Testing for Johne's Disease –

Tests available and what you should know about them

One of the things that make Johne's disease such a difficult disease is that there are no perfect tests for detecting infected animals. In fact, testing may not result in a clear cut yes or no answer. Choice of tests and the strategy should be farm/client specific. There is no one recipe that is right for every producer.

Types of tests

There are basically two types of tests: those that detect the organism (a bacteria called *Mycobacterium paratuberculosis*, abbreviated MAP) in manure samples and those that detect antibodies to the bacteria in blood samples.

The two most commonly used tests are the fecal culture, to detect the bacteria, and the ELISA, a blood test, that detects antibodies to the bacteria. A newer test, the "rapid fecal" (also called PCR test) is becoming quite useful in certain situations.

ELISA (pronounced ee-lye-za)

- Blood test
- Measures antibodies to bacteria that causes Johne's
- Useful as a herd screening test
- Rapid turn around, results generally in less than one week
- Relatively inexpensive
- "False negative" results are common (negative test result in a truly infected animal)
- "False positive" results are not common (positive test result in an animal that is not infected)

Blood for Johne's disease testing can be easily obtained from the tail vein.

FECAL CULTURE

- Culture of manure – can detect as few as 100 bacteria per gram of manure
- The bacteria are slow growing, results take up to 16 weeks
- Two types of culture
  - Standard solid media culture – Readily available and results take eight to 16 weeks
  - Liquid culture system - Results take four to eight weeks, but less available than standard culture
- The definitive test, considered the reference test against which other tests are compared
- More expensive than ELISA
- Positive test is considered definitive: means animal has Johne's disease
- "False positive" results are exceedingly rare
- "False negative" results occur, but less often than with ELISA

"RAPID FECAL" also called fecal PCR

- Test done on manure
- Detects bacterial DNA
- Rapid turn around: one to two weeks
- Positive test means that animals is shedding MAP
- More expensive than fecal culture
- Less available than either ELISA or culture

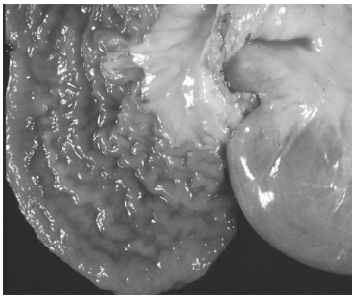
Manure for fecal culture must be fresh and taken directly from the cow. Using manure from the ground is not acceptable and may be contaminated.

Other blood tests include AGID and gamma interferon. The milk ELISA measures antibodies in milk. Histopathology on tissue detect the organism. These tests are not used commonly in beef cattle.

What you need to know to interpret the results.

In many situations, when testing for a disease, the test results say "yes this cow has the disease" or "no she doesn't". This isn't often the case with Johne's disease and is one reason it is such a frustrating disease. When interpreting the results from Johne's testing you need to consider the test used (ELISA vs fecal); the sensitivity and specificity of the test; the prevalence of Johne's disease on the farm (percent of herd infected); the number of animals tested; the source of the animal; and the age of animals tested.

- Sensitivity = refers to the percentage of infected animals that test positive
- Specificity = refers to percentage of healthy, non-infected animals that test negative
- False negative = when a cow that actually is infected tests negative
- False positive = when a cow that actually is **not** infected tests positive
- Predictive value = probability that a given test result is correct
  - Predictive value is affected by the prevalence of the disease in the herd



Small intestine (ileum) from cow with clinical Johne's disease. Surface appears thickened like corrugated cardboard, limiting the ability of the cow the absorb nutrients and water.

Test	Sensitivity	Specificity
ELISA	30	90
Fecal Culture	60	99.9

This chart shows that neither the ELISA nor the fecal culture are particularly good at detecting infected animals (low sensitivity). So again, a negative test result does not necessarily mean the tested cow doesn't have Johne's disease. However, Johne's disease is a progressive disease, and the tests are better at detecting the disease as the disease progresses. When there are no clinical signs of disease, neither test will do a good job of identifying MAP infected animals, but as the disease progresses the sensitivity of the tests increases.

To interpret the results you need to take into account the prevalence of infection in the herd. For example, a closed herd that has tested negative annually for ten years and then unexpectedly has a positive ELISA on one cow. This cow has previously tested negative on five annual tests. There has never been a clinical case of Johne's disease on this farm. What does the positive ELISA mean? Given the history and the prevalence of the disease on the farm (essentially zero) and the Johne's disease management program, the risk that this animal is infected is low and this is likely a false positive.

Now think about another very different situation: an ELISA positive cow in a herd with a history of clinical disease and both ELISA and fecal culture-positive animals. This herd also buys and sells cattle of all ages and uses cull dairy cows as embryo transfer recipients. In this case, the ELISA-positive cow, even if negative on tests in the past, likely has Johne's disease. The cow is at higher risk of having Johne's because of the high prevalence of the disease in the herd and the lack of any Johne's disease prevention or control program.

Johne's disease is complicated because not only is the infection acquired at a young age (with no evidence of disease for years), but also there is no test that can tell you that your animal does not have Johne's disease with 100 percent certainty. Testing is decreases the probability that your herd is infected and decreases the risk of selling animals infected with MAP.

Things to remember about Johne's disease testing

Your test results are -

Negative ELISA or negative fecal culture

- A negative tests does not mean the animal is "Johne's disease-free"
- A negative test does not mean the animal is not infected with MAP
- Negative results on repeated tests decreases the risk that the herd or animal is infected with MAP
- Negative results on repeated tests does not decrease the risk to zero
- A negative test result in an animal infected with MAP is called a "false-negative" test result
- False-negative test results are more common in the early stages of infection (young cattle)

Positive ELISA

- A positive ELISA in a clinically normal cow in a herd with low prevalence of Johne's disease may not be MAP infected – this may be a "false positive" test result
- A positive ELISA in a clinically normal animal in a herd with high prevalence of Johne's disease may actually be infected with MAP – this may be a "true positive" test result
- Positive ELISA results should usually be followed up with culture

Positive culture

- Positive results mean that the animal is infected with MAP – this animal has Johne's disease
- Positive results mean that the animals is shedding MAP bacteria into the environment
- Positive results on culture mean that the animals should be culled

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Michigan Department of Agriculture: (517) 373-1104 • U.S. Department of Agriculture: (517) 324-5290
Michigan State University, College of Veterinary Medicine & Michigan State University Extension:
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