

Self-Assessment for Bovine Practitioners Beef Cow-Calf Section

Warren J. Kilpatrick, D.V.M., M.A.
William L. Sippel, B.S., V.M.D., M.S., Ph.D.
Diplomate, American College of Veterinary Pathologists
Mark F. Young, B.S., D.V.M., M.S.
John C. Ränge, D.V.M., M.S., Ph.D.
Diplomate, American College of Theriogenology
College of Veterinary Medicine
Texas A&M University
College Station, Texas 78843

This program was produced and recorded for presentation by television. The material has been abstracted and converted for use in the printed form. Because some questions or problems relied on visual presentations on television, they could not be changed to printed form and are therefore omitted.

Introduction

The program you are about to see was produced at Texas A&M University by the office of Veterinary Continuing Education.

The program was prepared for the American Association of Bovine Practitioners and is concerned primarily with problems associated with beef cow and calf operations. Here to present the cases and answer the questions are four veterinarians. I will be asking most of the questions, and I am Dr. Warren Kilpatrick of the Large Animal Clinic and coordinator of the continuing education programs for the College of Veterinary Medicine at Texas A&M University.

"I am Dr. Bill Sippel, executive director of the Texas Veterinary Medical Diagnostic Laboratory, a diplomate of the American College of Veterinary Pathology."

"I am Dr. Mark Young, head of the food animal medicine section at the Texas A&M University Large Animal Clinic, professor in the Department of Medicine and Surgery."

"Dr. John Ränge, member of the food animal medicine section and diplomate of the American College of Theriogenology."

We have something for everyone concerned with beef cow-calf operations. We have cases, we have explanations, and, of course, we have questions. We will give you the answer to each of the questions we ask, and we hope that you will agree with the answers we give you. We will start with basic veterinary medicine, and because reproduction is so important to a beef cow-calf operation, we will be asking you questions about bulls, about cows, and problems that affect calf production by beef cows. Then we will proceed into raising the calf, an important item in the beef cow-calf operation. We will ask you questions about immunity, we will ask you questions about toxicology, we will ask you questions about management. Some questions are simple, and you really won't find them very challenging. But the purpose is to help you assess how well you are doing and how much you know about beef cow-calf veterinary medicine. We will enable you to think or act in a variety of situations. We may give you some problems that you will not normally handle, but you should be aware of the do's and don'ts. Make an attempt to answer all of the questions. You may not encounter some of the cases we present, and think that you don't need to know some of the information that we present, but the principles of diagnosis and therapy are relative to the problems you do see. Please listen carefully to the discussions that follow the questions. Well, that tells you what we're going to do. Just how do you take this test? You should have a score sheet. We'll give you a question or two to warm you up, and then challenge you with some questions about cow-calf veterinary medicine. Most of the questions will be multiple choice. We may ask for more than one answer. For each question we will describe a clinical problem, or give you a question and then give you a list of alternative solutions. The alternatives labeled a-b-c-d or e will be announced only once. As the alternatives are announced, an abbreviated list will appear on the television screen. Now, here is a sample question:

Pulmonary emphysema shows all of the following characteristics

except the one: (a) increase in the elasticity, (b) an increase in lung volume, (c) coalescence of alveoli, (d) loss of inherent pulmonary contractability, (e) an increase in carbon dioxide retention.

Now, if this were part of the test, you would circle the letter that corresponds to the answer you choose. As I said before, there is usually only one correct answer to each question but some request multiple answers, and we will let you know when these multiple answer questions come along. If necessary, leave the question unanswered and get ready for the next one, which is going to follow very rapidly. Since the questions will be presented rapidly, they will, to a certain extent, test your decision-making ability. They will not necessarily test your ability for total recall. As questions about clinical situations come quickly, you should be prepared to separate relevant information from trivial information, just as you do in your regular practice. Now that you know how to take the test, let's begin. Now, remember you have in general only five seconds to answer each question. So get ready. . . .

Here is question number 1. It should be easy for anyone who has been in cow-calf practice for very long.

1. Photosensitization in cattle usually does not affect which one of these areas? (a) the muzzle, (b) light skin areas, (c) perineal region, (d) dark skin areas, (e) teats.

Now, that was an easy question. Let's try another simple one.

2. The organism *Moraxella bovis* is thought to be the cause in cattle of a condition known as: (a) "foot rot," (b) pulmonary emphysema, (c) abdominal paracentesis, (d) casting of the withers, (e) "pinkeye."

"Every veterinarian has had some experience in pharmacology and knows how to figure percentage solution. Dr. Ränge, why don't you give the next problem?"

"Well, the next question is a short one."

3. 10% formalin is: (a) 1 part 37% formaldehyde solution to 9 parts water, (b) 1 part 37% formaldehyde solution to 3.7 parts water, (c) 1 part 37% formaldehyde solution to 2.7 parts water, (d) 1 part 37% formaldehyde solution to 6 parts water.

Question number four is a problem that could really be from almost anyone's practice in cow-calf operation.

4. A herd of beef cows has been properly vaccinated for leptospirosis, infectious bovine rhinotracheitis and vibriosis. A poor conception rate is observed in two-year-old heifers nursing their first calves. Nearly all of the older cows are diagnosed pregnant following a 75-day breeding season. The most likely explanation for this situation is: (a) the older animals probably have an immunity to some unidentified reproductive infection which is interfering with conception in the young cows; (b) early embryonic death; (c) energy intake is insufficient to support reproduction as well as lactation and continued growth of the two-year-old heifer; (d) vitamin A deficiency; (e) phosphorus deficiency.

Question number four is related to poor conception. Question number five is related to another problem associated with reproduction, that of abortion. It's a kind of a case study.

5. A midwestern farmer had a herd of 93 Angus cows. One morning in January a cow aborted at seven months after breeding. The fetus with its placenta are not available to you when you arrive that afternoon. You decide to take a blood sample and take it to

the state diagnostic laboratory for a serological abortion screen. Your laboratory checks for brucellosis, leptospirosis, infectious bovine rhinotracheitis, and for campylobacter. When you receive the test reports three days later, they are all negative and there have been no more known abortions in the herd. What action should you take? (a) Make a diagnosis of non-infectious abortion, (b) vaccinate the herd immediately against IBR, leptospirosis, and campylobacter, (c) request an abortion screen from a blood sample taken from the same cow 14 days later.

We are going to have several questions now that relate to fertility evaluation in bulls used for breeding. The first is question 6.

6. A three-year-old bull is being evaluated for breeding soundness. The circumference of the scrotum is 35 cm. Is a 35-cm scrotal circumference classified as: (a) very good, (b) good, (c) poor.

7. As we continue with the evaluation for breeding soundness, the same three-year-old bull shows 18% primary abnormalities of sperm. When classifying sperm morphology, the semen, showing 18% primary abnormalities of sperm, is considered to be: (a) very good, (b) good, (c) fair.

8. As we continue with the evaluation of breeding soundness, we find that the semen of this same three-year-old bull shows swirls without black lines. When classifying motility of bull semen, when swirls without black lines are observed, should it be called: (a) very good, (b) good, (c) fair, (d) poor.

9. Bovine practitioners often must decide the stage of pregnancy of a cow, from day one to calving. But let's make it easy and ask you at 42 days after a cow is bred, which of these signs would lead you to make a diagnosis of pregnancy? For this question, there is more than one answer. (a) The fetal membrane slip, (b) placentomes, (c) middle uterine artery fremitus, (d) fetus palpation, (e) amniotic vesicle.

10. Let's give you another easy question and ask you another question about the stage of pregnancy. One hundred and twenty days after a cow is bred, which of these signs are necessary to make a positive diagnosis of pregnancy? Again, there is more than one correct answer. (a) Fetal membrane slip, (b) placentomes, (c) middle uterine artery fremitus, (d) fetus palpation, (e) amniotic vesicle.

Several of the following questions relate directly to calf production which is so important in a cow-calf operation.

11. The water losses associated with diarrhea in young calves have been estimated to be as high as: (a) 25 ml/kg/day, (b) 50 ml/kg/day, (c) 75 ml/kg/day, (d) 100 ml/kg/day.

12. The next question is involved with the gastrointestinal tract of the young calf. The fluid portion of the material in the gut of the normal calf is derived: (a) 1/2 from ingested fluids, 1/2 from gastrointestinal secretions; (b) 3/4 from ingested fluids, 1/4 from gastrointestinal secretions; (c) 1/4 from ingested fluids, 3/4 from gastrointestinal secretions; (d) almost 100% from ingested fluids.

13. The next question also involves the gastrointestinal tract of young calves. The acidosis seen in calves with diarrhea is caused by: (a) intestinal bicarbonate loss, (b) organic acid synthesis, (c) anaerobic metabolism causing lactate synthesis, (d) decreased renal function, (e) all of the above.

14. Another question on calf scours. The one most important measure on the prevention of calf scours is: (a) vaccinating the cow prior to calving, (b) A-DE injections to the dam, (c) disinfect navel, (d) colostrum milk, (e) administration of oral antibiotics at the time of birth, (f) administer vaccine against viral diarrhea agents during the first 12 hours of life.

15. Colostral milk is important in the protection of the calf. The next question relates to colostrum milk. The majority of colostrum immunoglobulins are able to cross the intestinal mucous membranes of newborn calves for a certain period of time. Which of the following best represents that time? (a) 48 hours after birth, (b) 5 days after birth, (c) 1 week after birth.

Question number 16 will start to test your knowledge of some of the immunity theories.

16. The main class of immunoglobulin that is present in colostrum in cows is: (a) IgG, (b) IgA, (c) IgM, (d) IgE.

The next question will also test your knowledge of the theories of immunity.

17. The main class(es) of immunoglobulin present in the nasal secretions and in the intestinal mucosa is: (a) IgG, (b) IgA, (c) IgM, (d) IgE.

The next question is also about immunity.

18. A six-month calf is shown to have antibodies vs. BVD virus in its blood. Could this be due to: (a) passive immunity via colostrum, (b) postnatal exposure to BVD virus, (c) intrauterine exposure to BVD virus, (d) any of the above.

19. A serum sample taken three days after the onset of respiratory signs in a weaning calf was reported by your diagnostic laboratory as having an HI (hemagglutination inhibition) titer of 1:128 against PI-3 virus. A serum sample taken from the same calf 10 days later had a PI-3 titer (HI test) of 1j;256. Is this increase in titer significant? (a) yes, (b) no.

20. In young calves, parenteral immunization and vaccinations are generally delayed for at least two months because of: (a) the immunological immaturity of the young animal, (b) vaccination in young animal could result in immunological paralysis, (c) the presence of colostrum passive immunity interferes with the immune response, (d) all of the above.

Something comes along in practice once in a while that's easy. Here's a question that should be easy for you.

21. While *Moraxella bovis* is apparently associated with the occurrence of pinkeye in cattle, a group of other factors is also associated with this condition. Which of the following factors would be considered as in this group? (a) lush pastures, (b) ultraviolet radiation, (c) face flies, (d) vitamin D deficiency, (e) protein deficiency, (f) IBR infection.

22. Infectious bovine rhinotracheitis virus shows several manifestations in an infected young calf. Which of the following signs or forms would be consistent with an infection with this virus? (a) upper respiratory tract infection, (b) calf diarrhea syndrome, (c) conjunctivitis, (d) meningo-encephalitis, (e) all of the above.

23. A client of yours has a serious problem with losing calves at 8-12 weeks of age due to a pneumoenteritis complex. You decide to bleed all calves at 10 days of age in order to somehow predict which calves will come down with the syndrome. Which serological test would you request to acquire the necessary knowledge? (a) serological serum for IBR, PI-3, BVD antibodies, (b) radial immunodiffusion test, (c) total serum protein by refractometer, (d) any of the above.

24. There are other tests that can also be used to give information on globulin levels. These include: (a) zinc sulphate flocculation test, (b) sodium sulphate flocculation test, (c) ammonium sulphate flocculation test, (d) any of the above.

25. A yearling calf has been sick for one month with symptoms of intermittent diarrhea. It is a poor doer, has a rough haircoat, mucosal ulcerations. A BVD virus was, in fact, isolated from feces of the calf that was submitted to the state diagnostic laboratory. A blood sample from the calf was also submitted to the diagnostic laboratory one month after the start of the illness. This blood sample was negative for BVD antibodies. What would your diagnosis be? (a) BVD is still the primary diagnosis regardless of the absence of antibodies, (b) non-specific enteritis, (c) nutritional enteritis, (d) salmonellosis.

26. One year ago you vaccinated 79 Hereford cows for a client, using a three-way leptospirosis vaccine, because leptospirosis had been a problem in the herd. This month a cow aborted a seven-month-old fetus. You take a blood sample from the cow and send it to your state veterinary diagnostic laboratory, requesting leptospirosis tests because it had previously been a problem. The diagnostic laboratory used the rapid plate test for serological testing for leptospirosis. The report showed a titer of 1:40 against all five serotypes of leptospirosis tested for by the laboratory. What does this most likely mean? (a) acute leptospirosis, all five

serotypes, (b) acute leptospirosis, one serotype, (c) vaccination titer, (d) non-specific reaction, (e) residual titer from previous infection.

27. A heifer was mistakenly vaccinated against bovine virus diarrhoea during the third month of gestation. She delivered a weak calf at term. You are concerned that this might have been caused by the BVD vaccination. Which of the following laboratory tests would most likely help you in determining if this was really the case? (a) virus isolation from various fresh tissues of the calf, (b) calf blood antibody level determination, (c) histopathological analysis of calf tissues.

28. We are going to play some more immunity games, and I would like to have you decide what antibody is the first to be produced in response to an antigen stimulus? (a) IgG, (b) IgA, (c) IgM, (d) IgE.

29. One of our clients has a Shorthorn cow that is the family pet. It is hand-milked to provide milk, cream, butter, ice cream, and also has an annual calf for the family beef freezer. Lately, the cow has been getting a runny nose, starts to breathe more heavily than normal, and has shown some skin welts, and the owner has determined that this is now happening very shortly after one cutting of clover hay is being put down from the hayloft above the cow. To confirm that this is an allergic manifestation to something associated with the hay, what type of antibody could you expect to find increased? (a) IgG, (b) IgA, (c) IgM, (d) IgE.

30. Where is this antibody, associated with allergies, most likely to be found? (a) in the serum, (b) in the nasal passages, (c) attached to the surface of mast cells, (d) in leucocytes.

31. I had a client with a farm on a river bottom. The pastures were well fertilized, and growth of grasses in the fall was fast. One morning a cow, with a calf three months old, was down in the pasture, and my diagnosis was grass tetany due to magnesium deficiency. Before treatment, I took a venous blood sample and later from the laboratory I received a report showing magnesium level was 2.83 mg%. Normal serum magnesium levels in cattle are considered to be in which of these ranges: (a) 0.5 - 2.0 mg%, (b) 2.0 - 3.5 mg%, (c) 3.5 - 4.0 mg%, (d) 4.0 - 5.5 mg%.

32. A southern coastal ranch had all of the potential for disease outbreaks. A slow-running creek came into one of the main pasture areas from another ranch where leptospirosis was a frequent problem. Snails were numerous in some of the waters where cattle drank, so bacillary hemoglobinuria was a problem. Flies, mosquitoes, horseflies were everywhere and could serve to spread diseases such as anaplasmosis. And, Texas fever ticks had been found in the herd last year. Suddenly, four animals were dead and several cows were very sick and most of the symptoms I saw in the animals pointed to all of these diseases. There was one common finding, however, that enabled me to make a clinical diagnosis before receiving laboratory confirmation. None showed any hemoglobinuria. Hemoglobinuria usually does NOT occur in one of the following diseases. So, my clinical diagnosis should have been: (a) leptospirosis, (b) piroplasmiasis, (c) anaplasmosis, (d) bacillary hemoglobinuria.

33. Forty-seven Hereford heifers being raised as breeding animals were moved to lush pasture from an overgrazed pasture. In two days, three heifers showed incoordination, were excited, showed twitching of muscles of the limbs, eyelids, and ears. They showed rectal temperatures that were essentially within the normal range. I made a diagnosis and gave each of the affected heifers large doses of thiamin hydrochloride for three days. Two of the three recovered, the third died on the second day. What was the diagnosis? (a) thromboembolic meningo-encephalitis, (b) poli-encephalomalacia, (c) listeriosis, (d) lead poisoning.

34. Some agricultural chemicals cause signs that are similar to nitrate (nitrite) poisoning. The one(s) that may cause the same signs and lesions directly or indirectly is (are): (a) nitrous dioxide or nitric oxide, (b) cyanide, (c) sodium chlorate, (d) 2, 4-D, (e) chlorinated hydrocarbons.

35. In most parts of the United States we see a common substance used as a feed additive or perhaps a feed substitute. This

substitute is known as urea. It is added to feed in an attempt to supplement the protein part of the ration. It is mixed with molasses, corn, straw, peanut hulls, etc. When we, as veterinarians, see this used, sometimes we are going to have to diagnose urea toxicity. In urea toxicity in cattle the rumen pH generally: (a) does not change significantly, (b) drops to 5/5 and below, (c) raises to 8 and above, (d) is variable and thus cannot be used diagnostically.

36. When we stopped or decreased the use of lead in paint several years ago, we thought perhaps the problem of lead poisoning would decrease. However, lead poisoning is still a very common finding in cattle. So, we've got to be prepared to diagnose lead poisoning. Which of the following is considered to be unacceptable for lead analysis from a live animal? (a) EDTA blood, (b) citrated blood, (c) heparinized blood, (d) clotted blood, (e) feces.

37. Sometimes we have a dead cow in which we suspect lead poisoning and we might submit tissue samples to a laboratory for analysis to lead us to our diagnosis. So, from a dead cow, which are preferred samples for lead analysis? (a) liver, lung; (b) brain, intestine; (c) kidney, skin; (d) kidney, liver.

38. Certain levels have been established for inclusion of urea in rations of ruminants. As veterinarians we should know just what is permissible. The maximum level of urea inclusion in the ration of a ruminant is considered to be what percent of the total dry matter of the ration? (a) 1%, (b) 3%, (c) 5%, (d) 10%.

39. Now that we know that a certain percent of the total dry matter of the ration can be urea, we should also know how much of the total protein equivalent of the concentrate mixture in the ration of the cow can be urea. Urea can safely supply how much of the total protein equivalent of the concentrate mixture in the ration of a cow? (a) 1/10, (b) 1/3, (c) 1/2, (d) 2/3, (e) 3/4.

40. When you give a dose of antibiotics to a cow, we've got to tell the owner, "Don't you sell this cow for slaughter for a certain period of time." When we use oxytetracycline and give the cow a therapeutic dose for treatment of some disease, just how long, at the present time, must we tell the owner to withhold the animal from slaughter? (a) 0-7 days, (b) 8-14 days, (c) 22-30 days, (d) 30 or more days.

41. Another common agent that is used in the therapeutics of cattle is that of penicillin-streptomycin. We probably ought to be familiar with the withdrawal times associated with the use of this product on animals that are going to slaughter so that we might be able to advise our clients of the proper time interval. So, what is the proper withholding time for animals receiving penicillin and dihydrostreptomycin combinations? (a) 0-7 days, (b) 8-14 days, (c) 15-21 days, (d) 22-30 days, (e) 30 or more days.

42. Of course, not all of the drugs that veterinarians use in cow-calf operations are given with a needle. We quite often give drugs orally. One of the common drugs used to remove intestinal worms is thiabendazole. Animals that have received thiabendazole cannot be slaughtered for how many days? (a) 3 days, (b) 7 days, (c) 10 days, (d) 20 days, (e) 30 or more days.

43. This question is fairly complex. It involves not only diagnostic problems but some problems not uncommon to most practitioners. An owner of a remote cattle ranch comes to your office and complains about a condition in one isolated herd of 50 Hereford cows. These are some distance from your office. The cows go off feed, develop a fever for 3-5 days, after which diarrhea begins and the temperature drops. The rancher has actually checked rectal temperatures on several of the sick animals, and therefore, is not guessing about this part of the history. A nasal discharge develops and the mucous membranes of the mouth become red. The eyelids on some cows are swollen. Lachrymation develops and may become purulent. The cornea of some becomes cloudy. Ulcerated areas develop in the mouth. The diarrhea that develops becomes very profuse, blood-stained. The haircoat becomes dull and the skin may be scurfy. Some cattle have also developed pneumonia with thick, clear mucus draining from the nostrils, later becoming purulent. Several animals have aborted in late

stages of the disease. Dehydration and weight loss have been severe. The first animal was affected two weeks ago, and all animals now show some degree of involvement. Most of the animals have died in four to seven days, but many are still hanging on. Treatment with penicillin-streptomycin or nitrofurans in the water have been ineffective. As a veterinarian, we should do one or more of the following: (a) insist on making a visit to the premises for pre- and post-mortem examinations of the cattle, (b) diagnose BVD-mucosal disease complex, prescribe antibiotics, (c) diagnose malignant head catarrh, prescribe oxytetracycline and dispense electrolytes, (d) suspect rinderpest and report to state and federal disease control officials, (e) diagnose a simultaneous BVD-salmonella infection, prescribe suitable antibiotics and electrolytes as supportive treatment.

Answers

1. The area of the body is not the determining factor. Two factors are important. The color of the skin and the possibility of exposure to sunlight. So, if you selected (d), you were right.

2. Foot rot is an infection, but it is not caused by *Moraxella bovis*. Pulmonary emphysema is often caused by an allergy. Abdominal paracentesis is a surgical procedure. Casting of the withers is an old-time name for uterine prolapse. So, the correct answer is (e) pinkeye.

3. Formaldehyde is sold commercially as 37% solution and is known as formalin. Therefore, to make a 10% formalin solution, one will need 1 part of 37% formaldehyde and 9 parts of water, or answer (a).

4. Probably the most important thing to consider in this question is the need for sufficient energy intake in the young cow that is nursing her first calf, and for this reason, we would then say answer (c). There is also the possibility under some circumstances that answer (a) would play a role here. The fact that certain reproductive diseases could possibly cause this symptom.

5. While the majority of cows aborting due to IBR, brucella, leptospirosis, and/or campylobacter have a significant titer at the time of abortion, some only have low or no antibody titers in the blood at parturition. However, their blood antibody levels will rise significantly within 10-14 days post partum. Therefore, answer (c) is correct.

"I noticed in the previous question that we used the term 'vibriosis,' and now we are using the term 'campylobacter.' I presume most of you know that this is the new name for vibrio organism and is the one that we should be using from now on. However, I imagine the term 'vibriosis' will be with us for a long time. I have a question for Dr. Sippel. What do you do after this two-week period has elapsed, we take the blood sample, and the serological tests are still negative?"

"In this case, I think we need to look for the more unusual causes of abortion, such as BVD, possibly bluetongue, or others. Quite likely in this case, when you get negative results both times you will not learn the cause. If it were one of the more unusual things such as a strept infection, an *E. coli*, or salmonella, the above serological tests will be negative and the cause will not be learned. However, I think the owner should be cautioned to be careful to look for the fetus and placenta in additional cows that might lose their calf later on. If these are found, send them to the diagnostic laboratory.

6. The answer to this question would be (b), or good. The Society of Theriogenology has adopted a revised breeding soundness criteria. One of the changes has been the introduction of scrotal circumference, or, in other words, testicle size, into the scoring system. You will notice that in the age group of over 30 months, as this three-year-old bull would be, his testicle size was in the 33-to-40 category, being 35 cm. Consequently, he would rate in the good category. You notice also there would be 24 points given in this instance for this part of the scoring system.

1976 Revised Breeding Soundness Criteria
Scrotal Circumference

Class	Months of Age				Point Score
	12-14	15-20	20-30	More than 30	
Very Good	>35	>37	>39	>40	40
Good	30-35	31-37	32-39	33-40	24
Poor	<30	<31	<32	<33	10

7. Again, the answer is good, so (b) would be correct. I think you realize that morphology is very important in the evaluation of a bull, and that primary abnormalities are the most important of the morphology examination. In this particular instance, as you view the chart, you will see that the primary abnormality category rating of good includes 10 to 19% of primary abnormalities. So, the answer would fit in this category, assuming of course that the total abnormalities do not exceed 40. This would indicate that secondary abnormalities are less important and we can have a large number of them. You will notice that in both the scoring of morphology and scrotal circumference, a maximum of 40 points each may be achieved and under this particular system, consequently, a lot of emphasis is placed in these two areas.

1976 Breeding Soundness Criteria
Morphology

Class	Primary Abnormality	Total Abnormality	Point Score
Very Good	<10	<25	40
Good	10-19	26-40	24
Fair	20-29	41-59	10
Poor	>29	>59	3

8. No reason to change when you have a winner. Let us stay with (b), or good. Here we are talking about the movement seen under the microscope when we place a drop of undiluted semen on the slide and examine it. If there is vigorous swirling activity, then there will be these waving black lines that occur as we view through the microscope. As the swirls are still present, but not quite as active, we do not usually see these lines, and for that reason then, we would place this in the good category. The points possible on the examination of semen for its motility or movement, under this particular system, again is a possibility of 20. In other words, we are placing somewhat less emphasis on this than the other parts.

1976 Breeding Soundness Criteria
Motility

Class	Movement	Point Score
Very Good	Swirls-with black lines	20
Good	Swirls-without black lines	12
Fair	Slight Wave Movement	10
Poor	Feeble to no movement	3

9. In this question we still have the reasonably early pregnancy diagnosis situation and some of the structures that develop during pregnancy have not had the time to be very well developed. There are two structures, however, that we can detect at this time and the two correct answers would be first (a), the fetal membrane slip, or in other words, detecting the chorio-allantois as it has already developed to this extent. And then (e), the detection of the amniotic vesicle in the uterus itself.

10. Any one of several answers here would lead to a definitive diagnosis of pregnancy. Under (a) the fetal membrane slip, of course, the fetal membranes are still present at 120 days and under some circumstances we can palpate them, but they are rather difficult to feel at this time and are not very important as far as pregnancy diagnosis is concerned. The other correct answer, (e) the amniotic vesicle, by this time has greatly enlarged and the amniotic sac is quite large and impossible to identify. So, that leaves us with three correct answers: (b) the detection of the placentomes which at 120 days should be quite easy; (c) the middle uterine artery fremitus whereby the enlargement of the middle uterine artery may be recognized, and, finally, in most cases we can actually palpate the fetus itself. Although in some instances it may be so far in the abdominal cavity of the cow as to be quite difficult and almost impossible to palpate. So, the correct answers would be (b), (c), and (d).

11. The answer can be either (c) or (d) depending on how you want to calculate it. There have been estimations that the calf will lose as much as 74 ml/kg/day in water. When this is added to the losses associated because the calf did not absorb fluids of about 25 ml/kg/day, the net loss to the calf might be considered to be 100 ml. This represents quite a degree of dehydration. Inasmuch as the question asks for that which was lost, we are accepting (c) as the right answer.

12. In the normal calf it is estimated and has been measured that probably as much as 3/4 of the fluids that make up the gastrointestinal tract are derived from gastrointestinal secretions and only 1/4 are contributed by ingestion. So, the answer to this question is (c).

13. While this question well might be beyond the realm of what the local practitioner might normally be expected to know, it was included here because it is important in understanding the degree of acidosis that develops in these calves. Actually, all of the answers are contributory to the cause of acidosis in the calves. So, (e) all of the above, is the correct answer for this question.

14. Immunity of the cow is very important. Vitamins are important. Good calf care is important, including disinfecting the navel. Antibiotics can be used, and may in some operations have their place. Vaccines may be important in some calf operations, but the single most important item for the prevention of calf scours is giving the calf colostrum milk, which contains immunoglobulins, vitamins, and food. The sooner we get that colostrum into the calf, the better off that calf is going to be. So, the answer to this question is (d) colostrum milk.

15. Absorption of immunoglobulins through the intestine is an active rather than a passive process which takes place for a period up to 48 hours after birth. After this time, absorption is practically negligible. The exact mechanism of the cessation of absorption is not known. So, the correct answer for this question is (a).

While it is true that colostrum may not be absorbed after 48 hours in very great quantities, it is still important to bear in mind that even though it is not absorbed, it does have a beneficial effect on the surface of the intestinal tract and will form antigen-antibody complexes that may be beneficial to the calf.

16. In most other animals class IgA is the main class of immunoglobulins present in the colostrum. In the bovine, however, IgM is the main class of immunoglobulins. So, the correct answer to this question is (c) IgM.

17. IgA is the principal immunoglobulin in exocrine secretions. The IgA-producing antibody cells are found in the sub-epithelial tissues and respond to antigens that enter locally. This class of immunoglobulin is important in protecting the mucosal surfaces from the invasion of pathogenic microorganisms. So, the answer is (b) IgA.

18. It has been demonstrated that colostrum-derived immunity to BVD virus can last anywhere up to nine months in the calf. Likewise, calves infected with the BVD virus in the second trimester of pregnancy have been shown to develop antibodies *in utero* and to be born alive at term. So, the correct answer is (d) any of the above.

19. Only a minimum of a four-fold titer increase is significant. A twofold increase is still within the technical error range inherent to any serological procedure such as might be derived from pipetting errors. Therefore, only an increase in titer to 1:512 would be considered to be significant. For this reason, the answer is (b) no.

20. Maternally derived colostrum antibody could interfere with the immune response by combining with the antigen. The antigen-antibody complex formed will rapidly degrade and eliminate the reaction of the antigen on the appropriate cell surface receptors. Additionally, the complex could exert a suppressive effect on the antigen-sensitive lymphocytes. So, the answer is (c) the presence of colostrum passive immunity interferes with the immune response.

21. The exact relationship between the causative agent of pinkeye and the other factors associated in this question have long been debated. Without question the role of the face fly has often been incriminated. However, recent research would indicate that

the organisms must have the interference or the irritation of the ultraviolet light on the surface of the eye to cause the development of pinkeye. The relationship of face flies and other factors are probably only incidental in the transmission of the disease and have no relationship to the cause. So, the answer to this question is (b) ultraviolet radiation.

22. We have already said that this disease, the IBR virus, has many manifestations, so let us run down the list. A. The upper respiratory infection is expected with this type of virus. B. The calf diarrhea syndrome is something that we see every now and then in young calves suffering from this disease. C. The conjunctivitis is another common sign. And D. The meningo-encephalitis is something that is seen almost exclusively in the calves and the younger animals. Thus, the easiest way to answer this question is (e) all of the above.

23. (b) radial immunodiffusion.

24. (d) any of the above. (See Williams, et al., Vet. Record 96: 81-84, 1975.)

25. It has been shown that BVD-infected cattle frequently fail to develop antibodies even though they may have been ill for months. These animals usually do not recover and succumb to the infection. This is thought to be due to the fact that the BVD-infected lymphocytes are incapable of developing antibodies and are immunologically deficient or incompetent. Therefore, the answer to this question is (a) BVD. Those who would like additional information on this subject can find it in the American Journal of Veterinary Research, June, 1973, pg. 753.

26. The first antibodies produced after a leptospirosis infection often cross-react a great deal. In fact, it is frequently impossible to determine which species really was infecting the animal with an "early" serum sample. If this same cow is retested three weeks later, the homologous titer will probably be higher. Thus, the correct answer is (b).

27. BVD vaccine virus may cross the placenta. A fetus as young as three months, exposed to BVD virus or other antigens, may respond immunologically. It is difficult, if not impossible, to recover BVD virus from term calves. A positive BVD titer in fetal or newborn calf (before colostrum intake) is good proof that the fetus was exposed. Histological changes in the tissues may not be sufficiently characteristic to allow a diagnosis. Therefore, the answer is (b) calf blood antibody level determination.

28. The answer is (c). IgM is the first antibody to be produced in response to an antigen stimulus.

29. (d) IgE.

30. The correct answer is (c) attached to the surface of mast cells. The reaction of the antigen with the IgE immunoglobulin attached to the surface of the mast cells leads to the release of histamine and other pharmacologically active mediators of anaphylactic reaction.

31. The correct answer is (b).

32. The answer to this problem is fairly straightforward. First of all, leptospirosis and bacillary hemoglobinuria both characteristically cause an intravascular destruction of red blood cells due to toxin productions. Likewise, the organism piroplasmosis causes intravascular destruction of erythrocytes. All three of these then would produce conditions that would manifest themselves by the clinical sign of hemoglobinuria. However, anaplasmosis produces destruction of red blood cells outside of the vascular system and thus there is no spillage into the vascular system of the hemoglobin, and the hemoglobin then does not find its way into the urine. So, the answer to this question is (c) anaplasmosis.

33. The fact that the cattle responded to the thiamin hydrochloride is a good diagnostic test. However, if you wanted to look good you might have removed the brain of the one that died and sent it to a diagnostic laboratory where characteristic lesions could confirm your diagnosis and perhaps make you feel a bit more cer-

tain. At least it would have proved the animal had polioencephalomalacia and they didn't get well just because you were lucky. The answer, therefore, is (b) polioencephalomalacia.

34. The answer to this question is (d) the herbicide 2, 4-D. After certain weeds and sugar beet tops are sprayed with 2, 4-D, metabolic changes take place in the plants which result in the build-up of high levels of nitrate. The cattle that eat these weeds may be poisoned with nitrate. Sodium chlorate signs are usually more severe than those of nitrate (nitrite) poisoning.

35. Changes in the rumen pH are quite consistent with urea toxicity, so if you selected (d), you are wrong. If you selected (a), you are wrong. Because of the breakdown of the urea in the rumen, a large amount of alkalosis is produced and thus the pH of the rumen often raises above 8 and can be used as a significant indicator of urea toxicity in cattle. Thus, the answer is (c) raises to 8 and above.

Practitioners should have in their cars at all times pH papers that have a wide range from about 4 to 8. Such papers are made by a German chemical company known as E. Merck. These are very useful to confirm a suspected case of urea poisoning or of acidosis. Texas practitioners find these very useful.

36. The correct answer is (a) EDTA blood. The reason that this is not acceptable is due to the fact that many samples of this are contaminated with lead. However, all of the other samples would be very satisfactory to diagnose this condition in live animals.

37. The correct answer here is (d) kidney and liver. These specimens are preferred due to the fact that the element concentrates in these organs.

38. The correct answer is (a) 1%.

39. This question, along with the question before, is often confused along with other percentages. I think that it is well for us to remember, as we indicated before, that the maximum level of urea in a ration of an animal should represent only 1%. However, there are some other percentages that we need to keep in mind. One is that if the urea is being mixed with a concentrate mixture to be provided to the cattle, it should only represent three percent of the

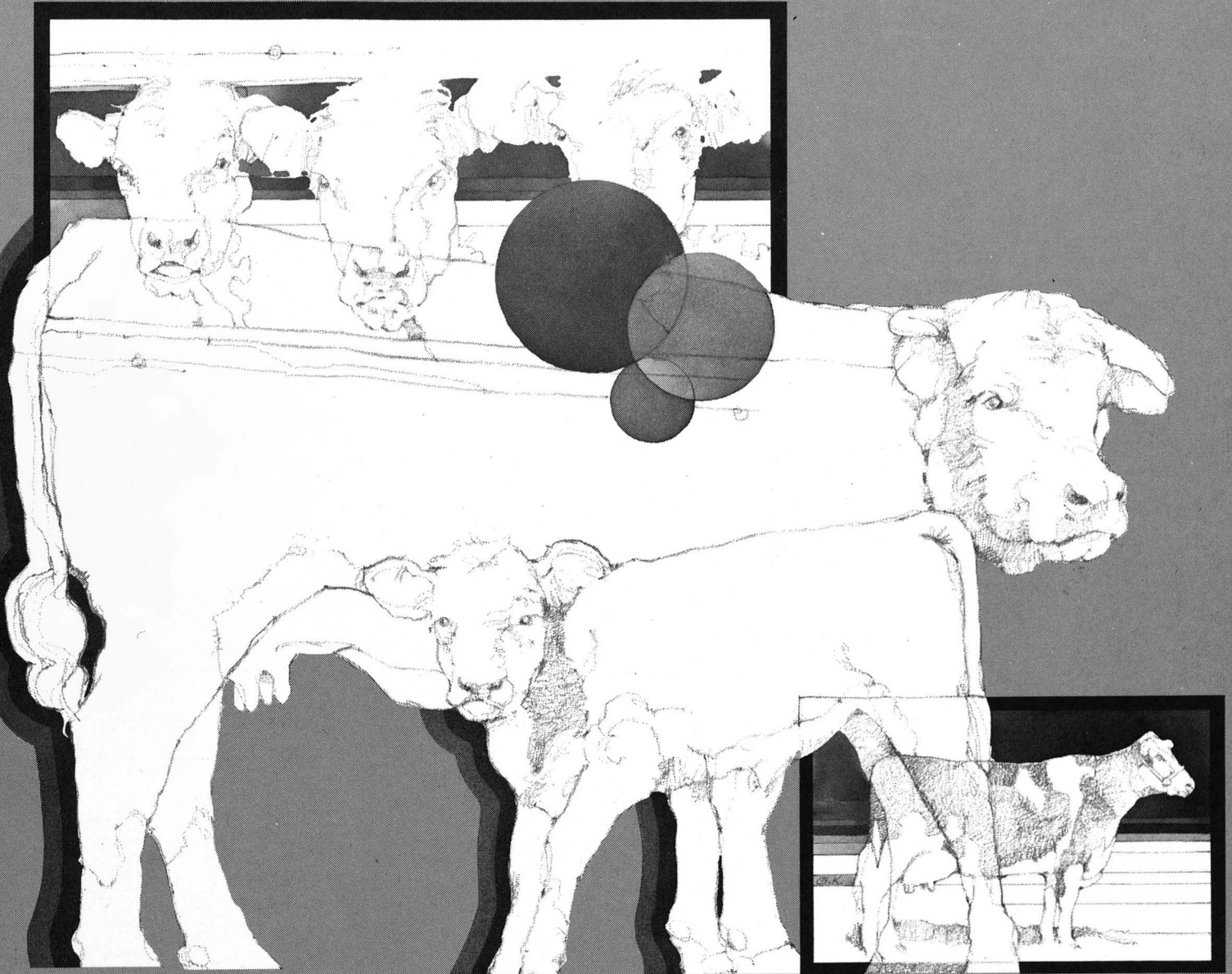
ration. And under no circumstances should we try to provide more than one third of the total protein in the cow's ration by urea. Additionally, we must remember that these animals must have other nutrient factors involved in the ration in order to convert the urea to utilizable protein on the part of the cow. So, the answer to this question is (b) 1/3.

40. Various manufacturers have different brands of oxytetracycline, and one brand may have different withholding times than another brand. So, each veterinarian should be very familiar with the product he is using on a particular animal. He should read the label and then follow the label instructions and then pass the word on to the owner of the animal. At the present time manufacturers are being told to have animals receiving oxytetracycline withheld from market for 22-30 days. So, (c) would be the correct answer.

41. The answer is (e) 30 or more days. The reason for this is because of the dihydrostreptomycin in the combination having a long tissue time and requiring a much longer withdrawal time than the penicillin.

42. The answer is (a) 3 days. According to present regulations, thiabendazole-treated animals must be withheld from slaughter for three days or more.

43. Rinderpest should be suspected due to the severity of this disease. For this reason a visit to the premises should be strongly advocated. So, (a) and (d) are the correct answers. I have had the privilege of participating in two foreign animal disease courses at the Plum Island Laboratory and it is very frightening to see these diseases and realize how very similar they look to diseases you see in your practice every week. I think that it is imperative that practitioners be alert to foreign animal diseases and their symptoms and certainly should call a foreign animal disease expert through your state or federal veterinarian in order that they can call on one of their foreign animal disease experts to come out and collect samples and send them off to be sure to eliminate one of these conditions. This is not only essential for the welfare of the country but it gets you off the hook if one of these dread diseases does come into the United States.



Single dose G-H-P

One vaccination with Leptovac G-H-P . . . and cattle are protected against all three major types of leptospirosis—*L. grippityphosa*, *L. hardjo*, *L. pomona*. There's no need for a repeat visit, no need for a second injection, no need for extra handling.

Leptovac G-H-P is the first and only bacterin of its kind. It's produced by a highly sophisticated process involving specially-developed fermentation and nephelometric technology. Your assurance of optimum levels of all three antigens in every dose . . . and uniformly effective protection against all three serotypes.

Leptovac G-H-P is safe for cattle of all ages, including pregnant beef or dairy cows. It can be used

in a program with 'Vibrin,' Norden's vibriosis bacterin, to prevent another major cause of reduced calf crops.

Ask your Norden representative about Leptovac G-H-P, the single dose bacterin that protects against three types of leptospirosis.

Leptovac G-H-P



