

Feedlot Diagnostics and Common Sense

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Abstract

Approaches to feedlot diagnostics continually change as new information becomes available to managers, veterinarians and diagnosticians. Record keeping has evolved to a point where considerable precise information regarding performance, demographics and health issues can be quickly generated. Diagnostic laboratories continue to develop more precise techniques for detecting pathogens, deficiencies and tissue damage. The role of the attending veterinarian becomes more challenging and demanding because production costs and performance issues dictate the need for better health performance. Only the on-site veterinarian can provide the skill needed to decide what information is needed and to assimilate that information into useful decision-making. Sensitive and specific diagnostic tests must be viewed with perspective to avoid being misled into overinterpreting diagnostic information.

Introduction

The modern feedlot often contains dairy breed cattle along with the more traditional beef breeds. This lessens the apparent differences between the dairy and the beef industries. The changing feedlot populations have some influence on health problems that are encountered. The diagnostician's challenge is to sort out the differences between interesting observations and data that can be utilized in planning meaningful programs.⁸ There are two distinct motives for diagnostic efforts. The first is a need to monitor health events and to identify trends that may affect performance. The second is to help solve problems that are usually identified as increasing numbers of sick cattle (pulls) or deaths. Conditions that may relate to diagnostic confusion are discussed.

New Diagnostic Approaches

New Tests

The most exciting new techniques are those employing polymerase chain reaction (PCR).⁵ These work by amplifying small amounts of DNA (or RNA) segments so that detectable levels are reached. It is not important

that the organisms being tested for are alive as long as the DNA is intact. This results in an ability to detect extremely small amounts of DNA. The tests are also very specific. Interpretation is fairly simple but a positive test only tells us that a specific agent is present, not how much is present. Less sensitive tests can be more meaningful if one assumes that less sensitive tests are more likely to be positive only if the agent is present in high numbers and is, therefore, more significant. The problem of overreacting to identified pathogens may be amplified. Most feedlot populations harbor numerous viruses, bacteria, mycoplasma and chlamydia. Caution must be applied in assuming cause and effect significance in the presence of a small amount of DNA. The PCR test does have some limitations. The most important is that its extreme sensitivity means that laboratories must follow strictly controlled procedures to prevent false positives resulting from cross-contamination in the laboratory. Another disadvantage is that these tests are somewhat more expensive than some other types of tests. Results with PCR, as with other tests, should always be viewed by the practitioner as information that must be considered along with the clinical situation and other information.

Diagnosis of Bovine Virus Diarrhea

Development of much simpler, more rapid tests has provided new opportunities for diagnosis of bovine virus diarrhea (BVD), particularly in the case of persistent infection. The presence of high numbers of virus particles can be detected by immunohistochemistry on skin samples or by abbreviated virus growth and identification often referred to as "rapid elisa". These tests presumably detect only persistent infections but some caution must be exercised in making this interpretation. These tests will be further studied and may prove helpful in some type of national BVD control. Even with these new tools, there are some issues that need more complete study before the subject of eradication may be seriously considered.

The BVD diagnosis tends to be overworked in abortions and feedlots. At this time, there is simply a lot of BVD virus cycling in most cattle populations. Sufficient study of samples from almost any population will result in identification of BVD virus. This means that BVD

can be a “normal” finding that may be a convenient but inadequate answer to some set of problems. The clinician needs to put virus identification in perspective with regard to its importance. So-called vaccine breaks in feedlots are a good example. First, highly stressed, marginally sick, cattle are vaccinated with a products labeled against such use. Then the cattle break with IBR or other infections in spite of vaccination. Next the vaccine is exonerated because the cattle were found to have BVD virus present. The rest of the story is that a lot of cattle that did not “break” were also carrying BVD.

Diagnostic Problem Areas

Neglected Necropsies

The only time feedlot necropsies are of no value is when they do not get done. The benefits of necropsies are: (1) They establish a baseline of what is happening or not happening with the health program; (2) They detect trends or changes in usual disease status of the animals before the changes are recognized in the numbers of pulls or dead animals; (3) They are a source of information that is simply not available or interpretable by feedlot personnel; (4) They provide an excellent way to measure treatment response; (5) They are wonderful opportunities to teach feedlot employees why their jobs are important and what they might do to improve results. Many feedlot practitioners teach feedlot employees to perform and report necropsies. This is an effective way to maintain communications. Some feedlot consultants use recorded notes plus digital images to provide long-distance input.

The following discussion stresses some diagnostic pitfalls but should not be interpreted as a reason to avoid diagnostic work. It is intended to try to make those efforts more focused and productive.

Mycoplasma Infections

Mycoplasma infections have been receiving increased attention over the past several years. The reasons are unclear but there are two possibilities. The first is more sensitive diagnostics such as PCR. The second is the infusion of many more Holstein cattle in the feedyards. *Mycoplasma* infections tend to be a bit specific with regard to target tissues such as middle ear in young dairy calves and tenosynovitis in feedlot cattle.^{1, 4, 11, 12} There is a trend to move *mycoplasma* pneumonias from initiating factors in acute pneumonia to causes of chronic lesions with abscesses. Some serious misconceptions can result from failure to recognize that *Mycoplasma bovis* and *Mycoplasma dispar* are common inhabitants of bovine respiratory tracts.⁹ Merely finding *Mycoplasma bovis* in pneumonic tissue is far from determining cause and effect, especially with pulmonary abscesses that can have multiple causes. There has been a tendency to use

Mycoplasma spp as a convenient explanation for conditions where no other cause is identified.

Mycoplasma species are good examples of organisms that are commonly present in upper respiratory tracts. Nasal swabs are of little benefit in evaluating health concerns. This is also true of most other agents. Nasal swabs are of little benefit in attempts at virus isolation unless sampling, storage and shipment are carefully worked out with the destination laboratory.

Clostridial Enterotoxemia

Clostridial enterotoxemia is commonly diagnosed based on sudden death and the presence of *Clostridium perfringens* or clostridial toxins. This syndrome is poorly defined and difficult to diagnose at best.¹⁰ There are no characteristic lesions and all intestines harbor *Clostridium perfringens*, so merely finding the organism, regardless of type, does not establish a cause and effect. These sudden deaths are probably more often the result of acidosis and its associated changes.³ There is evidence that *Clostridium perfringens* type C and D bacterin-toxoids really have no impact on sudden deaths in the feedlot.²

There is increasing discussion of *Clostridium perfringens* type A involvement in acute, fatal hemorrhagic enteritis in dairy cows.⁷ There seems to be an association but pathogenesis is difficult to define because of the ubiquitous nature of *Clostridium perfringens*. Models for experimental study have not been developed. Autogenous vaccines have been used with some positive reports, but there have been no controlled studies. Careful attention to feeding practices may be more important.

Interstitial Pneumonia

Interstitial pneumonia is a term that describes a general type of lesion that is usually quite diffuse and that has a predominant interstitial component. The classical version is an atypical interstitial pneumonia (AIP) that is of poorly defined etiology although it apparently involves tryptophan in some cases. This condition tends to affect heifers more than steers and is seen more in hot weather. The other common cause of interstitial pneumonia is bovine respiratory syncytial virus (BRSV). Both conditions tend to affect animals that have been on feed for some time. The important issue is that differential diagnosis depends on judicious diagnostic information management. Consider history and tests for BRSV but keep in mind that BRSV may be identified in any steer at any time. Further, gross lung lesions do not provide a differential. Some pathologists think they can differentiate these histologically. Others question whether histopathology can differentiate in most cases. The question here is whether to initiate a vaccination or other control program that may or may not produce benefits based only on a supposition.

Bacterial Culture Failure

Bacteria simply do not always grow in culture. Failure to identify a suspected organism in one sample simply doesn't offer much information. Reasons for failure are not always clear but may include prior treatment with antibiotics. It is important to establish patterns by sampling multiple animals if possible. *Salmonella* spp are generally viewed as easy to isolate and identify but sometimes they just don't grow. Bacterial cultures are best applied to animal populations by sampling multiple animals, establishing trends and matching results to other clinical and diagnostic information.

Sensitivity testing is another example of the need for multiple isolation attempts. Simply determining the sensitivity of one organism from an entire feedlot population is probably a waste of effort. Determining what constitutes an adequate sample is problematic, but it certainly involves more than one isolate. There are numerous reports of clinical response to antibiotics to which cultured organisms were resistant. The reverse is also true. Sensitivity information is best used for guidelines, not for rules.

Central Nervous System Disease

There are two basic principals in the diagnosis of central nervous system (CNS) disease. The first is removal of the brain at necropsy. The second principal is that it is usually necessary to get laboratory support by submitting half the brain refrigerated and the other half in formalin. Diagnosticians are frequently frustrated by a history of CNS disease and a failure to submit brain. The reason is a belief that it takes exceptional skill, time, and effort to remove a brain. There are several ways to quickly and efficiently remove a brain. One way is to simply use an axe to remove the skull with a few strokes. Perfection as taught in many schools is not necessary and this method allows the head to remain attached to the carcass for easier removal of the carcass. Another easy method involves water pressure after detaching the head.

Polioencephalomalacia

Most, perhaps all, feedlot polioencephalomalacia is the result of excess sulfur consumption, not lack of thiamine.⁶ A clinical response to thiamine administration has no diagnostic value because thiamine may produce some response in a number of central nervous system disorders. There is, however, close association between polioencephalomalacia and consumption of greater than 0.4 percent elemental sulfur. Always start a diagnostic investigation by determining sulfates in feed and water. The success of thiamine administration in the feed to stop a polioencephalomalacia outbreak is dependent on the timing of the rain dance. Keep in mind that ruminants may adapt to higher concentrations of sulfur over the first thirty days on feed.

Icteric Holsteins

People are seeing icterus and hemoglobinuria in Holstein steers that have been on feed upwards of ninety days. Some have some degree of weakness and/or respiratory disease. They often recover with some apparent antibiotic benefit, but significant numbers die. Necropsies are pretty unrewarding. Lesions consist of icterus, some subcutaneous edema and hemoglobinuria. No pathogens are consistently identified although there is some suspicion that *Leptospira* spp may be involved. Some reports suggest some response to 5-way leptospiric vaccines. However, attempts to isolate leptospira are generally unsuccessful. Relatively mild kidney lesions are sometimes present and a few have contained organisms resembling leptospira. However, most of these are negative by PCR. Serology is also generally not diagnostic. These continue to be a diagnostic frustration.

Conclusion

Sensitivity and reliability of diagnostic tests are continually improving. Some diagnostic myths can be avoided. The underlying need in feedlot diagnostics is the veterinarian who is ready to take clinical information, combine it with laboratory information, and make good common-sense judgments.

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