle relaxants and systemic antibiotics
- preputial transection, placement of a purse-string suture to retain the prepuce in position, and daily lavage of the preputial cavity with a lubricating solution

465. Dehorning in cattle over 6 months of age can result in an open sinus. Which sinus is typically involved in such cases?

- maxillary
- nasal
- sphenopalatine
- conchal
- frontal



466. Effective analgesia for dehorning of a tranquilized 5-month-old goat kid requires local anesthesia of the:
- cornual branch of the lacrimal nerve
  - infratrochlear and facial nerves
  - cornual branch of the lacrimal and infratrochlear nerves
  - infratrochlear nerve
  - maxillary and facial nerves
467. Which method of dehorning goats can be used effectively for the respective age group listed?
- chemical paste for kids 6 to 9 months old
  - Keyes (guillotine) dehorner for adults (over 1 year old)
  - tube dehorner for kids 2 to 3 months old
  - Gigli wire for kids 2 to 3 months old
  - electrocautery for kids 6 to 9 months old
468. What is the most common life-threatening complication following surgical correction of a right abomasal volvulus in an adult cow using a right flank omentopexy?
- abomasal fistula formation
  - incisional dehiscence
  - left displacement of the abomasum
  - abomasal atony
  - abomasal ulceration
469. All the following are accepted approaches for management of mild spastic paresis in Holstein calves **except**:
- tibial neurectomy
  - physical therapy (passive manipulation and hydrotherapy)
  - partial tenectomy of the gastrocnemius muscle at its insertion on the calcaneus
  - immediate culling because of the hereditary nature of the condition
  - raise to slaughter weight without treatment and ship for slaughter
470. Which of the following correctly matches a fracture with its appropriate treatment?
- Closed transverse midmetacarpal fracture in a 500-lb Angus heifer is treated with a Robert-Jones bandage applied from the elbow to the coronary band.
  - Salter I fracture of the distal radius in a 1-day-old Holstein calf is treated by transfixation with an external fixator.
  - Closed reducible Salter II fracture of the distal tibia in a 100-lb Charolais calf is treated by application of a Schroeder-Thomas splint.
  - Closed transverse proximal tibial fracture in a 2-year-old Simmental bull, treated by application of a full-limb cast.
  - Closed comminuted fracture of P1 in the right forelimb lateral digit, treated by application of a padded splint made with polyvinyl chloride (PVC) pipe.
471. In a mature, lactating dairy cow with craniodorsal coxofemoral luxation of 3 days' duration, which treatment regimen is most likely to restore a functional gait?
- Perform open reduction of the coxofemoral joint; assist recovery with hip lifters; hobble the hind limbs for at least 3 weeks after surgery.
  - Perform closed reduction of the coxofemoral joint; assist recovery with hip lifters; house in deep bedding for at least 6 weeks after surgery.
  - Perform femoral head ostectomy; house in deep bedding for at least 3 weeks after surgery.
  - Perform open reduction of the coxofemoral joint; place limb in a non-weight-bearing sling for at least 2 weeks after surgery.
  - Prescribe stall confinement in a well-bedded stall for 4 months, followed by steady increases in exercise over the next 2 weeks.
472. Which of the following is **least** appropriate for treatment of a 3-cm-diameter superficial squamous-cell carcinoma of the cornea at the medial canthus in a beef cow?
- cryotherapy with a minimum of three freeze-thaw cycles
  - topical application of silver nitrate followed by a third-eyelid flap
  - enucleation
  - diathermy
  - local resection followed by cryotherapy
473. You are presented with a 4-year-old pasture-breeding Hereford bull with a 3-week history of hind limb lameness. On examination you can see a 3- to 4-cm-wide mass on the dorsal aspect of the interdigital space of both hind limbs. Palpation of the masses produces a painful response and reveals that they extend several centimeters distally in the interdigital space. Both masses are covered with a moist, foul-smelling exudate. What is the most likely cause of these findings and what is the most appropriate treatment?
- These are hairy warts; treat with formalin footbaths every other day.
  - This is interdigital dermatitis; clean the feet with a topical antiseptic and treat with iodine footbaths every other day.
  - This is interdigital hyperplasia; resect the masses, wire the toes together, and bandage the feet with an antiseptic dressing to be changed every 3 to 5 days for 2 weeks.
  - This is heel horn erosion; debride the affected areas and move the bull to clean bedding for at least 1 week.
  - This is bilateral digital trauma; radiograph both feet to determine joint involvement and administer systemic antibiotics for 2 weeks.
474. In an adult cow what is the most consistent way to provide complete analgesia to the digits of the hind limb for diagnosis or therapy?
- ring block 2 cm proximal to the dew claws with 4 to 5 ml 2% lidocaine per site
  - four-point block, at midmetatarsus, of the lateral and medial plantar and superficial and deep peroneal nerves with 4 to 5 ml 2% lidocaine per site
  - intravenous infusion of 10 to 20 ml 2% lidocaine into any vein distal to a tourniquet placed at the proximal metatarsus
  - injection of 80 to 100 mg xylazine into the dorsal saphenous vein distal to a tourniquet placed at the proximal metatarsus
  - injection of detomidine at 10 µg/kg into the jugular vein
475. Which of the following matches a potential complication of general anesthesia in adult cattle with an appropriate preventive measure?
- To prevent femoral nerve paresis following surgery in dorsal recumbency, position the animal with the hind limbs fully extended during surgery.
  - To prevent self-trauma during recovery, manually restrain the animal in lateral recovery until fully alert.
  - To prevent aspiration of rumenal reflux during surgery or recovery, withhold feed for at least 36 hours and water for at least 24 hours before surgery.
  - To prevent aspiration of excessive saliva during surgery or recovery, position the animal's head with the nose higher than the poll.
  - To prevent left forelimb paresis following surgery in left lateral recumbency, at surgery position the animal with the right forelimb pulled cranially and the left forelimb pulled caudally.

## Answers

1. **d** This device is used to ligate and divide mesenteric vessels.
2. **b** This device is used for colonic anastomosis.
3. **a** This device is used to close the ileal stump after resection.
4. **c** This device is used for end-to-end small-intestinal anastomosis.
5. **b** The hock often appears dropped and more angled with a complete rupture.
6. **c** Two rapid freezes to  $-20^{\circ}\text{C}$  and slow thaw cycles result in the most cell death.
7. **a** The vascular endothelium is damaged when tissue is frozen. This results in thrombosis, which causes further cell death from ischemia. An immune response often causes cell death in the late phase of cryonecrosis. Options *b*, *d*, and *e* cause cell death in the immediate phase.
8. **d** *Laser* is an acronym for *light amplification by stimulated emission of radiation*.
9. **e** Carbon dioxide laser irradiation is conducted through an articulating arm by a series of mirrors. Efforts to conduct this irradiation through flexible fibers have not been practical because of attenuation of power and heat dissipation.
10. **d** A split-thickness graft leaves a portion of the dermis at the donor site. Expansion of a sheet graft makes a mesh graft. An autograft uses donor and recipient sites on the same individual.
11. **c** Fibrin adhesions, which are later converted to fibrous tissue, cause initial adherence to the graft bed. Plasmatic imbibition then nourishes the graft until vascular channels are developed. This is called *inosculation*.
12. **d** A  $\beta$ -hemolytic *Streptococcus* produces proteolytic enzymes that dissolve the fibrin scaffold responsible for fixing the graft to the wound bed.
13. **d** The tendon sheath was contaminated at the time of injury. The horse became acutely lame when the lesion began healing and drainage from the sheath stopped, causing pain.
14. **d** Effusion within the tendon sheath would be exhibited.
15. **d** Aspiration of fluid from within the sheath would allow cytologic diagnosis and culture to ensure appropriate antibiotic therapy. Lavage would remove debris and damaging proteolytic enzymes from the sheath.
16. **d** Such metacarpal lacerations often produce lameness from flexor tendon adhesion to the enclosing tendon sheath.
17. **e** Fiberglass is more radiolucent than plaster.
18. **a** These signs describe guttural pouch tympany.
19. **e** This foal had unilateral disease, so fenestration of the median septum would allow trapped air to exit through the normal right guttural pouch.
20. **e** The vascular supply travels near the medial and lateral bands.
21. **a** The descending colon has sacculations and two bands (one on the antimesenteric border and one at the dorsal attachment of the mesocolon).
22. **b** The invaginating portion is called the *intussusceptum*.
23. **d** The distal segment is called the *intussusciens*.
24. **d** The other breeds show some predisposition to inguinal hernias.
25. **e** This condition in neonatal foals is considered to be hereditary.
26. **d** The cylindrical mass palpated was the impacted ileum. This cannot always be detected. However, the other palpation findings, clinical signs, geographic region, and diet also fit this diagnosis rather than the other options.
27. **b** This condition may resolve with medical treatment. Fluid therapy to superhydrate the horse and possibly loosen the impaction is the most important aspect of medical treatment.
28. **c** Medical treatment has obviously not resolved the impaction. Continued fluid therapy and the resulting intestinal distention will lead to deterioration of the patient's condition and possibly contribute to postoperative ileus.
29. **d** The intestine typically moves from right to left through the epiploic foramen.
30. **e** *Parietal hernia* is the correct term to describe any hernia in which one wall of the intestine is incarcerated without disrupted flow of ingesta. An omentocele is a hernia with omentum incarcerated. An omphalocele is a body-wall hernia resulting from abnormal migration of body wall folds during embryonic development. This leaves herniated organs covered by amnion rather than skin.
31. **a** Most equine enteroliths are composed of magnesium ammonium phosphate.
32. **d** These signs describe proximal enteritis.
33. **c** Fluid therapy to combat hemoconcentration is of utmost importance; gastric decompression alleviates pain and prevents gastric rupture.
34. **d** This procedure allows ingesta to bypass much of the inflamed, immotile small intestine. The stoma created closes with time so normal digestion can occur.
35. **d** This provides the best exposure to the field.
36. **d** Foals with uroperitoneum are usually hypochloremic.
37. **a** A grade 1 rectal laceration involves only the mucosal layer of the rectum. A grade 2 laceration disrupts the muscular layer of the rectum while not disturbing the other layers. Grade 3 rectal lacerations disrupt the mucosal, submucosal and muscular layers. The serosal layer alone is intact in grade 3A lacerations. Dorsal lacerations into the fat-filled mesocolon are grade 3B. Grade 4 rectal lacerations disrupt all layers of the rectum and allow contamination of the abdominal cavity.
38. **d** Grade 3B rectal lacerations cause this type of damage.
39. **b** These horses should not be allowed to eat anything before definitive treatment at a referral center. Treatment usually involves general anesthesia and softening of the feces. The other options would be appropriate.
40. **a** This statement is not true.
41. **a** Bowel with strangulation obstruction becomes black and edematous because venous outflow is disturbed and arterial blood supply is not.
42. **b** The radiographic signs are consistent with hypertrophic osteopathy. This condition is often associated with thoracic lesions (neoplasia or abscess); however, it has been seen with abdominal masses and ovarian tumors as well.
43. **d** Hypertrophic osteopathy usually resolves when the underlying problem is corrected.
44. **d** The colon is entrapped over the renosplenic ligament, which passes from the left kidney to the spleen.
45. **c** The diagnosis would be confirmed when the colon was definitively palpated crossing over the renosplenic ligament. Rolling these horses in a clockwise direction while under general anesthesia often reduces the displaced large colon without surgical intervention. However, if rolling does not resolve the entrapment, immediate celiotomy should be performed while the horse is still under anesthesia.
46. **e** The most important advantage of rolling in this case is that the horse would be ready to compete in the championship event in 3 weeks, as there would be no abdominal incision requiring time to heal. This treatment is generally less expensive than celiotomy and requires less hospitalization, but both would be less important in a high-quality horse.
47. **e** Gross distention of the abdomen would be associated with severe distention of the colon. The distended colon would be less likely to be moved into proper anatomic location.
48. **e** Increased mortality is not associated with rolling to reposition the large colon. The other options are true.
49. **b** The ventromedially displaced spleen lies close enough to the ventral abdominal floor, so that it is often punctured during abdominocentesis. The splenic blood is concentrated and has a higher packed cell volume than peripheral blood.
50. **e** Inhibition of fibroblast proliferation would decrease adhesion formation.
51. **d** The duodenum can be used as a landmark during surgery for locating the epiploic foramen, but it is not one of its borders per se.
52. **e** The correct name for the structure is the *duodenocolic ligament*.
53. **d** Jejunocolic anastomosis is recommended following any ileal resection, because the ileum has a single blood supply that makes any type of end-to-end (or side-to-side) anastomosis hazardous.
54. **c** In most cases impaction of the ventral large colon responds to medical treatment, which usually includes withholding feed and administration of fluids (oral, intravenous) and pain medications.
55. **d** This describes the Cushing suture pattern.
56. **a** The crushing component of the emasculator should be oriented proximal to the cutting blade.
57. **c** Small openings can have a negative effect on the outcome.
58. **c** First-degree perineal laceration involves only the vestibular mucosa and skin of the dorsal commissure. Second-degree perineal laceration involves the vestibular mucosa and submucosa and extends into the muscles of the perineal body, including the constrictor vulvae muscle.
59. **e** Granulosa-cell tumor is the most common ovarian tumor in mares.

60. **b** Seminal vesiculitis is an infrequent but significant disease of stallions. The seminal vesicles can be palpated on the dorsolateral aspects of the neck of the bladder. The dimensions of the abnormal rectal palpation findings in a horse with impaction of the ventral large colon would be larger than 5 cm. Horses with a perirectal abscess have mild colic, depression, decreased fecal production, tenesmus, and fever. The perirectal abscess can be palpated as a firm, submucosal swelling. Patent urachus is seen in young foals.
61. **a** The prosthesis is anchored to the caudodorsal aspect of the cricoid cartilage and the muscular process of the arytenoid cartilage.
62. **d** The maxillary sinus can be accessed directly via trephination or a bone-flap technique using these landmarks. The rostral compartment of the maxillary sinus communicates with the ventral conchal sinus, and the caudal compartment of the maxillary sinus communicates with the frontal, sphenopalatine, and middle conchal sinuses. With extensive disease of the paranasal sinuses, other surgical approaches may be indicated.
63. **a** This description is more consistent with dorsal displacement of the soft palate.
64. **d** Although epistaxis or a serosanguineous nasal discharge is the most common clinical sign of ethmoid hematoma, fatal hemorrhage has not been reported. Epistaxis is not a typical clinical sign associated with the other three conditions.
65. **b** Association of nasal discharge with nursing in a neonate is essentially pathognomonic for cleft palate. Persistent dorsal displacement of the soft palate can be associated with coughing and nasal discharge containing food material in some horses. Intermittent dorsal displacement of the soft palate causes exercise intolerance in racehorses; clinical signs of the condition are usually absent at rest.
66. **e** This is the correct orientation of these structures in the proximal metacarpus.
67. **b** Treatments for carpus valgus may include hemicircumferential transection/periosteal stripping.
68. **c** This type of osteochondritis dissecans may be treated by arthroscopic surgery of the tarsocrural joint.
69. **e** This type of osteochondritis dissecans may be treated by arthroscopic surgery of the femoropatellar joint.
70. **d** This type of subchondral cystic lesion may be treated by arthroscopic surgery of the medial femorotibial joint.
71. **a** Treatments for superficial digital flexor tendinitis may include proximal check desmotomy.
72. **d** The extended lateral splint prevents abduction of the limb, which could lead to an open fracture (medial skin wound).
73. **b** Periosteal stripping is a growth acceleration procedure.
74. **d** In hind limb lameness (at the trot), a slight downward motion of the head can be seen when the contralateral forelimb hits the ground. Also, the tuber coxae on the affected side has more vertical displacement than does the contralateral tuber coxae.
75. **e** Blocking of the distal interphalangeal joint is unlikely to relieve lameness associated with the deep digital flexor tendon.
76. **a** Open tibial fractures are seldom repairable in adult horses.
77. **b** Wound closure after formation of granulation tissue is termed delayed secondary closure.
78. **a** The acronym VAN can be used to remember this order.
79. **c** Overcorrection is not a problem with this procedure.
80. **e** Incisional and preputial swellings are minimized by postoperative exercise.
81. **d** This is probably normal peritoneal fluid.
82. **a** In some horses with cryptorchidism the epididymis and ductus deferens reaches the inguinal canal but the testicle is retained in the abdomen.
83. **c** Elective procedures should not be conducted in animals with signs of systemic illness. Surgery should certainly await further characterization of the foal's apparent illness.
84. **a** Osselets affect the fetlock joint.
85. **c** Gonitis affects the stifle joint.
86. **b** Bog spavin affects the tarsocrural joint.
87. **d** Low ringbone affects the coffin joint.
88. **e** Joint instability and muscle atrophy suggest sweeney or suprascapular nerve damage.
89. **a** Resection of the cranial edge of the scapula reduces trauma to the suprascapular nerve. A potential complication is fracture of the scapular neck.
90. **d** Endoscopy is indicated to determine the source of hemorrhage.
91. **a** Guttural pouch mycosis is the most common cause of profuse hemorrhage in a resting horse.
92. **d** Ligation of the internal carotid artery can prevent further serious hemorrhage in many affected horses.
93. **b** Neurologic involvement is a serious and potential irreversible process in the disease.
94. **a** Given the history and signs, this is the most likely diagnosis. Scrotal swelling is not marked in all stallions with acquired inguinal or scrotal hernia.
95. **a** Inguinal herniorrhaphy is indicated to correct the problem and to prevent recurrence. Resection and anastomosis of small intestine may also be necessary.
96. **d** Volvulus of the large colon causes pronounced pain and abdominal distention more rapidly than do other forms of intestinal obstruction.
97. **c** Rectal tears of this nature frequently progress to involve the full thickness of the rectum and result in profound contamination of the abdomen.
98. **c** This area of the tibiotarsal joint is most often affected.
99. **c** Dental abnormalities of the fourth premolar and the first molar often result in maxillary sinusitis in horses.
100. **e** The distal interphalangeal joint is also innervated by the dorsal branch of the digital nerve; therefore palmar digital analgesia will not completely eliminate pain emanating from this area.
101. **d** Flexural deformities of the fetlock are treated by desmotomy of the inferior check ligament.
102. **b** Fibrotic myopathy is treated by section of the tendon of the semitendinosus.
103. **c** Upward patellar fixation is relieved by section of the medial patellar ligament.
104. **a** Stringhalt is treated by removal of a section of the lateral digital extensor tendon.
105. **a** Sternothyrohyoid myectomy is used to treat dorsal displacement of the soft palate.
106. **d** Arytenoid chondritis is treated by subtotal arytenoidectomy.
107. **b** Roaring is treated with placement of a laryngeal prosthesis.
108. **c** Resection of the aryepiglottic fold relieves epiglottic entrapment.
109. **d** Squamous-cell carcinoma is the most common tumor of the equine penis.
110. **c** A physical examination will help determine which organ system(s) is/are involved and can be used to select further tests.
111. **e** The most common condition in foals that produces slowly progressive abdominal distention by fluid is rupture of the urinary bladder, causing uroperitoneum.
112. **a** Creatinine concentrations in peritoneal fluid are higher than normal serum values because of accumulation of urine in the peritoneal cavity.
113. **b** The kidneys excrete potassium-rich urine, which is resorbed via the parietal peritoneum, causing elevated serum levels of this electrolyte.
114. **a** Sarcoid is the most common neoplasm of horses and typically occurs on the limbs, head, and abdomen.
115. **b** Sarcoid is a benign tumor that is grossly similar to malignant neoplasms. Histopathologic examination is the only method for definitive diagnosis.
116. **d** Initial debulking decreases the size of the mass to be subsequently treated by cryotherapy and decreases the likelihood of recurrence.
117. **c** Osteochondrosis is a disease of growing cartilage.
118. **e** The most common site for subchondral cystic lesions in the equine stifle is the medial femoral condyle.
119. **d** Analgesia of the common digital nerve will eliminate pain emanating from the remainder of the digit (pastern and interphalangeal joints).
120. **b** *High ringbone* is the horse's term for osteoarthritis of the proximal interphalangeal joint.
121. **d** Pastern arthrodesis is used to treat high ringbone.
122. **b** Exuberant granulation tissue is very common in horses with distal limb lacerations.
123. **d** Idiopathic laryngeal hemiplegia is the most common disease producing these signs.
124. **a** Upper airway endoscopy is the easiest way to confirm the diagnosis of laryngeal hemiplegia and other upper airway abnormalities in racehorses.
125. **a** Prosthetic laryngoplasty is the most successful procedure for restoring performance of affected racehorses.
126. **a** Cryosurgery is one of the most effective treatments for sarcoids.
127. **d** Liquid nitrogen is used in commercially available cryosurgical units.

128. **a** The tissue must be frozen rapidly to  $-20^{\circ}\text{C}$  to enhance formation of intracellular ice crystals and thawed slowly to maximize cellular damage.
129. **a** Based on the results of 1000 arthroscopic surgeries, the distal aspect of the radial carpal bone is affected most often.
130. **b** One of the primary advantages of arthroscopic surgery is reduced tissue damage associated with the surgery and thus the amount of pain.
131. **b** Osteochondritis dissecans lesions involving the distal intermediate ridge of the tibia are readily accessible using arthroscopy.
132. **a** Though there are disagreements about whether use of prophylactic antibiotics decreases the length of hospitalization, this is a potential advantage of this practice.
133. **b** A clean-contaminated surgical procedure involves a minor exposure to bacteria. This type of procedure would be appropriate for incorporation of prophylactic antibiotics.
134. **d** A dirty surgical procedure involves clinically infected tissues.
135. **c** A contaminated surgical procedure involves gross exposure to bacteria. Antibiotic therapy is indicated under such conditions.
136. **a** A clean surgical procedure adheres to strict aseptic techniques, and antibiotics are not indicated unless a foreign body has been implanted in the tissues.
137. **d** To have any chance of being effective, antibiotics must be present at the time tissues are exposed to the bacteria.
138. **b** In contrast to the carbon dioxide laser, whose energy is absorbed by water, the Nd:YAG laser can be used in water-filled cavities.
139. **d** Polypropylene is a monofilament, nonabsorbable suture material.
140. **d** Polydioxanone suture material can be identified in tissues up to 210 days after implantation.
141. **c** Problems may be encountered during general anesthesia as a result of hypotension. Consequently preanesthetic agents are not selected for their ability to produce hypotension.
142. **b** Phenothiazine tranquilizers cause peripheral vasodilation through their effects on alpha receptors. They should be avoided in hypovolemic or hypotensive animals.
143. **d** Neuroleptanalgesia is produced by this combination of drugs.
144. **c** At dosages  $\geq 30$  mg/kg, chloral hydrate may cause the horse to sway or lose its balance.
145. **a** These drugs produce sedation and profound analgesia by interacting with  $\alpha_2$ -adrenergic receptors.
146. **e** These effects have been observed in horses given a pure opioid agonist, such as morphine, or a mixed agonist-antagonist, such as butorphanol.
147. **a** Use of aminoglycoside antibiotics may be associated with acute muscular paralysis and apnea resulting from neuromuscular blockade. This effect can also be caused by kanamycin, amikacin, gentamicin, and tobramycin.
148. **c** The combination of a muscle relaxant and a barbiturate provides excellent short-term anesthesia.
149. **e** Etorphine causes muscle rigidity that is not overcome by acepromazine.
150. **a** This ultrashort-acting barbiturate is extremely safe when used in combination with other agents.
151. **d** Though this ultrashort-acting barbiturate may be used successfully in some breeds of dogs, its duration of action is extremely short in horses.
152. **a** The term *MAC* defines the *minimal alveolar concentration* of an inhalant anesthetic agent.
153. **e** The other choices listed reflect the major determinants of arterial oxygenation.
154. **c** Arterial blood flow to the muscles of the forelimb can be reduced significantly if the limb is not elevated to a horizontal position.
155. **e** Xenografts are grafts used in different species.
156. **c** This skin graft includes the full thickness of skin.
157. **b** This skin graft is taken from and used in the same animal.
158. **d** This skin graft is used in different members of the same species.
159. **a** This is a variably thick skin graft that does not include all of the dermis.
160. **e** A skin graft will not remain viable unless the recipient bed has recently been debrided and contains new capillary buds.
161. **d** The most common complication of neurectomy is painful neuroma, hence the number of surgical techniques designed to minimize the occurrence of painful neuromas.
162. **e** The brachialis muscle is not involved in this surgical procedure.
163. **d** Because of the difficulty interpreting radiographic findings on plain films, the diagnosis must be based on a myelogram.
164. **b** Squamous-cell carcinoma most commonly affects the third eyelid and associated tissues.
165. **d** The dorsal border of the maxillary sinus bone flap is the infraorbital canal.
166. **e** Surgical treatment of the condition involves removal of the free border of the palate or transection of the muscles that displace the larynx caudally.
167. **c** Reduction of the size of the rima glottidis increases the resistance to air flow.
168. **b** Horses with guttural pouch empyema typically have a history of an upper respiratory tract infection, presumably with streptococcal organisms.
169. **c** This condition generally affects female foals and causes profound distention of the guttural pouch region with air.
170. **d** Epistaxis generally occurs as a result of involvement of the internal or external carotid artery.
171. **a** This is one of the primary sites used for surgical drainage of guttural pouch empyema.
172. **b** This technique is used to retract the arytenoid cartilage and increase the size of the rima glottidis.
173. **a** This surgical technique is used to remove affected arytenoid cartilages and to increase the size of the rima glottidis.
174. **d** This surgical technique is used as an emergency procedure to bypass obstructions affecting the upper respiratory tract.
175. **c** This procedure is used largely because of the difficulties associated with general anesthesia in draft breeds.
176. **d** Horses with acquired hernias are usually treated for colic.
177. **c** Horses with acquired hernias frequently have a history of trauma to the abdomen or thorax.
178. **a** Tears in the diaphragm generally occur at this junction.
179. **b** The other natural openings are for the esophagus and vena cava.
180. **c** Very often the fluid in the abdomen does not reflect the viability of the intestine incarcerated in the thorax.
181. **e** Because of the incomplete lobation of the equine lung and involvement of the ventral regions of the caudal lobes, this form of treatment has been unsuccessful.
182. **b** Because most cases of cleft palate are congenital, nasal regurgitation of milk occurs frequently.
183. **a** Because of the inadequate protection of the nasopharynx provided by the cleft soft palate, oral contents are frequently aspirated into the trachea and lungs.
184. **d** Because of the difficulty in placement of sutures, inadequate amount of soft tissue, and postoperative tension on the sutures, the suture lines in the soft palate frequently dehiscence.
185. **c** Because the cleft usually involves the most caudal aspect of the soft palate, surgical exposure is extremely difficult.
186. **d** Nasal regurgitation in an adult horse generally indicates esophageal obstruction.
187. **a** A physical examination must be performed to determine whether the obstruction can be palpated and to determine whether the horse requires intravenous fluids.
188. **d** Esophageal obstruction frequently occurs in horses that eat very quickly or that compete with other horses for feed.
189. **a** It is important to recognize that normal mucosal folds should be oriented longitudinally as the endoscope is gently withdrawn.
190. **c** After the esophagus has been obstructed, fusiform dilatation occurs in the area of the obstruction. Frequently this is the site of a subsequent obstruction if the horse is fed too soon after the obstruction has been relieved.
191. **b** Very often the obstruction resolves if the horse is sedated or tranquilized. It also is good practice to use gentle controlled lavage against the obstruction.
192. **e** Because this type of diverticulum has a rather narrow neck and extends outward from the normal esophageal lumen, it may serve as a site for obstruction.
193. **d** This type of diverticulum has a wide base along the normal esophageal lumen and then tapers to a point where the esophageal defect has finally healed by second intention. This type of diverticulum commonly develops after esophagostomy.

194. **c** Because milk cannot pass through the small intestine of foals with gastroduodenal obstruction normally, it may be retained in the stomach.
195. **e** If the surgeon decides that the affected esophageal tissue is unlikely to heal by primary intention, an esophagostomy may be performed and a nasogastric tube secured in place.
196. **d** This procedure is performed to connect the common bile duct with the jejunum.
197. **a** This surgical technique is used to bypass the stenotic pylorus and allow food to pass from the stomach directly into the duodenum.
198. **b** This surgical procedure is used to bypass an obstruction at the junction of the esophagus and the stomach.
199. **c** This technique permits food to bypass diseased proximal duodenum.
200. **a** Horses with impactions at the pelvic flexure rarely have fluid reflux from the stomach.
201. **c** To determine whether there is evidence of small-intestinal obstruction or strangulation obstruction, the most obvious diagnostic procedure is to perform a rectal examination.
202. **c** Ileal impactions occur predominantly in horses residing in the southeastern United States.
203. **d** The most efficient method of examining the small intestine is to start at either the ileum or the duodenum and trace in one direction only. Because it is not possible to exteriorize the duodenum, it is common practice to begin at the ileum.
204. **e** The prognosis associated with inguinal or scrotal hernias in horses is guarded, with reported survival rates ranging from 30% to 70%.
205. **d** This condition occurs as a result of rupture of the bladder, usually along the dorsal aspect of the bladder.
206. **c** This is a very common cause for emergency colic surgery in broodmares. Most affected mares have a 2- to 3-month-old foal at their side.
207. **e** Pedunculated lipomas tend to develop in aged horses and may strangulate a segment of small intestine.
208. **a** Telescoping of the distal aspect of the small intestine into the cecum may occur as an acute complete obstruction or as a partial obstruction that causes intermittent colic.
209. **b** Cecal impactions generally occur in middle-aged horses and cause mild to moderate abdominal pain. Early diagnosis (by rectal examination) and aggressive treatment are necessary, as spontaneous cecal rupture can occur.
210. **c** This condition is likely to occur in weanlings exposed to a large environmental worm burden (poor management on the farm).
211. **e** In most reported studies, incarceration of the small intestine in the epiploic foramen adjacent to the caudate lobe of the liver occurs in middle-aged horses.
212. **a** Enterolithiasis commonly occurs in horses residing in the southwestern United States, certain parts of Florida, and the midwestern United States.
213. **e** There are no reported cases of small-colon intussusception in horses.
214. **e** Even with heroic efforts, the prognosis with grade 3 rectal lacerations is guarded; that associated with grade 4 lacerations is poor.
215. **c** Though the cause of laminar ischemia remains elusive, these treatment aims are justified based on the available information about the animal's status during development of the condition.
216. **e** A common finding associated with this condition is prominent distention of the tendon sheath.
217. **a** Very often injection of local anesthesia over the palmar digital nerves on one leg causes the lameness on the other forelimb to become more evident.
218. **c** Marked improvement of the horse's gait with injection of local anesthetic over one palmar digital nerve should distinguish this condition from navicular disease.
219. **d** Because of the location of the lesions, the horse's gait will not be improved with a palmar digital nerve block.
220. **b** This condition is usually characterized by abnormal growth patterns in the hoof and a palpable digital pulse.
221. **d** Treatment must include administration of appropriate antimicrobial drugs and lavage of the affected synovial sheath.
222. **d** The foal must have at least four incisors present to permit proper application of the wire braces.
223. **d** This surgical technique has been used successfully for treatment of both conditions.
224. **c** This condition frequently causes the horse to knuckle at the fetlock.
225. **e** This flexural deformity may resolve with physical therapy in some foals.
226. **a** This condition frequently is termed *clubfoot*.
227. **b** This technique has been used successfully to treat clubfoot and mild to moderate cases of flexural deformity at the metacarpophalangeal joint.
228. **d** This cause of angular deformity can only be identified with radiography.
229. **c** This type of deformity most often affects the fetlock joint.
230. **e** This surgical treatment increases the rate of growth on the same side of the physis.
231. **b** This type of deformity most often affects the carpal region.
232. **a** This type of injury crushes a portion of the physis, resulting in premature closure of that portion of the physis.
233. **e** Screws and wires are applied to the more rapidly growing side of the physis.
234. **d** The only means of correcting this type of deformity is to remove a wedge of bone proximal to the joint.
235. **e** There is some evidence that osteochondrosis may be associated with low dietary levels of copper.
236. **d** Osteochondrosis lesions are far more common at the other sites.
237. **d** The prognosis for soundness is very good after removal of this fragment. There is some disagreement among clinicians as to whether these fragments should be removed in all affected horses.
238. **c** It has been the experience of numerous clinicians that the prognosis is better for horses undergoing arthrodesis of the proximal interphalangeal joint on the hind limb than on the forelimb.
239. **d** Often there is no radiographic evidence of flattening of the dorsal surface of the third metacarpal bone, and the enlarged synovial pad must be identified using ultrasonography or contrast arthrography.
240. **d** Of the various types of sesamoid fractures, this type appears to be least amenable to fragment removal, prolonged rest, or internal fixation. Present recommendations include cancellous bone graft, reduction of the fracture with cerclage wire, and cast immobilization.
241. **a** Because these fractures heal poorly, the apical bone fragment must be removed. Trauma to the attached suspensory ligament must be minimized during surgery.
242. **c** Though these fractures are less common than apical fractures, there is sufficient bone available on either side of the fracture line to permit application of a compression screw.
243. **b** Nonarticular abaxial sesamoid fragments generally need not be removed.
244. **c** Often a common limiting factor in the response of foals to treatment for septic arthritis is involvement of several joints.
245. **b** Septic arthritis in adult horses generally occurs secondary to injuries or contaminated joint punctures.
246. **d** Because septic arthritis in adult horses rarely involves more than one joint, the offending organism and the degree of involvement of the joint before treatment is instituted are of paramount importance.
247. **a** Septic arthritis in foals most often originates from another source (e.g., the umbilicus).
248. **a** These signs are not restricted to fractures of the distal phalanx, however.
249. **b** The prognosis associated with comminuted fractures of the proximal phalanx depends on whether an intact "strut" of bone is present.
250. **e** Bone screws should be restricted to the small metacarpal bone, otherwise fixation of the small metacarpal bone to the third metacarpal bone may change the alignment of the carpometacarpal joint surface.
251. **c** Several retrospective studies have shown adhesions to be more commonly associated with small-intestinal resection and anastomosis. Although the reason is unknown, proposed causes include the serosal surface of the small intestine being more prone to damage associated with disease, handling during surgery, and ischemia. The long mesentery allows the small intestine to become adhered to the abdomen, and the narrow lumen of the small intestine is more prone to mechanical obstruction from adhesions.

252. **e** An internal umbilical remnant and umbilical arteries are most commonly involved; therefore umbilical infections are difficult to detect on physical examination. Ancillary diagnostic tests, such as ultrasonography, may be used to confirm a diagnosis; however, umbilical infection should be suspected in foals with septic joints, for example. Infected umbilical remnants should be resected.
253. **e** In 81% of affected standardbreds and 67% of affected Thoroughbreds, distal splint bone fractures are associated with suspensory ligament desmitis because the ligamentous attachments of the suspensory ligament to the splint bone results in fracture of the splint bone during hyperextension. An enlarged suspensory ligament pushes the splint bones abaxially during flexion, resulting in fatigue fractures of the distal splint bones. Although splint bone fragment removal is controversial, fragment removal is recommended because of continued irritation from the fragment and further suspensory ligament damage.
254. **b** Implant fixation is generally not required for fractures of the middle third of the splint bone. Conservative treatment results in poor healing (nonunion, excessive callus formation) and lameness.
255. **c** The most common locations of carpal chip fractures are the distal radial carpal bone, distal intermediate carpal bone, and proximal third carpal bone. They occur most commonly in racing Thoroughbreds and quarter horses. Arthroscopy results in less damage to the soft-tissue joint structures, allows for joint irrigation and improved visibility, results in less postoperative pain, and provides better cosmetic results and improved performance as compared with arthrotomy.
256. **c** Retrospective studies have shown that 71.1% of horses with grade I lesions and 75% of horses with grade II lesions (both grades have minimal cartilage damage) return to performance at the same or higher level.
257. **d** The prognosis for soundness is poor. Removal of the osteophytes would not be beneficial because they are thought to be a result of remodeling caused by joint instability. Intraarticular polysulfated glycosaminoglycans have been associated with septic arthritis following injection.
258. **b** Severe articular ringbone treated conservatively has a poor prognosis for soundness. Although ankylosis (natural fusion) may occur in some cases, this takes several years or may not occur at all. Pastern arthrodesis produces good cosmetic and functional results.
259. **e** The pastern joint is a low-motion joint; arthrodesis produces good functional and cosmetic results. Fractures of P2 and pastern joint luxation result in severe degenerative joint disease and lameness. Arthrodesis of the joint is recommended.
260. **b** Type I fractures are most common in young foals. Because of the soft bone and proximal location of the fracture, they are extremely difficult to repair. Some screw-and-wire fixations have been associated with disintegration of the apophysis.
261. **e** The other forms of stabilization listed do not provide enough stability for this type of fracture when used alone; however, lag screws and transfixation pins may be used in combination with dynamic compression plates.
262. **b** Absorbable suture material should be used in the bladder to reduce recurrence of bladder stones. A double-layered continuous pattern is recommended to reduce leakage and minimize surgery time and amount of suture material in the repair.
263. **e** Antibiotics and nonsteroidal antiinflammatory drugs are important to reduce inflammation and bacterial numbers; however, lavage and debridement with arthroscopy dilute both bacteria and inflammatory mediators. Annular ligament desmotomy reduces pain associated with constriction and improved drainage.
264. **b** A single locking loop is not strong enough. Monofilament material should be used to reduce tearing of tendon tissue.
265. **c** In this area there is not enough skin to cover implants, such as plates. A full-limb cast provides enough stability for healing.
266. **d** Two retrospective studies have shown that 18% and 32% of affected horses returned to racing. This relatively low proportion is a result of the complexity of the problems leading to condylar fracture, including preexisting arthritis and soft-tissue injuries.
267. **d** In cases that are severe or persistent and that have not responded to other, more conservative treatment, medial patellar desmotomy may be performed to relieve the problem. This procedure may be associated with development of stifle joint arthritis and lesions on the patella.
268. **a** Cecal contents flow into the right ventral colon. Ileocolic anastomosis is used to treat cecal disease, such as cecal impactions.
269. **a** The cecocolic ligament is located between the lateral band of the cecum and the lateral free band of the right ventral colon.
270. **e** Large-colon volvulus causes vascular compromise by occluding the colic vessels, leading to rapid cardiovascular deterioration. At 1 to 3 months after foaling, broodmares are predisposed to this form of colic.
271. **e** Ileus and adhesions are common complications of small-intestinal anastomosis.
272. **d** Small-colon impaction is the most common cause of colic in miniature horses.
273. **c** Lipomas that cause bowel strangulation are a common cause of colic in old horses.
274. **c** Approximately 50% to 70% of horses subjected to small-intestinal anastomosis fully recover.
275. **d** Sarcoids are benign, locally invasive tumors that tend to recur.
276. **d** The emerging foal's foot or nose catches on the dorsal vulvovaginal fold, tearing the tissues.
277. **c** Perineal urethrotomy is typically performed for temporary urinary diversion in males with obstructive urinary outflow disease.
278. **e** Parietal peritoneum covers the internal body wall of the abdominal cavity.
279. **a** The cremaster muscle, an extension of the internal abdominal oblique muscle, sometimes contracts during castration.
280. **d** *Cystorrhaphy* is the surgical term for suturing the bladder.
281. **a** These techniques allow improvement in both reduction and fixation.
282. **b** Arthrotomy incisions of the femorotibial or femoropatellar joint are easily disrupted, prolonging the healing time.
283. **d** Arthroscopic lavage allows thorough evaluation and lavage of the joint and conversion to arthrotomy for prolonged drainage if necessary.
284. **e** Irrigation and elimination of debris are still required.
285. **a** Excessive fibrosis complicates subsequent vulvoplasties.
286. **d** First-degree lacerations involve only the vestibular mucosa and skin of the dorsal vulvar commissure and do not result in fecal contamination.
287. **d** The diet should be changed a sufficient time before surgery to ensure that the feces are soft but not fluid.
288. **d** Surgical repair is not always required.
289. **b** The paired sternothyroideus muscles are bluntly divided along the ventral midline. The incision is parallel to the tracheal rings through the annular ligaments, no more than half the circumference of the trachea.
290. **a** The cause is not determined in most cases of laryngeal hemiplegia.
291. **b** The goal of laryngoplasty is to mimic the permanent contraction of the cricoarytenoideus dorsalis muscle using a suture.
292. **b** All approaches to the guttural pouches require an exterior ventral midline or lateral incision. The objective of the surgery is to promote drainage.
293. **d** Heavy infestations of *Parascaris equorum* in foals, weanlings, and yearlings can lead to small-intestinal impaction, particularly after administration of anthelmintics dislodges large masses of worms.
294. **c** Enterotomy at the pelvic flexure allows access to both the dorsal and ventral colons for lavage and evacuation.
295. **a** Typhlotomy is cecal enterotomy.
296. **d** Inguinal hernia involves neither the small colon nor rectum.
297. **a** The ileum is located by grasping the dorsal tenia and following it to the ileocecal fold.
298. **d** Reestablishing vascularization is the first priority in skin graft procedures.
299. **c** Atheromas are a congenital disorder resulting from aberrant development of epithelial tissue, forming a benign cyst within the false nostril.
300. **c** Fibrotic myopathy affects the semitendinosus muscle, restricting the cranial phase of the stride and giving rise to the goose-stepping gait. Resection of the tibial attachment of the semitendinosus tendon lengthens the muscle-tendon unit.
301. **d** Hysterotomy is indicated. Cervicotomy is not likely to allow enough room for manipulation.

302. **e** Ventral midline is the safest approach.
303. **b** Squamous-cell carcinoma is the most common tumor causing necrosis and ulceration.
304. **c** Liquid nitrogen is most commonly used because of its low boiling point, relative low cost, and colorless, odorless, nontoxic vapor.
305. **e** The thermoprobe uses a technique for controlled heating in highly localized tissue volumes called the *localized current field method*. Radiofrequency currents pass through electrodes to the tissue to be treated.
306. **a** Hoof abscess is most likely. When the abscess drains the animal may walk almost normally.
307. **a** Upward fixation of the patella might be suspected.
308. **a** Penile hematoma would cause a circulatory disturbance, edema, and eversion of the prepuce.
309. **e** The retraction ability of the preputial muscles has nothing to do with hematoma of the bovine penis.
310. **e** Urolithiasis is uncommon in females.
311. **d** Traumatic reticulitis is not likely to cause a distinct area of gas accumulation on the right side, though gastrointestinal stasis may allow small pockets of gas to accumulate in the colon or duodenum.
312. **a** Decompression of accumulated gas and/or fluid must be accomplished first.
313. **e** Trauma from a balling gun or paste dewormer is a common cause.
314. **c** These lymph nodes drain the cranial part of the abdominal cavity, and enlargement usually indicates inflammation there.
315. **d** An expiratory grunt is commonly seen with traumatic reticulitis.
316. **c** Simple indigestion is the most likely choice.
317. **c** Traumatic reticulitis is the most likely choice.
318. **b** Abomasal volvulus is most likely to be accompanied by metabolic changes severe enough to cause alkalosis.
319. **d** The duodenum is found directly under the incision site.
320. **b** The right paramedian area between the umbilicus and the sternum is the correct choice.
321. **b** Colic may accompany these diseases in cattle.
322. **a** Often the object may be gently pushed into the rumen to relieve the obstruction.
323. **b** Usually the cecum must be decompressed before being untwisted. Cecopexy is usually not done.
324. **a** The first step is to provide adequate restraint.
325. **d** Alligator forceps are the instrument of choice. The other instruments are used for other types of teat surgery.
326. **c** Though this answer may be controversial, most affected animals recover with proper medical management consisting of hydrotherapy and antibiotics.
327. **b** The cow with abomasal displacement and relatively minor complications would have the best prognosis.
328. **d** The cow with vagus indigestion would have the worst prognosis, as a specific cause often cannot be identified.
329. **a** Hemorrhage is probably the most common complication, especially if preventive measures are not taken.
330. **d** The incision is made caudal to the sigmoid flexure, in the perineal area or more ventrally.
331. **a** Chronic movement of a traumatized tendon causes development of a granuloma.
332. **e** Immobilization is required to prevent excessive movement during healing.
333. **c** Traumatic rupture of the deep flexor tendon is likely.
334. **e** These blood gas values indicate metabolic alkalosis.
335. **c** Reducibility of the swelling usually differentiates these conditions.
336. **a** The key here is that splashing sounds were heard. Gas and fluid must be present for these sounds to be heard, so traumatic pericarditis is the most likely diagnosis.
337. **b** Scirrhus cord is most likely because the calf is febrile. Drainage should be established and antibiotic therapy given.
338. **e** Prolapsed fatty tissue should be trimmed after castration.
339. **c** The emasculator is the correct choice. The elastrator does not cause crushing but places a rubber band tightly around the scrotum to cut off all blood supply to the tissues.
340. **d** The simplest and most effective treatment involves relief of weight bearing.
341. **b** Based upon the location of the draining tract, suppurative tenosynovitis is most likely.

342. **c** Drainage in that area usually indicates infection and/or necrosis of the tendon. Resection is probably necessary.
343. **b** Because laminitis in this bull is of long standing, the bull probably has long, overgrown hooves that require periodic trimming.
344. **a** Chronic subclinical indigestion is often associated with laminitis in ruminants.
345. **c** A continuous inverting stitch is used, such as Guard's rumen stitch, Cushing, or Utrecht.
346. **b** Caudal paresis after calving is usually associated with damage to the sciatic nerve.
347. **c** Relief of weight bearing often allows adequate treatment and conservation of the digit.
348. **a** Only the first choice is a true statement.
349. **e** Adequate exercise usually leads to spontaneous resolution of the problem.
350. **d** Crepitation in the stifle ligaments probably indicates rupture of the ligaments.
351. **b** This allows the gas-filled organ to remain stable until the animal is rolled on its back.
352. **b** Some studies show that increased exercise prevents abomasal displacement.
353. **d** Uterine torsion is not likely to cause projectile vomiting.
354. **e** The reticulum is best explored from the left.
355. **e** Statistics show that cows of this age are affected in the first few postpartum weeks.
356. **d** Hypochloremia and hypokalemia are common with abomasal volvulus.
357. **b** The submucosa offers the most holding power for sutures.
358. **a** Most surgeries in ruminants are done under local anesthesia. Answer *b* is incorrect because it is a branch of the trigeminal nerve.
359. **d** Cancer eye is most common in 4- to 6-year-old cattle without pigmentation. Squamous-cell carcinoma does not metastasize very early. Lesions with fingerlike projections are papillomas.
360. **d** A Lichty knife is used to make incisions from inside the teat canal, toward the outside.
361. **b** Alpine goats especially must be dehorned before 2 weeks of age.
362. **b** Normovolemic anemia does not impair healing; hypovolemic anemia does.
363. **e** This is an advantage of an interrupted suture pattern.
364. **b** Atresia coli does occur in sheep and pigs.
365. **d** This is the only documented bacterial predisposing factor.
366. **a** This is because the medial front claw supports more weight than the lateral claw.
367. **b** Forced extraction is a common predisposing factor.
368. **c** The femoral nerve innervates the quadriceps femoris.
369. **d** They generally occur at the distal flexure.
370. **c** An indwelling catheter is the treatment of choice; the bladder heals without suturing. Laparotomy is not necessary.
371. **c** Both the herniated and normal sides should be repaired or the intestines may herniate.
372. **c** The left kidney is displaced to the right by the rumen and is more commonly affected by pyelonephritis.
373. **d** Because of straining and possibly the influence of estrogen, both are commonly encountered. A low-roughage diet minimizes recurrence.
374. **b** Sensory innervation of the eye, conjunctiva, nictitating membrane, and most of the eyelid is provided by the ophthalmic division of the trigeminal nerve and its branches.
375. **c** Both mandibular canines are extracted in the detusking procedure.
376. **d** The cow cannot bear any weight on the affected limb. Because of the heavy body weight, she would not be able to rise past midpoint using just one rear leg.
377. **d** Hygromas contain subcutaneous fluid and occur over bony prominences, such as the tarsus, carpus, and proximal tibia. They seldom cause clinical problems and do not require special treatment unless they become infected (unusual) or represent a cosmetic problem (e.g., in a show cow).
378. **b** The object is to achieve bloodless castration by separating (transecting) each spermatic cord proximal to each testis. The emasculator is applied across two sites to ensure complete transection of the cords.
379. **e** Despite the objections of many veterinarians, tail amputation is advocated by some animal scientists and dairy farmers as a means of reducing soiling of the udder and perineum with manure. However, it should not be used as an excuse to avoid adequate stable hygiene. Fly control in herds with amputated tails is very important.

380. **b** Local infiltration of the cornual nerve is quick and simple and provides effective analgesia for dehorning procedures. Answers *c*, *d*, and *e* would be ineffective; general anesthesia (*a*) is unnecessary.
381. **b** Electric dehorning cannot be performed effectively before the horn erupts (eliminating choices *c* and *e*), and should be done while the horn is small (eliminating choices *a* and *d*).
382. **e** A rectovaginal fistula, often present in heifer calves with atresia ani, provides an alternate route for passage of fecal material. Although affected calves are usually thin and have severe abdominal distention, some may survive untreated for several months.
383. **c** Failure to adequately close the defect in the mesentery following end-to-end anastomosis predisposes to postoperative herniation of a segment of small intestine through the newly created internal hernia.
384. **c** The cecal artery and vein are located in the ileocecal ligament along the ventral curvature (mesenteric border) of the cecum. The bovine cecum has neither lateral nor dorsal bands (*a*, *b*). The cecocolic ligament (*d*) is not transected unless the entire cecum is necrotic, requiring removal of the ileocecolic junction (rare).
385. **e** Because of the ventral edema, one should avoid any surgical technique that requires placement of a suture (*a* or *e*) or making an incision (*d*) through the edematous tissues. The technique described in *b* is not an accepted surgical procedure.
386. **b** Decreased abomasal emptying as a result of abomasal displacement causes sequestration of chloride-rich abomasal fluid, resulting in hypochloremia and hyperbicarbonemia (metabolic alkalosis).
387. **c** The area of tympanic resonance described is consistent with volvulus of the abomasum. The area of ping is centered too far cranially to be either cecum or ascending colon; it is too large and too far cranial to be jejunioileum. The omasum does not normally twist independently from the abomasum.
388. **a** Cows with abomasal volvulus develop hypokalemia because of decreased food intake, continued loss of potassium in the urine, and intracellular movement of potassium ions in exchange for hydrogen ions (in response to acidemia). Values below 2.0 mEq/L or above 8.0 mEq/L are not usually compatible with life.
389. **c** Cows with abomasal volvulus sequester chloride-rich fluid in the abomasum and forestomach compartments, resulting in hyperbicarbonemia and metabolic alkalosis, with a compensatory increase in carbon dioxide tension. This cow is unlikely to have a mixed disturbance consisting of metabolic acidosis and metabolic alkalosis because the anion gap is normal.
390. **a** Isotonic (0.90%) NaCl is an acidifying solution to be used for cattle and other animals with metabolic alkalosis. Supplementation with KCl is needed to treat hypokalemia; an infusion rate of 20 mEq/L is safe with isotonic fluids. The resultant fluid is mildly hypertonic (348 mOsm/kg).
391. **b** The abomasopexy should reposition the organ in its normal anatomic position (i.e., the greater curvature of the body should be adjacent to the ventral abdominal wall).
392. **d** The omentopexy holds the portion of the greater omentum that is just distal to the pylorus to the right paralumbar fossa. In this way the abomasum itself is maintained in a nearly normal location.
393. **c** The abomasum is a common site for lymphosarcoma in adult dairy cows. Bleeding ulcers are commonly present on the surface of the tumor.
394. **a** Administration of hypertonic saline solution increases the osmolality of the plasma (and almost simultaneously the interstitial fluid). Water is drawn from the intracellular fluid space to dilute the extracellular fluid (plasma and interstitial fluid), thereby increasing the osmolality of the intracellular fluid.
395. **e** The incision is made in the left paralumbar fossa. It is positioned close to the last rib (rib 13) to provide the surgeon with maximal room to reach cranially to the reticulum.
396. **b** With the exception of an occasional case involving the proximal jejunum, intussusceptions in adult cattle virtually always occur in the jejunioileum (the distal part of the jejunum and the proximal part of the ileum), where the mesentery is long enough to allow intestinal invagination.
397. **e** Because of the strong likelihood of a small-intestinal accident, such as intussusception, a right paralumbar fossa approach is indicated. The cow should be positioned in left lateral recumbency, perhaps under general anesthesia. Abdominal exploration and abdominal wall closure cannot be accomplished if the cow is positioned in sternal recumbency. Alternatively, the cow may be operated on in a standing position (not offered as an answer option).
398. **c** The proximal blind end must be united to a portion of bowel distal to the atresia (eliminating answers *d* and *e*). Most surgeons prefer to unite the proximal blind end to bowel close to the rectum (i.e., descending colon), rather than force digesta to pass through the unused portion of spiral and distal loops of ascending colon if the anastomosis is made to the distal blind end (*a* and *b*).
399. **d** Torsion of the mesenteric root results in volvulus of the small and large intestine. It is rapidly fatal, with affected cattle or other ruminants succumbing within 2 to 4 hours. The other conditions listed cause death if left untreated; however, affected cattle usually survive at least 24 hours and sometimes several days after onset of each of these conditions.
400. **c** The left kidney is positioned approximately on the midline, to the right of the dorsal sac of the rumen. It is best approached through an incision in the right paralumbar fossa, thereby avoiding the rumen.
401. **b** Volvulus of the cecum and volvulus of the first two segments of the proximal colon usually occur simultaneously and result in the clinical signs described. The area of ping is centered too far caudally to be abomasum; volvulus of the omasum does not occur by itself. Volvulus of the jejunioileum results in several smaller areas of ping and one would palpate distended loops of small intestine per rectum. Volvulus of the ascending colon is rare unless accompanied by cecal volvulus.
402. **d** The cecum and proximal loop of the ascending colon can be exteriorized and manipulated through a standard right paralumbar fossa celiotomy. In most cases this procedure is performed with the cow in a standing position, using regional or local analgesia (anesthesia).
403. **d** An average Holstein cow weighs approximately 600 kg. Assuming loss of 8% body weight as a result of volume depletion, the volume deficit to be replaced during the first 12 hours is estimated at  $8\% \times 600 \text{ kg} = 48 \text{ L}$ .
404. **e** Dehorning mature cattle exposes the frontal sinus, which communicates directly with the cornual sinus in the adult. Infections are most common in the summer months, during fly season.
405. **a** The pyloric part of the abomasum (or adjacent omentum) is usually present in the umbilical hernia sac.
406. **d** To ensure removal of all infected tissue, the urachal stalk should be removed in its entirety, including the apex of the bladder, which is closed using an inverted suture pattern.
407. **c** The needle is inserted between the sacrum and first caudal (coccygeal) vertebra, or at the first movable joint space (between Cd1 and Cd2). Note that the bovine sacrum is fused, making responses *a* and *e* inappropriate.
408. **e** Epidural injection of 10 ml lidocaine would desensitize the perineal area, making a Caslick's procedure possible. All the other procedures listed involve other areas of the rear portion of the animal.
409. **a** The cranial vena cava is the preferred site for blood collection in adult pigs.
410. **e** The hog holder device encircles the upper jaw in the interdental space.
411. **a** The dorsal and ventral branches of the first three lumbar nerves supply the muscles and skin of the paralumbar fossa.
412. **b** Correct application of paravertebral anesthesia relaxes the muscles on the side of the block, causing the cow to develop a convex appearance on the side of the block.
413. **d** Many cows urinate after the administration of xylazine because of increased smooth muscle tone.
414. **a** Large perireticular abscesses are usually caused by chronic reticuloperitonitis. At surgery a nail or wire is often found in the region of the abscess.
415. **d** The preferred treatment for perireticular abscess is rumenotomy, followed by lancing of the abscess into the rumen in an area of firm adhesions between the rumen and abscess.
416. **a** The signs described are classic for hematoma resulting from a breeding accident, causing rupture of the tunica albuginea.



417. **d** Bulls with hematoma of the penis often develop prolapse of the prepuce.
418. **b** Fibropapillomas are relatively common in young bulls, especially those housed in groups.
419. **d** Surgical removal of the tumor usually is curative. Some veterinarians recommend concurrent administration of wart vaccine.
420. **a** The uterine incision is made in the gravid horn over the fetus, midway along the horn.
421. **c** The incision would pass consecutively through the external abdominal oblique, internal abdominal oblique, and transversus abdominis muscles.
422. **c** Cattle have no canine teeth or upper incisors.
423. **a** Union of the proximal loop of the ascending colon to the outside turn of the spiral loop of the ascending colon bypasses the obstruction. Responses *b* and *d* unite two portions of bowel distal to the obstruction. Response *e* unites two portions of bowel proximal to the obstruction. Response *c* is anatomically correct in that it bypasses the obstruction; however, it bypasses too much bowel.
424. **b** Abomasal volvulus (*a* and *c*) occurs on the right side of the abdomen, as does cecal dilatation (*d* and *e*).
425. **e** Abomasal ulcer disease and traumatic reticuloperitonitis are likely to cause localized peritonitis in the area of the xiphoid.
426. **d** Nasal adenocarcinoma is a locally expansive tumor originating from the ethmoid turbinates. It can be treated surgically if recognized in time. Though nasal bot infestation and chronic rhinitis can produce unilateral nasal discharge in sheep, they rarely cause facial asymmetry. Tooth root abscessation is rare in sheep, and ethmoid hematoma is a condition unique to horses.
427. **c** Recumbency is contraindicated in animals with abdominal distention, including late pregnancy. Late pregnancy also interferes with placement of a blind tack from the left flank approach.
428. **e** Omentopexies if properly placed are fairly stable. However, excessively thin or fatty omentum does not hold sutures well and may tear loose. Right paramedian abomasopexy ensures stabilization of the abomasum.
429. **b** Open procedures are reliable but more expensive. Rolling alone has a high rate of recurrence and further treatment will probably be required.
430. **c** Any suggestion of respiratory disease increases the risks with recumbent procedures. A standing left flank approach allows direct access to a portion of the abomasal serosa and an opportunity to safely break down some adhesions.
431. **d** The right flank approach provides the best access to the greatest number of structures in the abdomen.
432. **b** The ping area is too large to be small intestine, uterus, or spiral colon. Its location is centered in the paralumbar fossa, rather than over the caudal rib cage, indicating cecum rather than abomasum.
433. **e** A right flank approach provides good surgical access to more abdominal structures than any other approach; however, some structures require an alternative approach. Surgical access to the reticulum is limited to a cranioventral midline approach or transruminally via a left flank approach. The abomasal fundus is best accessed via a right paramedian approach. This approach is also best for access to the omasoabomasal orifice, although access would still be poor in an adult cow. The dorsal rumen sac is best accessed via a left flank approach.
434. **a** The close association of the loops of spiral colon and their imbedment in fatty mesentery make it very difficult to reliably identify or isolate individual loops. Obstructions in this area are typically bypassed by anastomosing the closest identifiable, mobile proximal structure (cecum) to the closest identifiable, accessible distal structure (descending colon).
435. **c** The jejunum is most commonly involved in intussusceptions in adult cattle. The ileocecal valve is rarely a site of intussusception in adult cattle (unlike horses) because of accumulation of fat in the mesentery.
436. **b** The descending duodenum is located immediately deep to the peritoneum at the site commonly used for a right flank approach and can be accidentally damaged by an overly aggressive incision.
437. **a** The pyloric antrum of the abomasum is in closest proximity to the umbilicus and can frequently be palpated in the hernial sac of an umbilical hernia of calves. The omental sling of ruminants provides a barrier between the jejunoileum (most commonly involved in umbilical hernias of monogastric species) and the ventral body wall of calves.

438. **c** Distal phalanges refers to the section of distal jejunum and proximal ileum and is supported by the longest segment of mesentery.
439. **b** The descending duodenum is supported by very short mesentery and is the least mobile structure of those listed.
440. **b** Localized umbilical swelling in calves results from umbilical herniation or localized infection of the umbilicus. An infected umbilicus shows signs of inflammation (heat, redness, pain) with variable drainage or a fluctuant cavity filled with pus. Swelling caused by infection is continuous with the body wall and cannot be reduced completely into the abdomen. In contrast, simple hernias are nonpainful and cool and can be manually reduced into the abdomen.
441. **a** The most common structures in a calf umbilical hernia are omentum and the pyloric region of the abomasum. The defect in the body wall can be detected as a palpable ring. Incarcerated umbilical hernias are very uncommon in calves, therefore an inflamed nonreducible umbilical mass can generally be considered to represent infection. Both hernia and infection can be present in one mass in calves, in which case a portion of the mass has characteristic signs of infection while another portion is cool and reducible. As a result, a hernial ring can be palpated around part but not all of the mass.
442. **d** Umbilical infections in calves frequently extend proximally along one of three fetal structures. The umbilical vein extends from the fetal umbilical cord craniodorsally to the liver. The urachus extends caudodorsally to the bladder apex. The paired umbilical arteries also course caudodorsally past the bladder apex to the internal iliac arteries in the fetus. Whereas these structures normally lose functional patency at delivery and deteriorate gradually thereafter, ascending infection from a neonatal umbilical infection can result in abscessation of any of these structures. Involvement of one of these umbilical remnants can frequently be detected by palpation of an enlarged stalk extending craniodorsally or caudodorsally from the umbilicus into the abdomen. Craniodorsal stalks indicate umbilical vein involvement, whereas caudodorsal stalks may be either urachus or umbilical artery.
443. **e** Infections that have ascended one of the umbilical remnants act as thick-walled abscesses and are rarely responsive to antibiotic therapy alone. The infection is commonly segmented along the course of a stalk, which makes attempts to drain or lavage from the umbilical opening unsuccessful. Complete umbilical vein stalks extending to the liver are not amenable to transection, and attempts to do so leave a focus for infection. The most effective treatment is to marsupialize the stalk as close as possible to the liver to provide a short route for drainage.
444. **e** This animal is at high risk for urolithiasis and at relatively low risk for intestinal obstructive disorders. The nature of the peritoneal fluid is suggestive of uroperitoneum, which would require disruption of the urinary tract proximal to the neck of the bladder. Comparison of urea nitrogen and creatinine levels in the blood and peritoneal fluid would help confirm this diagnosis but is not always possible in a field setting.
445. **d** Animals with bladder rupture cannot eliminate urinary products, many of which can be resorbed from the peritoneal cavity. Fluid therapy should begin expansion of fluid volume without increasing the concentration of dangerous byproducts. Isotonic saline solution allows rehydration without increasing potentially life-threatening hyperkalemia (lactated Ringer's solution), dramatically increasing urine production (50% dextrose solution), or risking dramatic fluid or electrolyte shifts (hypertonic saline or isotonic bicarbonate solution).
446. **b** Retrograde catheterization of ruminants is difficult and potentially dangerous because of the sharp bends of the sigmoid flexure and the mucosal diverticulum in the proximal urethra. Initial clearance of urethral calculi also would not resolve the bladder rupture or ensure sufficient continued patency of the urethra to allow the bladder tear to seal.
447. **e** Placement of a Pezzer catheter in the bladder relieves pressure on the bladder, avoiding bladder rupture and potentially relaxing the urethra. Many urethral calculi spontaneously dislodge under these conditions and preserve urethral function for future breeding.

448. **d** Unlike adult ruminants with abomasal outflow obstructions, which are consistently alkalotic, affected preruminant calves are as likely to be acidotic as alkalotic and may be either hyperkalemic or hypokalemic. They are also more likely to be hypoglycemic. A combination of isotonic saline solution and dextrose is a safe initial fluid choice. Laboratory confirmation of acid-base and electrolyte status is important in calves because of the variability in response.
449. **c** The location of this ping area is more consistent with abomasum than cecum.
450. **a** Cattle less than 6 months of age cannot be reliably restrained in a standing position. Dorsal recumbency increases the risk of respiratory distress in a calf with abdominal distention; therefore lateral recumbency is preferred. A right flank or paracostal approach provides good access to the abomasum and intestinal structures in a calf.
451. **c** Normal presentation places the calf's head and forelimbs in the immobile uterine body and cervix, with one or both hind feet in the mobile distal (cranial) end of the uterine horn. Traction can be placed on the calf's tuber calcaneus and fetlock with one's hands, allowing safe movement of the uterus toward the body wall and avoiding the need to grab the uterine wall directly.
452. **c** If a cow will not remain standing during examination, it is unlikely that the animal will stand during surgery, therefore a recumbent approach is indicated. A left-side approach decreases the tendency for the intestines to fall out of the incision.
453. **b** To prevent infection resulting from contamination introduced during surgery, antibiotics should be administered just long enough before surgery to achieve high serum and tissue levels at the time of incision and administered often enough to maintain levels through the period of possible contamination. There is no advantage to more prolonged preoperative or postoperative administration, and to do so increases the risk of overgrowth or persistence of resistant organisms. Prophylactic use of antibiotics should not be confused with therapeutic use in the face of existing infection, in which case a more prolonged course would be indicated.
454. **c** Exploration of the abdomen is important in cases of suspected vagal disease to confirm or rule out causes other than traumatic reticulitis. Exploration must be done before the rumen is incised. After that point the incisional area is contaminated with potential pathogens and exploration would disseminate these organisms. Transrumenal palpation is also important in evaluation for vagal syndrome and should be included as a routine part of any exploratory surgery.
455. **c** The Zepp operation involves resection of the lateral aspect of the external ear canal in dogs.
456. **a** Vaginal prolapses typically occur in the last few months of gestation and seldom occur following parturition.
457. **e** In neonates ligamentous structures are less likely to be disrupted by excessive force than is bone. Femoral nerve paresis and a slipped capital femoral epiphysis should be the primary differential diagnoses.
458. **a** Amputation at or above mid-P1 eliminates the stabilizing interdigital cruciate ligaments. Also, if the fetlock joint is entered, the incision communicates with the medial digit.
459. **d** The coxofemoral joint is large but is poorly accessible for either needle or arthroscopic lavage.
460. **d** Serum electrolyte values are unlikely to change under the circumstances described. The complete blood cell count and total plasma protein assay are necessary to evaluate for sepsis and colostrum absorption status. At this age joint infection is commonly multifocal, and all joints should be palpated. Cytologic examination of joint fluid is most likely to provide initial direction for therapy. A Gram stain and culture of joint fluid are also recommended.
461. **d** The cytologic findings in the joint fluid and the clinical signs are consistent with joint sepsis. Rapid initiation of appropriate therapy is essential if function is to be maintained. Systemic antibiotics and joint lavage are the most effective means of therapy. A sample for culture should be collected before antibiotic use is initiated to help guide later therapy should the response not be optimal.
462. **b** Penile hematoma is a condition of young breeding bulls.
463. **b** Penile hematoma typically occurs when an erect or partially erect penis is suddenly deviated ventrally, as during breeding. The pressure and deviation tear the corpus cavernosum, typically dorsally at the level of the attachment of the retractor penis muscle, which might serve as a fulcrum, producing an excessive bend at the lesion site.
464. **b** Both surgical and medical management have been used, without a clear overall advantage of either approach.
465. **e** In cattle more than 6 months of age, dehorning can open the frontal sinus, resulting in frontal sinusitis.
466. **c** In kids of this age the cornual branch of the lacrimal and infratrochlear nerves must be blocked for dehorning.
467. **c** Chemical paste, electrocautery, and tube dehorners must be used before the horn buds have attached to the skull (before 3 months of age). A Gigli wire is indicated for fairly large attached horns. Keyes dehorners should not be used in goats because of the relatively fragile nature of the caprine skull.
468. **d** Right abomasal volvulus can produce persistent motility disturbances, from entrapment during volvulus of the nerve and/or blood supply to the abomasum as it passes along the omasal groove or from direct damage to the abomasal wall as a result of distention. In either case normal coordinated contractions are occasionally not reestablished. The result is progressive abomasal distention with fluid or solid ingesta.
469. **b** This is a progressive neuromuscular dysfunction that is hereditary in a variety of dairy and beef breeds, including Holstein calves. No effective physical therapy has been described. Several surgical procedures have had variable success in ameliorating or occasionally resolving the clinical signs. Because of the hereditary nature of the condition, treatment is strongly discouraged in animals intended for breeding. Weight gain is slowed in severe cases but may continue in milder cases.
470. **c** Cattle tend to have good bone healing capacity, with rapid and stable callus formation given adequate fracture stabilization. The general principle of immobilization of the joint proximal and distal to the affected bone still applies. Because of the thickness of the proximal limbs and the deep body wall in cattle, full-limb casts are only reliably effective for fractures distal to the hock and carpus. A Schroeder-Thomas splint provides effective stabilization of fractures as far proximally as the distal tibia and distal radius. Padded bandages and padded PVC splints provide inadequate immobilization for complete long-bone fractures (*a* and *e*). Transfixation devices require sufficient normal bone proximal and distal to the fracture for insertion of at least two transfixation pins and are not appropriate for physal fractures.
471. **a** It is rarely possible to achieve good closed reduction of coxofemoral luxations in cattle because of the difficulty in manipulating the large structures involved and the tendency for joint capsule and other soft tissues to be interposed between the acetabulum and femoral head, increasing the likelihood of relaxation. Femoral head ostectomy results in progressive arthritis and lameness. Stall confinement may serve as a temporary measure to improve comfort but does not halt the progression of lameness. Open reduction and assistance during anesthetic recovery (hip lifters) and the early postoperative period (hobbles) to prevent rapid limb abduction or hip extension allow a good prognosis for cattle that can stand and have no other structural damage. Attempts to sling the limb only decrease the cow's ability to balance and place stress on the other limbs.
472. **b** Topical cautery would not remove the neoplastic tissue and use of a third-eyelid flap would only obscure progression of the lesion.
473. **c** Interdigital hyperplasia can produce progressive lameness. Once the lesion has increased to several centimeters in size and produces pain, resection is the only reliable treatment method. Smaller, nonpainful lesions may be managed in the short term with topical antiseptic therapy.
474. **c** Intravenous infusion after tourniquet application provides the most complete analgesia.
475. **c** Feed and water should be withheld before surgery for at least 36 and 24 hours, respectively, to prevent reflux and aspiration.

## NOTES

## 11

## Theriogenology

W.B. Ley

**Recommended Reading**

- Hafez ESE: *Reproduction in farm animals*, ed 6, Baltimore, 1993, Williams & Wilkins.  
 Leman AD et al: *Diseases of swine*, ed 7, Ames, Iowa, 1992, Iowa State University Press.  
 McKinnon A and Voss JL: *Equine reproduction*, Baltimore, 1992, Williams & Wilkins.  
 Morrow DA: *Current therapy in theriogenology*, ed 2, Philadelphia, 1986, WB Saunders.  
 Varner DD et al: *Manual of equine reproduction*, St. Louis, 1998, Mosby.  
 Peters AR and Ball PJ: *Reproduction in cattle*, Ames, Iowa, 1995, Iowa State University Press.  
 Radostits OM et al: *Veterinary medicine*, ed 8, Philadelphia, 1994, WB Saunders.  
 Youngquist RS: *Current therapy in large animal theriogenology*, Philadelphia, 1997, WB Saunders.

Practice answer sheet is on page 299.

**Questions**

- Infection of the sow during the first half of gestation with porcine parvovirus may lead to:*
  - fetal death and mummification, prolonged gestation, and failure to farrow
  - fever and anorexia in sows for 7 to 10 days, with occasional vomiting
  - congenital anomalies in piglets
  - fetal resorption, with regular return to estrus
  - abortion in nearly all infected sows
  - 60 days after farrowing
  - 21 days after weaning
  - 4 months after farrowing
- A healthy normal sow that farrows, nurses, and subsequently weans a litter of pigs at 28 days postpartum is most likely to exhibit a fertile estrus:*
  - 2 to 3 days after weaning
  - within 4 to 8 days after weaning
- Which disorder is **not** a significant cause of abortion outbreaks in gestating sows?*
  - leptospirosis
  - brucellosis
  - pseudorabies
  - mycotoxin ingestion
  - porcine reproductive and respiratory syndrome

4. Concerning prostaglandin  $F_{2\alpha}$  ( $PGF_{2\alpha}$ ), which statement is most accurate?
- The porcine corpus luteum (CL) is sufficiently sensitive to prostaglandin lysis at any time during the cycle to allow  $PGF_{2\alpha}$  use in estrus synchronization.
  - $PGF_{2\alpha}$  has limited use in swine reproduction because there is only a 2- or 3-day period when the CL is sensitive to  $PGF_{2\alpha}$  luteolysis.
  - $PGF_{2\alpha}$  is routinely used to induce and synchronize farrowing.
  - $PGF_{2\alpha}$  is not effective for induction of farrowing.
  - $PGF_{2\alpha}$  is not approved by the Food and Drug Administration for use in swine.
5. Concerning diestrus in sows, which statement is most accurate?
- Diestrus is dominated by progesterone and may last up to 6 months in sows.
  - Diestrus is dominated by progesterone and lasts 4 weeks in sows.
  - Diestrus is dominated by estrogen and lasts 45 days in sows.
  - Diestrus is dominated by estrogen and lasts 5 days in sows.
  - Diestrus is dominated by progesterone and lasts 14 to 16 days in sows.
6. Estrus synchronization is critical to production success of farrowing units. What is the most effective way to synchronize estrus in older, randomly cycling sows in a farrowing unit?
- Administer prostaglandin  $F_{2\alpha}$  ( $PGF_{2\alpha}$ ) on two occasions, 10 days apart.
  - Administer 400 IU pregnant mare serum gonadotropin (PMSG) and 200 IU of human chorionic gonadotropin (hCG) to all sows 10 days after farrowing.
  - Wean the litters of all of the sows, transport the sows in a truck, and unload them into the breeding pens.
  - Expose all of the sows to high-libido boars for 1 week.
  - Administer a progestogen for 2 weeks in the feed.
7. Concerning cystic ovaries in sows, which statement is most accurate?
- It is not a common cause of infertility.
  - It contributes to irregular estrous cycle lengths and to anestrus.
  - It is only a problem if multiple cysts are present on the ovaries.
  - It always results in nymphomania because the large cysts contain sufficient granulosa tissue to produce estrogens.
  - Affected sows respond well to human chorionic gonadotropin or gonadotropin-releasing hormone.
8. Concerning leptospirosis in pigs, which statement is most accurate?
- Infections typically cause severe epididymitis in boars.
  - It is a very severe environmental contamination problem in swine units.
  - It is easily eradicated and never becomes enzootic.
  - It causes severe orchitis and infertility in boars.
  - Because it can be host adapted to swine and shed in the urine, it can easily become enzootic.
9. Benefits of using teaser rams in a flock of ewes include:
- prevention of venereal disease transmission
  - earlier estrous cyclicity and synchrony of ewes in the flock
  - no effect on the subsequent lambing period
  - fewer rams needed for the breeding program
  - increased conception rates because of delayed return to estrus after lambing
10. A producer with a registered flock of Finnsheep in the southeastern United States has just discovered that an expensive ram she recently purchased from a sale in Texas is positive for *Brucella ovis* on enzyme-linked immunosorbent assay (ELISA). This ram has not been exposed to any of her ewe flock, but he has been turned out with her other rams (bucks) for the past 30 days. She asks your recommendations on brucellosis control, as she has heard that it can be a significant cause of infertility. What is the most appropriate advice for this producer?
- Do not worry, as *B. ovis* is not significant cause of abortions in ewes.
  - Have the infected ram and any other exposed rams slaughtered.
  - Repeat the ELISA on this ram and have his semen cultured and a complete breeding soundness examination.
  - Have this ram tested again using the complement-fixation test, as ELISA for *B. ovis* is frequently falsely positive.
  - Repeat the ELISA on this ram and isolate him from all other rams and ewes until the test result is known, have a complete breeding soundness examination, and have blood samples collected from all other exposed rams in 6 weeks to be submitted for ELISA.
11. A shepherd's cooperative has a commercial flock consortium of 4000 ewes. This flock has had lambing losses this season that are much higher (30%) than in previous years (<5%). The primary problem is that the lambs of first-time lambing ewes die in the first 4 or 5 days of life. Few, if any, abortions have been observed, but several lambs were stillborn. Placentas have not been examined. No ewes have died or become systemically ill. The 4000 ewes are maintained as a single flock, with 15% to 20% additions purchased each year from sales in Ohio or West Virginia. The sheep are routinely vaccinated against *Campylobacter fetus subsp. fetus*, *Chlamydia psittaci*, *Leptospira interrogans (five-way)*, and *Escherichia coli* before breeding and again within 30 days before the start of the expected lambing season. The diet consists of pasture (fescue grass and clover mixture) supplemented with free-choice alfalfa hay, a minimum of 1 lb of ground corn per head per day for the 30-day period before lambing, and selenium (1 ppb) in trace mineralized salt. The ewes are in good body condition, with scores averaging around 4 on a scale of 1 to 5. Which three disorders are most likely to be involved with this flock's problem?
- chlamydiosis, listeriosis, and salmonellosis
  - vibriosis, leptospirosis, and Q-fever
  - border disease, brucellosis, and white muscle disease
  - enzootic abortion, toxoplasmosis, and border disease
  - ringwomb, chlamydiosis, and bovine parainfluenza-3 virus infection
12. Estrus synchronization programs for ewes vary by methodology or application of pharmacotherapy. All of these programs, however, involve use of:
- progestogen, prostaglandin, and luteinizing hormone
  - melengestrol acetate, follicle-stimulating hormone, and prostaglandin
  - progestogen, prostaglandin, and equine chorionic gonadotropin (eCG)
  - human chorionic gonadotropin, melatonin, and inhibin
  - estradiol, progestogen, and gonadotropin-releasing hormone
13. Pregnancy toxemia is a disease of pregnant ewes associated with poor nutritional management, multiple fetuses, and physiologic stress. Which clinicopathologic abnormalities are most likely to be found in affected ewes?
- hyperkalemia and glucosuria
  - hyponatremia and hyperglycemia
  - leukocytosis, hyperglycemia, and ketosis
  - ketonuria and hypoglycemia
  - alkalosis and hyperglycemia

14. Which finding would classify a sexually mature ram as unsatisfactory with respect to breeding soundness?
- brachygnathism
  - epiphora and purulent conjunctivitis of one eye
  - scrotal circumference of 33 cm
  - spermiogram with 40% morphologically normal sperm
  - body condition score of 5 (scale of 1 to 5)
15. Concerning reproduction in sheep, which statement is most accurate?
- Peak fertility and fecundity of ewes in the northern temperate hemisphere occurs around the time of the summer solstice.
  - Hampshire, Suffolk, and Merino ewes tend to have twins and triplets.
  - White-faced breeds tend to be more affected by season and are among the more prolific of the breeds.
  - "Flushing" refers to isolation of ewes from rams for 2 to 3 weeks, followed by reintroduction of rams to the ewe flock in an attempt to stimulate ovulation for subsequent mating.
  - Crossbred ewes tend to have increased fecundity.
16. In sheep, accelerated and "out-of-season" lambing programs have successfully reduced the potential lambing interval from once every 12 months to:
- once every 4 months
  - once every 8 months
  - twice in 20 months
  - 5 times in 4 years
  - 3 times in 12 months
17. In ewes, gonadotropin-releasing hormone (GnRH) stimulates the anterior pituitary gland to release:
- prolactin and luteinizing hormone (LH)
  - LH and follicle-stimulating hormone (FSH)
  - FSH and ovine chorionic gonadotropin (oCG)
  - LH and oCG
  - LH and oCG
  - LH and growth hormone
18. *Toxoplasma gondii* is a protozoan parasite that causes abortion in pregnant ewes and goat does. Two recommendations for control of toxoplasmosis on farms where outbreaks have occurred should include:
- vaccinate before breeding and feed tetracyclines during gestation
  - vaccinate after breeding and reduce the number of feral cats on the premises
  - restrict access of cats to feed sources, neuter cats on the farm, and feed monensin to pregnant ewes and goat does
  - cull affected ewes and goat does and eliminate access of cats and birds to feed sources
  - test and slaughter serologically positive ewes and goat does and vaccinate virgin females before breeding
19. Ewes and goat does are similar in many respects with regard to their reproductive anatomy, reproductive patterns, and breeding management. By which characteristic do ewes and goat does differ?
- interestrus interval
  - anatomy of the uterine horns
  - type of placentation
  - gestation length
  - seasonality of natural breeding season
20. Concerning pseudocyesis in goat does, which statement is most accurate?
- It occurs after every estrus unless a pregnancy is established.
  - It occurs when goats are induced to ovulate with human chorionic gonadotropin.
  - It lasts approximately 1 month.
  - It occurs somewhat frequently and may be associated with spontaneous lactation.
  - It usually occurs early in the physiologic breeding season.
21. Concerning induction of parturition, which statement is most accurate?
- When inducing parturition in cows, PGF<sub>2α</sub> is used to lyse the corpus luteum (CL) and dexamethasone is used to convert placental production of estrogen to progesterone.
  - When inducing parturition in ewes, oxytocin is the preferred agent.
  - When inducing parturition in goat does, PGF<sub>2α</sub> is given to lyse the CL because goats are a luteal-dependent species throughout gestation.
  - When inducing parturition in mares, oxytocin is given to lyse the CL and cause milk letdown.
  - When inducing parturition in sows, cortisol is given to convert placental progesterone to estrogen.
22. Females of which species are stimulated to begin estrous cyclicity in response to decreasing daylight hours (shorter days)?
- horses
  - cattle
  - pigs
  - llamas
  - goats
23. You are performing rectal palpation on a 19-month-old, 850-lb Jersey heifer. On the right ovary you feel no palpable structures and the ovary measures 10 × 15 × 20 mm. The left ovary is also relatively small but has a firm, semifluctuant protuberance centromedial on the ovary that is about 10 mm in diameter. Considering these findings, this heifer's uterus is most likely to have:
- no tone (flaccid on palpation)
  - good to excellent tone (very firm on palpation)
  - an amniotic vesicle palpable within it
  - fluid palpable within its lumen
  - no significant change from its palpable characteristics during diestrus
24. Replacement dairy heifers intended for breeding need special husbandry considerations because:
- poorly grown heifers reach puberty later than do normal heifers
  - they should be one half of their mature body weight at the time of breeding
  - they should calve when they reach 3 years of age
  - poorly grown heifers reach puberty earlier than do normal heifers
  - they should be two thirds of their mature body weight at the time of calving
25. Concerning testosterone in bulls, which statement is most accurate?
- It is produced by the Leydig cells of the testicle.
  - It has a positive-feedback effect on the hypothalamus and pituitary gland.
  - Exogenous testosterone should never be given, as it can cause testicular degeneration.
  - It is produced by the Sertoli cells of the testicle.
  - Testosterone production can be stimulated by administration of exogenous follicle-stimulating hormone.
26. What are the four cardinal (primary) signs of pregnancy in cows?
- palpable amniotic vesicle, fetus, fremitus in the middle uterine artery, and placentomes
  - palpable amniotic vesicle, fetal membranes, placentomes, and fetus
  - palpable amniotic vesicle, fremitus in middle uterine artery, uterine fluid, and fetus
  - palpable amniotic vesicle, placentomes, and fetus, and high serum progesterone levels
  - palpable amniotic vesicle, fremitus in middle uterine artery, and placentomes, and high serum progesterone levels

27. What are the characteristics of normal lochia in cows?

- progressive change from red to brown color, fetid odor, watery in nature, and decreased volume over time
- progressive change from red to brown color, no odor, mucoid in nature, and increased volume over time
- progressive change from red to brown color, no odor, mucoid in nature, and decreased volume over time
- progressive change from reddish brown to a lighter lymphlike color, no odor, and decreased volume over time
- progressive change from brown to red color, fetid odor, mucoid in nature, and increased volume over time

28. Various treatments have been used in an attempt to reduce the sequelae of retained fetal membranes in postpartum cows. Oxytetracycline has been used by intrauterine infusion because of its broad spectrum of antibacterial activity and its antibacterial properties in the presence of organic material. Concerning intrauterine infusion of oxytetracycline in postpartum dairy cows, which statement is most accurate?

- This use is approved by the Food and Drug Administration (FDA); the cow's milk should be discarded for 48 hours after the last dose.
- This use is allowed through the Extra-Label Use Provisions set forth by the FDA; the cow's milk does not need to be discarded.
- Persistence of oxytetracycline in retained fetal membranes may lead to antibiotic residues in milk for up to 144 hours after the last dose.
- This procedure improves the reproductive efficiency of cows with retained fetal membranes and is recommended in all such cases.
- This use is not approved by the FDA; oxytetracycline should never be used for this purpose under any circumstance.

29. Concerning penile hematoma in breeding bulls, which statement is most accurate?

- Affected bulls may be returned early to breeding use with aggressive surgical intervention, especially if the hematoma has been present for more than 14 days.
- It is characterized by extravasation of blood into the scrotum.
- It warrants a grave to poor prognosis for recovery of breeding soundness, regardless of treatment method.
- Affected bulls may be returned early to breeding use with aggressive medical intervention, especially if the hematoma is large (>20 cm).
- Affected bulls may rapidly develop parapenile abscesses, which can form adhesions between the penis, prepuce, and adjacent connective tissues, severely restricting movement of the penis.

30. Concerning breeding management of stallions, which statement is most accurate?

- Stallions need a routine program of exercise to maintain body condition for the athletic and psychologic demands of the breeding season.
- Stallions do not respond to artificial lighting as a means of stimulating breeding performance earlier in the season.
- Stallions require careful monitoring and constant restraint to prevent development of breeding vices.
- A 4-year-old stallion can be managed the same as a 13-year-old stallion with respect to number of mares to be bred in any given breeding season.
- All major breed registries now allow use of artificial insemination techniques.

31. Concerning therapy for penile paralysis (paraphimosis) in horses, which statement is most accurate?

- Antibiotics and antiinflammatory drugs are the only treatment necessary to completely resolve the problem.
- Hot-water hydrotherapy for 20 minutes three to six times a day is very beneficial.
- Application of a sling or nylon suspensory apparatus to maintain the penis within the prepuce is integral in the early medical management.
- Engorgement of the corpus cavernosum penis results in intractable erection that does not respond to any type of therapy.
- This condition is usually unresponsive to medical therapy; surgical intervention using corpus cavernosum penis bypass is the only effective means of salvage.

32. In the breeding soundness examination of stallions, what is the most reliable indicator of potential satisfactory reproductive performance?

- semen volume
- genital and semen cultures for venereal diseases
- libido
- daily sperm output prediction from testicular volume
- number of progressively motile, morphologically normal sperm in the ejaculate

33. Ejaculatory disorders most likely to be encountered in stallions include all of the following **except**:

- urospermia
- premature ejaculation
- emission and ejaculation failure related to urethral stricture or obstruction
- emission and ejaculation failure related to psychogenic disorders
- hemospermia

34. Which organisms are most commonly involved in venereal infections of mares and stallions?

- Brucella abortus*, *Campylobacter fetus*, and *Chlamydia psittaci*
- Streptococcus zooepidemicus*, *Escherichia coli*, and *Corynebacterium* spp.
- equine herpesvirus-3, *Taylorella equigenitalis*, and *Klebsiella pneumoniae*
- Pseudomonas mallei*, *Streptococcus equi*, and *Campylobacter fetus* subsp. *venerealis*
- Klebsiella* spp., equine herpesvirus-1, and *Trichomonas foetus*

35. Which of the following is **least** likely to affect reproductive cyclicity after a mare has entered the physiologic breeding season?

- an artificial lighting program
- intramuscular injection of 200 mg progesterone in oil once daily for 10 days
- oral administration of progestogen for 14 to 21 days
- intravenous injection of 1500 to 3000 IU of human chorionic gonadotropin on the second or third day of estrus
- intramuscular injection of 5 to 7 mg prostaglandin F<sub>2α</sub> every 9 to 11 days

## Answers

- No developmental anomalies have been reported. Abortion is uncommon. If there is increased stillbirth of piglets, it is because of the effect of littermates that died during gestation. This prolongs gestation and/or the farrowing interval. Sows are subclinically affected and do not show systemic signs of illness.
- Removal of the litter from the sow at 3 to 5 weeks postpartum results in follicular development, estrus, and ovulation within 4 to 8 days of weaning.

3. **e** Leptospirosis, brucellosis, pseudorabies, and mycotoxigenosis all can cause abortion outbreaks in sows. Abortion is not a primary sign of porcine reproductive and respiratory syndrome in gestating sows.
4. **c** The porcine CL becomes responsive to PGF<sub>2α</sub> at about day 12 after ovulation (day 6 to 8 in mares and cows). At any time after day 12 to 14 of gestation, pregnant sows are sensitive to the luteolytic effects of PGF<sub>2α</sub> and either abort or farrow, depending upon the stage of gestation.
5. **e** Diestrus is dominated by progesterone and lasts 14 to 16 days in mares, cows, and sows.
6. **e** PGF<sub>2α</sub> does not have an opportunity to affect the porcine corpus luteum. PMSG and hCG combination therapy should be used after weaning. Batch-weaning is effective only for lactating sows. Progestogen therapy with altrenogest is the most effective method in randomly cycling older sows.
7. **b** Cystic ovaries account for approximately 10% of the reproductive problems in swine sent to slaughter. They contribute to low conception rates, erratic estrous cycles, and aggressive behavior. Nymphomania has not been described in swine. Large ovarian cysts occur more commonly. Treatment efficacy is transitory at best.
8. **e** Leptospirosis has been associated with late-term abortion, stillbirths, birth of weak and unthrifty piglets, and neonatal mortality.
9. **b** Pheromone production by intact rams stimulates silent ovulations in ewes that are in early transition to the breeding season.
10. **e** Addition of *B. ovis*-infected rams to the breeding flock can spread brucellosis to other rams and ewes if control measures are not instituted. Rams should only be added after two negative ELISAs performed 45 to 60 days apart.
11. **d** Chlamydiosis (enzootic abortion of ewes), toxoplasmosis, and campylobacteriosis (vibriosis) are the most common causes of abortion in ewes. However, vaccination against campylobacteriosis in this flock would diminish the likelihood of any significant impact from that disease. Thus border disease must assume tertiary importance. Salmonellosis, Q-fever, and leptospirosis are infrequent and sporadic causes of abortion in ewes. These ewes were supplemented appropriately with selenium.
12. **c** Progestogens administered in pessaries, sponges, or implants are used to mimic a natural diestrus period, followed by prostaglandin administration to lyse any corpora lutea that may have formed and eCG pregnant mare serum gonadotropin to stimulate follicle development.
13. **d** Pregnancy toxemia (ketosis, lambing sickness, twin lamb disease) is a metabolic disease of advanced gestation. Negative energy balance, hypoglycemia, and increased fat catabolism produce the characteristic ketonemia, ketonuria, and neurologic signs of depression, inappetence, incoordination, impaired vision, prostration, and death.
14. **a** Brachygnathism is a congenital defect that should not be propagated in the breeding population. Rams should be physically examined and must be satisfactory with respect to overall health and structural integrity. Breeding soundness requires health in whole body, not just reproductive soundness.
15. **e** The peak breeding season in the northern hemisphere occurs around the time of the winter solstice. Black-faced breeds tend to be less prolific (fecund) and more seasonal than white-faced breeds. "Flushing" involves nutritional stimulation to induce multiple ovulations. Crossbreeding increases fecundity through hybrid vigor.
16. **b** Using the STAR system from Cornell University, ewes can lamb once every 8 months and five times in 3 years.
17. **b** The anterior pituitary produces, stores, and secretes LH and FSH in response to changes in the frequency and amplitude of secretion of GnRH from the hypothalamus.
18. **c** Cats should be neutered to curtail breeding on farms because cats become infected with *T. gondii* soon after weaning. Once a cat has shed oocysts, it acquires immunity to reinfection. Use of monensin as a feed additive for sheep suppresses *Toxoplasma* infection of the placenta.
19. **a** Goats have an interestrus interval of 20 to 21 days. Sheep ovulate every 16 to 17 days during their seasonal breeding periods. Other factors described are similar between the two species.
20. **d** Pseudopregnancy occurs rather frequently in goats and is referred to as a "cloudburst." After a period approximating normal gestation, the doe voids a large volume of cloudy fluid. The abdominal distention subsides and the goat enters a lactation of low productivity. This occurs spontaneously.
21. **c** Intramuscular or subcutaneous injection of PGF<sub>2α</sub> induces abortion or parturition in goats at any time during gestation.

22. **e** Goats are seasonally polyestrous and respond to artificially shortened day length once they have been exposed to 60 days of artificially prolonged daylight (17 to 19 hour days).
23. **b** Estrogen improves contractility or tonicity of the uterus. The uterus is flaccid and atonic during the progesterone-dominated phase of diestrus. The palpable structure described on the left ovary is consistent with a dominant follicle. No luteal structures were identified.
24. **a** Early weight gain is the most prominent factor in determining the onset of puberty. Heifers should be bred to calve at 24 months of age.
25. **a** Androgens (testosterone) are produced by the interstitial cells (Leydig cells) of the testicle. Hypothalamic effects are mediated by way of conversion to estradiol. Stimulation of production is by luteinizing hormone.
26. **b** Elevated progesterone levels in the serum, plasma, or milk and fremitus of the middle uterine artery are secondary signs of pregnancy. The other findings listed are primary or cardinal signs of pregnancy in cows.
27. **d** Normal lochia is usually yellowish to brown or reddish brown. The volume voided varies greatly between individual cows. The greatest amount is voided on day 2 or 3 after calving. Voiding of lochia is reduced gradually and it virtually disappears by days 14 to 18. At about 9 postpartum days it may be blood-tinged. Normal lochial discharge does not have an unpleasant odor.
28. **c** The duration of drug residues in milk after intrauterine infusion in postpartum cows depends on many factors, such as blood flow to the myometrium, the amount of drug expelled through the cervix and vagina, the amount of fluid in the uterus at the time of administration, and daily milk production. Oxytetracycline use is allowed by the Extra-Label Use Provisions set forth by the FDA.
29. **e** Parapenile abscesses commonly occur secondary to penile lacerations or penile hematoma. These have a poor prognosis for

- return to breeding soundness due to adhesion formation. Early surgical intervention, within 5 days after injury, holds the most promise for early return to breeding soundness.
30. **a** To prevent behavioral problems, stallions should be exercised daily. Stallions respond to artificial lighting.
31. **c** Medical treatment is intended to contain and reverse acute problems and to obviate the need for surgery. Control of edema, both gravitational and inflammatory, is integral to successful early resolution. Passive retention of the detumescent (flaccid) penis precedes the ability to voluntarily retract the penis.
32. **e** Fertility in stallions is significantly correlated with percent age of motile sperm, percent age of progressively motile sperm, number of progressive sperm, and percent age of morphologically normal sperm in an ejaculate.
33. **c** Ejaculation is a sacral spinal reflex mediated by the pudendal nerve. In stallions, the most common ejaculation disorders are emission and ejaculation failure and urine contamination of the semen. In a large percentage of cases ejaculation problems appear to result from musculoskeletal disorders or are psychogenic in nature. Also encountered, but less frequently, are premature ejaculation, hemospermia, and azoospermia. Urethral obstruction is very rare.
34. **c** Equine coital exanthema (equine herpesvirus-3), contagious equine metritis (*T. equigenitalis*), equine viral arteritis (equine arteritis virus), and genital infections with *Pseudomonas (P. aeruginosa)* and *K. pneumoniae* are the main causes of venereal disease in horses in North America.
35. **a** When applied correctly for at least 60 days, artificial lighting programs work well in anestrous mares to stimulate earlier return to estrus. Once the mare has entered the transitional phase between anestrous and the physiologic breeding season, artificial lighting is unlikely to have further benefit with respect to altering estrous behavior.

## NOTES