



Johne's Watch

The latest information concerning Johne's Disease.

Vol 3 Issue 1

Improve The Accuracy of Your Johne's Testing Program Without Increasing Cost

When establishing a Johne's testing program, determining the goals of the program and then deciding what role testing will play is critical to success. The goal of some programs is to manage Johne's, while others desire to eradicate the disease from the herd altogether.

Tailoring a testing protocol to meet the needs of the program is critical to creating an efficient and effective program. Misguided testing protocols are often the source of frustration adding significant expense with little return.

Quick Review of Test Types

Antibody-based tests (such as an ELISA) detect the body's **response to** *M. paratuberculosis*, the causative agent of Johne's disease. While these tests are usually less expensive than other tests, they are hindered by the fact that an animal's humoral response to *M. paratuberculosis* develops over several years (so the test is most effective in later stages of the disease) and doesn't necessarily develop to the same extent as other animals responding to the same organism. Antibody-based tests are generally useful when entire populations of animals need to be monitored.

In addition to determining presence of disease, they also give a valid estimation of the prevalence of disease. Occasionally, extraneous factors, (environmental, animal health, etc.) may alter the effectiveness of the test, but as a general rule they are valuable tools.

Organism-based tests (fecal culture, Rapid Fecal Test) detect the **presence of** *M. paratuberculosis*. Organism-based tests are considered the 'gold standard' for disease detection and as such are used to help determine the effectiveness of other tests, such as antibody-based tests. *M. paratuberculosis* can be detected (is being shed) long before the body mounts a humoral response, which is the underlying reason why these tests are more accurate than antibody-based tests and are accepted as individual animal tests. The disadvantage to this type of test is that they are also usually more expensive.

The Frustration

The two types of tests measure different aspects of Johne's disease. Based on research results, and vast amounts of collective experience, we know this basic difference in tests leads to scenarios where infected animals can be ELISA positive but fecal negative, or ELISA negative but fecal positive. While understanding the science is helpful in explaining this discrepancy, it makes establishing a Johne's control program very frustrating!

Typically, testing programs have the propensity to rely on ELISA tests, then manage positive reactors at critical control points. While it is possible to successfully



Improve Your Johne's Program Accuracy By Pooling Fecal Samples

implement a program of this type, it is important to keep in mind the limitations of antibody-based tests.

Research indicates that ELISA's should identify 10 to 40 percent of the infected animals in the herd depending on the proportion of the infected animals in advanced stages of disease. It is safe to expect that at least some proportion of these animals, not identified by the ELISA, are shedding bacteria back into the environment, passing the infection to herdmates. Other factors, both physiological and environmental, affect the development and maintenance of the humoral response. Therefore, it is even possible to obtain conflicting results using the same type of test. In infected herds, this frustrating scenario can continue for five to ten years until sufficient testing is obtained to weed out the true positives. In herds that are uninfected, false positive results often lead to unnecessary testing in the future.

So how do you deal with this frustrating scenario? Try pairing the antibody-based tests, with the improved accuracy of fecal testing to clarify the performance of the ELISA in your herd and find the stragglers hiding in the early stages of Johne's disease, without sending your testing bill through the roof.

Recent studies have validated a simple procedure that brings the cost of fecal testing down to that of an ELISA. Now, veterinarians and producers can get the added performance of fecal testing at a substantial reduction in cost by pooling samples together for analysis.

Pooling works by combining equal amounts of manure from four animals into a single sample. If the pooled fecal sample comes back negative, the four animals represented in that pool can be considered negative until their next annual test. If the pooled sample comes back positive, the individual samples comprising that pool can be retested to find which of the four animals represented in that pool is (are) positive. While a positive fecal pool could result in five fecal tests rather than four, most of your animals, and hence pooled samples, are likely to be negative, with a net result of three to four fecal tests for the price of one.

While relying heavily on fecal testing may appear pricey at first, strategic pooling can reduce the cost of fecal testing to that of ELISA testing by increasing the likelihood that a pooled sample will come back positive or negative. For example, animals strongly suspected to have Johne's disease (poor performance, poor condition, family Johne's history) can be pooled together with the caveat that if the pooled sample comes back positive then all four will be considered positive for Johne's disease and dealt with according to your Johne's management plan. Keep in mind that fecal positive animals have detectable levels of the bacteria in their manure, and are the most direct sources of disease transmission in your herd.

Those animals not suspected of, nor showing signs of disease can be pooled together. While this will increase the likelihood that the pooled sample will come back negative, pooling still retains the ability to detect the presence of a single positive animal compared to concurrent testing of individual samples.

Benefits of Pooling

Research by Kalis et.al. (2000) in the Netherlands showed that strategic pooling was able to detect 39 out of 45 positive animals (87%) compared to 43 out of 45 positive animals (96%) from 733 cows individually cultured for Johne's disease. More recently, Wells et.al. (2002) concluded that pooling (5 to 1) was able to detect the presence of a single cow with high fecal bacteria concentrations 94 percent of the time.

A perfect situation to utilize pooling is to evaluate the performance of your ELISA. A pooled sample from four previously ELISA-positive animals will almost certainly come back positive if the ELISA is adequately working in your herd. Likewise, a pooled sample from four previously ELISA-negative animals should come back negative. In this situation, management decisions based on future ELISA results are sound investments in a testing program designed to control the spread of Johne's disease.

However, if the results on pooled fecal samples do not corroborate previous ELISA results, the ELISA may be giving too many erroneous results to be an effective component of a Johne's control program. If this scenario occurs on a regular basis, abandon the ELISA in favor of fecal testing to dictate your management decisions.

Additionally, many veterinarians and producers have expressed the need for a test in younger animals before they enter the string. Considering that infected animals begin shedding the bacteria in their manure much earlier than they begin producing antibodies in the blood or milk, strategic pooling offers an excellent, cost effective, test for young herd replacements (purchased or raised) in low prevalence herds. Rather than looking at animals individually, look at them in groups by pooling fecal samples. Animals represented in negative pools can be considered good to go, whereas animals represented in positive pools can be evaluated more closely or discarded altogether. Think twice before utilizing or acquiring a group of replacements in which 25 percent or greater of the pooled samples come back positive, the numbers simply aren't in your favor.

Eradicating Johne's

The scientifically sound testing approach to Johne's eradication is to alternate between annual antibody-based tests (blood/milk ELISA) and organism-based tests (fecal culture/Rapid Fecal Test). Cumulatively, the combination of antibody-based and organism-based tests is the most effective scenario to identify infected animals since many infections can escape detection by a single type of test for several years. Without detection, these stragglers are an important source of new infections, which presents itself as a failure to reduce the prevalence of disease in many Johne's control programs.

The chances of infection escaping both types of tests are markedly lower and by alternating tests, infections missed one year are likely to be picked up the next. Therefore, stragglers can be identified and managed earlier in the disease cycle,



Summary

reducing the odds of transmission and achieving eradication in a shorter timeframe. Testing can all but cease at this point so the investment in time for fecal testing is returned by the elimination of a testing program in subsequent years.

Pooling allows the incorporation of fecal testing in any Johne's control program at approximately the same cost per animal as the more common ELISAs. Testing of young herd replacements, final clean-up stages in low prevalence herds, and confirming questionable ELISA results are all instances when fecal testing can contribute significantly to the progress of a Johne's control program.

For more information or to discuss how to incorporate fecal pooling into your Johne's management program contact Todd Byrem, AntelBio Technical Specialist, at 1.800.631.3510.

References

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AntelBio
Antel BioSystems, Inc.
3655 Forest Road
Lansing MI, 48910
1.800.631.3510
www.antelbio.com

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