

What you need to know about controlling Johne's

Regular testing and culling of positive animals, immediate separation of calves from dams and vaccination go a long way toward ridding farms of this infectious disease.

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TRADITIONALLY known as Johne's disease, paratuberculosis is an infectious disease of ruminant animals caused by *Mycobacterium paratuberculosis*. In mature cattle, the disease can produce a prolonged diarrhea and weight loss which results in death.

Currently, there is no practical, effective therapy for the disease. In heavily infected herds, as many as 5 to 10 percent of adult cows may develop diarrhea and die annually. As explained below, many cows not showing diarrhea also may be infected.

The adverse effects of nonclinical infection on milk production, reproductive efficiency and overall health have not been measured accurately, but many researchers and clinicians believe that the losses due to decreased production may be more costly than the losses due to diarrhea and death.

The condition differs from other common diarrheal diseases in that paratuberculosis has a remarkably long incubation period. A mature cow showing diarrhea today due to paratuberculosis almost certainly was infected with the disease when she was a young calf. She has carried the infection silently for years in her intestinal tract, and some recent stress such as calving, shipment or concurrent disease has caused her to suddenly develop clinical signs.

During the long period of incubation, before clinical signs are seen, the young cow may pass the bacteria in large numbers in her feces, even though she does not show signs of diarrhea. Because of this, the cow barn, maternity pens, pastures and other areas of the farm may become heavily contaminated with *Mycobacterium paratuberculosis* before the farmer has any idea that the disease is a problem on the farm. By the time the first cow with diarrhea is recognized as having paratuberculosis, many individual cattle on the farm already have been exposed and become infected.

The major route of infection is the fecal-oral route. This means that new infections occur when susceptible animals consume water, feed or bedding contaminated with manure containing *Mycobacterium paratuberculosis*. This organism is very resistant to destruction and can linger in farmyards, ponds and pastures for well over a year.

There appears to be an increased resistance to infection with *Mycobacterium paratuberculosis* as cattle grow older. Cattle exposed for the first time as adults are very unlikely to become infected. The most susceptible animals are newborn calves, particularly those born to infected dams. They are most likely to be exposed to infectious organisms as they pass through the fecal-contaminated birth canal, nurse on a manure-soiled udder or lie in contaminated bedding in the calving pen or gutter. If calving pens are not cleaned between cows, even calves born to clean cows likely will be ex-

posed to infection. The fact that most new infections occur in newborn calves makes control of paratuberculosis particularly difficult and quite prolonged.

When the first case of clinical paratuberculosis is diagnosed in an adult cow, you must realize that there probably is a whole generation of recently exposed calves that will not show signs of disease for at least two to three or more years. This is based on the assumption that the cow with disease has been a long standing member of the dairy herd and not a recent purchase.

Diagnosis . . .

The first step in diagnosis is to be informed enough about the disease to be suspicious. Any adult cow that develops diarrhea after a stress, such as calving, may have paratuberculosis. If she remains on feed, appears bright and alert and does not run a high fever, then paratuberculosis becomes a more likely diagnosis. If the diarrhea persists for more than a week and does not respond to therapy, paratuberculosis becomes the most likely diagnosis, and further testing is indicated.

A number of tests are available. Table 1 provides the names of these tests and points out some of their strengths and limitations. Two deserve additional discussion.

Uses of the AGID test

The AGID test is a rapid serologic test for the diagnosis for bovine paratuberculosis. If used properly, it can be very helpful in paratuberculosis control programs.

AGID can be used for:

1. Confirming the diagnosis of paratuberculosis in a cow showing signs of diarrhea and weight loss.
2. Eliminating paratuberculosis from the differential diagnosis in a cow showing signs of diarrhea and weight loss.
3. Identifying individual infected cows in a known positive herd that are heavy fecal shedders but not yet showing clinical signs, for the purpose of culling.
4. Screening a whole herd when the paratuberculosis status is unknown. If the whole herd is negative, then the herd is very likely free of paratuberculosis. If even one animal is positive, then paratuberculosis is present in the herd.

AGID should not be used for:

Testing individual animals for paratuberculosis prior to proposed sale or intended purchase. Too many false negative results are possible in cows not showing clinical signs of paratuberculosis. Infected animals can be bought or sold unknowingly if other tests are not used in conjunction with or in place of the AGID test.

The bacterial culture of feces generally is considered to be the most accurate test for Johne's disease. If the cow is shedding *Mycobacterium paratuberculosis* in her manure, she undoubtedly has the disease. However, the major drawback to this accurate test is that the organism is quite finicky and may take as long as 12 weeks to grow on special media after submission to the lab. This delayed information certainly is useful with regard to the herd diagnosis but may be of little help to you concerning the individual cow which may have died or was culled while awaiting the test results.

In recent years, a blood test known as the AGID test has been shown to be as accurate as the fecal culture for diagnosing paratuberculosis in cows already showing signs of diarrhea. The advantage of this test is that results are available within 48 hours, so that a decision can be made regarding the case at hand. The AGID test recently has been approved by the USDA and now is available commercially for use by veterinarians and diagnostic laboratories (Rapid Johne's Test, Immucel Corp., Portland, Maine).

The significance of a positive diagnosis depends on the history of the cow testing positive. If she has been purchased recently, has been restricted to the milking herd and not commingled with the young stock and has had diarrhea for only a short time, the cow should be eliminated immediately. Chances are that no long term adverse effects have occurred.

If the cow was purchased as a springer, her calf also should be eliminated as a potential carrier. You must make an honest appraisal of the potential exposure this cow had to any other newborn calves on the farm since she may have been a source of infection for many susceptible newborns.

If a positively diagnosed cow has been a long standing member of your herd, and especially if you maintain a closed herd, the diagnosis of paratuberculosis is very troublesome indeed. It probably means that the disease already is well established in the herd, and a large percentage of cows and young stock already are infected. If this is your situation, you must think carefully about whether or not to institute an eradication program.

Eradication possible . . .

Although eradication of paratuberculosis is possible, it is not simple. In an English study of 231 infected, vaccinated herds, the average time from the initiation of control to the total elimination of infection was over four years. Since eradication will involve a considerable amount of time and expense, the farmer should consider carefully his own circumstances and whether the payback from having a paratuberculosis-free herd is worth an eradication effort.

Factors which will affect your decision include any obvious loss of income from not eliminating paratuberculosis and the regulations

Table 1. Tests available for diagnosis of clinical paratuberculosis in cattle

Test	Sample performed	Where performed	Positive test result	Comments
Intravenous johnin test	live cow	on the farm	temperature rise 6 to 8 hours after injection	requires two farm visits, some false negative and some false positive results occur
Intradermal johnin test	live cow	on the farm	skin swelling 48 hours after injection	same as above
Complement fixation	serum	state lab	antibody detected	some false positive and some false negative results occur
AGID	serum	state lab or veterinarian's office	antibody detected	some false negative results, but few false positive results occur; results in 48 hours
ELISA	serum	research lab or private commercial lab	antibody detected	few false negative but many false positive results can occur
Lymph node biopsy	intestinal node obtained surgically	surgery on farm; examination at state lab	bacteria cultured or observed microscopically	expensive, invasive procedure, but high accuracy
Fecal smear	feces	state lab or veterinarian's office	bacteria observed microscopically	more rapid than fecal culture, but many false negatives occur
Fecal culture	feces	state lab	bacteria cultured	no false positive results, few false negative results, but culture requires a minimum of 8 weeks growth

concerning control of paratuberculosis in your state which may obligate you to some level of testing or quarantine. Check with your veterinarian to determine the regulations.

While the economic necessity for eliminating paratuberculosis might be obvious for a commercial bull stud or a purebred breeder with significant income from sale of breeding stock, the question of eradication is not easy to answer for many commercial dairy herds. Some of the economic losses associated with paratuberculosis, particularly the production losses associated with carrier animals not yet showing diarrhea, are not fully known.

It has been suggested that subclinical paratuberculosis may be responsible for low milk production, mastitis problems, prolonged calving intervals, high culling rates, slower growth in heifers and high susceptibility to other disease problems. Yet there is little hard data on what these problems may be costing the dairy farmer. Eradication should be an informed decision arrived at after consultation with your veterinarian.

There are really three objectives to an eradication program. They are: eliminate infected animals from the herd, reduce the risk of infection in animals not exposed and strengthen the disease resistance of those animals.

In practical terms, these objectives translate into the following program goals:

1. Identify and cull *Mycobacterium paratuberculosis* infected cattle.
2. Initiate management practices which minimize contact between young stock and older infected cattle and reduce exposure to environmental bacteria.
3. Consider vaccination of young stock against paratuberculosis.

Identification and culling . . .

Once the diagnosis of paratuberculosis has been made, any cow showing diarrhea should be culled immediately. At the very least, the cow should be isolated until a definitive diagnosis has been made.

Since the majority of infected cows will not be showing signs of diarrhea, it is necessary to test all adult cattle on a regular, periodic basis over a prolonged period of time. Testing should continue for at least two years so that all calves born after testing has begun will have matured and entered the milking string and will be included in at least one herd wide test. One way to accelerate the eradication program is to cull the offspring of cows found positive on test since their offspring were at higher risk of being infected at birth.

The test method of choice for routine testing is the bacterial culture of feces. Once again, the drawback of this test is the delay of three months or longer for test results. Also, it should be recognized that this test only will find positive animals that were shedding actively on the day the fecal sample was taken. A signifi-

cant number of infected animals may not shed the organism routinely in feces. This on again-off again shedding is another reason for regular, periodic testing in the herd.

Another test worthy of consideration for herd-wide testing is the AGID test. As mentioned earlier, this test will perform as well as the fecal culture when testing cows with paratuberculosis that already are showing diarrhea. When looking for subclinical cases not yet showing signs, the AGID test does not perform as well as the fecal culture test. On average, the AGID test only will find one of every three positive cows identified by fecal culture.

However, despite this limitation, there are several reasons the test still is very useful. The cows that are identified by the AGID test tend to be the heavier fecal shedders, most responsible for contaminating the environment with *Mycobacterium paratuberculosis*. Secondly, the test will identify these cows within 48 hours, as compared to 12 weeks, allowing rapid culling from the herd. Finally, the AGID test has an extremely high specificity which means that it rarely yields false positive results. Therefore, cows that test positive with the AGID test can be culled with a high degree of confidence. A summary of the uses and limitations of the AGID test are given in the side bar.

Management practices . . .

The goal of management changes is to reduce exposure of susceptible animals, mainly young stock, to *Mycobacterium paratuberculosis*. To accomplish this, calves should be born in freshly cleaned and bedded maternally pen, hand fed colostrum from washed udders and removed immediately from the dam and placed in housing away from the adult cow herd. I prefer individual pens or hutches. Calf related chores should be performed daily before handling the cows. Clean boots and coveralls should be re-

served for when working with young calves.

Young stock should be raised away from the cow herd until at least breeding age. Replacements should not be pastured on fields where manure from the cow herd has been spread or allowed to drink from ponds or waterers shared by cows. Avoid buying cattle when their paratuberculosis status is unknown. Use artificial insemination instead of natural breeding.

Vaccination . . .

The use of vaccine is somewhat controversial. The vaccine that is available has several restrictions. It can be used only in herds in which paratuberculosis already is known to exist. It can be given only to calves during the first month of life, administered only by a veterinarian and obtained only by permission of the state regulatory veterinarian after the herd has been tested free of bovine tuberculosis.

It is important to stress that, currently, the vaccine can be used only on calves in herds where paratuberculosis is known to be present. This means that calves already may have been exposed to infection before they are vaccinated. If they already are infected, then vaccination will not eliminate the infection, but will serve only to prevent the onset of diarrhea. Even this protection is not absolute. I have seen several official calfhood vaccinates which developed clinical diarrhea after being purchased and shipped to a new herd.

Therefore, the farmer considering a paratuberculosis control program should avoid the trap of thinking that the answer to his problem simply is vaccination. If the level of environmental contamination on the farm is not reduced by identification and culling of infected adults and improved management of young stock, the protective effects of vaccination may be overridden, and progress toward eradication will be slowed.