How Do We Control Johne's Disease in Florida Herds?

D.Owen Rae[1], Linda Keller[2], C. Dix Harrell[3], and Suzan Loerzel[4]
[1,2]College of Veterinary Medicine, University of Florida, Gainesville, Florida
[3,4]Animal and Plant Health Inspection Service, USDA, Gainesville, Florida

Introduction

Mycobacterium avium subsp. paratuberculosis (MAP) is a bacteria that infects ruminants worldwide. It causes chronic, thickening of the gut (granulomatous enteritis), known as Johne's Disease. The disease is characterized by chronic diarrhea and weight loss, despite a good appetite, even on a high plane of nutrition. There is no known cure for the disease and it is eventually fatal. The disease has a significant economic impact.[1,2,3] The organism can be isolated from the cow's colostrum and milk and is transmitted primarily by the fecal-oral route to their calves in the first few months of life. There is a long incubation period and the animal rarely shows clinical signs until two years of age or more. Herds become infected by new additions that may be shedding the bacteria and showing no clinical signs. Control of the disease is difficult. Currently there are no reliable tests for detecting early infection.[4,5]

Many studies have been done worldwide to estimate the prevalence of infection in ruminants. The prevalence appears to be on the rise. In an early study in the USA, 7,450 culled, clinically normal cattle in slaughterhouses in 37 states from 1983 to 1984 indicated an apparent prevalence of 2.9% in dairy cattle and 0.8% in beef cattle, with an overall prevalence of 1.6%.[6] In Florida, a 1986-1987 survey indicated a prevalence of 8.6% in beef cattle and 17.1% in dairy cattle.[7] The high prevalence in that study warranted the re-evaluation of the prevalence of Johne's disease in the state today.

Do We Have a Problem in Florida?

Data from the Florida State Veterinary Diagnostic Laboratory and USDA APHIS statewide submissions of specimens submitted for Johne's testing from 1999-2001 were examined. The data represented 32,011 cattle, of which 25,561 were dairy cattle and 6,450 were beef cattle. These cattle originated from 75 herds in 30 Florida counties. Beef breeds represented in this study were predominantly Brahman crosses. Purebred beef herds included Angus, Brangus, Hereford, Charolais, Red Angus, Limousin, Santa Gertrudis, and Senepol breeds. Dairy herds were almost exclusively of the Holstein breed. Females accounted for 26,604 of the cattle tested and 40 of the 73 herds were female only.

The distribution of the 49 beef and 26 dairy study herds across the state is illustrated in Figure 1. Counties of herd origination, state region, number of tested cattle and herds, and herd size category are summarized in Table 1. The estimated apparent prevalence of MAP antibodies in the sampled Florida cattle was 6.5% (2,089 of 32,011 cattle). Of the 75 herds, 62 herds (82.7%) had at least one seropositive animal in the herd. The apparent sample prevalence and herd prevalence estimates for each of the categories of herd size, herd type, and geographical location of that herd are shown in Table 2 and 3.

Prevention and Control of Johne's Disease in Beef Cattle

Note: *This information is derived from the United States Animal Health Association,*

National Johne's Working Group (NJWG), Subcommittee on Education, 2003 (http://www.usaha.org/njwg/jdbeefm.html).

Many animals in the early stages of Johne's disease may not be seen. Therefore, it becomes a herd problem, besides an individual animal problem. Johne's disease can be prevented, controlled and even eliminated from infected herds, based on a thorough understanding of the disease. Half-hearted attempts to prevent or control Johne's disease will generally fail. Once a herd becomes infected, control of Johne's disease takes time. Usually, the infection has been spreading through the herd for a few years before clinical cases are noticed. A typical herd control program may take 5 years or longer. Faster programs are possible, but may be more expensive. Prevention is cheaper than control.

Prevention

Prevention should be the goal of every ranch and farm that is currently free of the disease. It is encouraging to note that management practices directed at preventing Johne's disease will also reduce the risk for other important cattle diseases as well.

Several viral, bacterial, and parasitic intestinal diseases that affect beef herds are also transmitted from infected animals excreting or shedding the pathogen in their feces. A potential list of these pathogens includes calf scour microbes like BVD, Corona and Rota viruses, E. coli, and Salmonella bacteria. There are also intestinal parasites like Coccidia and Crypto plus nematodes or worms transmitted through manure.

The basics of prevention are straight forward. Prevent infections by closing the herd from animal additions or securing additions or replacements from Johne's-free or Johne's test-negative herds. In herds where infection is already present, additional steps are required for control. These include manure management, colostrum or milk management, identification of infected animals and their removal or separation from the herd, and by culling offspring of known infected mothers.

I. Prevention Practices
- Prevent infections by closing the herd or securing additions from Johne's-free or Johne's test negative herds.
- Purchase replacements from a herd that has individual cow/calf records, good management practices and is currently herd-test-negative.
- Purchase replacements from a herd that has had no evidence of Johne's disease for 5 years as a second choice.

II. Control Practices for an Infected Herd

A. Reduce infections by manure management (all manure is suspect).
- Maintain high standards of cleanliness in animal handling during calving periods.
- Avoid build-up of manure and contaminated mud in pastures and corrals where animals are kept.
- Calves should be born in a clean environment with minimal fecal contamination.
- Avoid crowded calving areas.
- Place new cow/calf pairs into clean uncrowded pastures as soon as bonding has occurred.
- Keep cow/calf pairs and replacement heifers in clean uncrowded pastures.
- Protect post-weaned replacement heifers from adult fecal contamination at least until they are a year old.
- Avoid manure contamination of feed by using feed bunks, hay racks, and by not using the same equipment to handle feed and move manure.
- Avoid manure contamination of water sources where animals drink.

- For maximum risk reduction, infected pastures could be tilled or grazed by non-replacement, feeder-cattle until environmental conditions destroy the microbe.

B. Reduce infections in calves by colostrum management.

- Use the colostrum from Johne's-negative dams if needed to supplement some newborn calves.
- Thoroughly clean the udder and teats before collection of the colostrum to avoid manure contamination.
- Clean dam's udder and teats following any assisted births.

C. Reduce infection spread by identifying and removing infected animals and their calves.

- Consult with your veterinarian for decisions on how best to use and interpret tests used for diagnosis of Johne's disease.
- Use a test-certified diagnostic laboratory for running your tests.
- Identify all females and their daughters remaining in the herd.
- Remove, or keep separate, all test-positive animals.
- Prevent infection spread by culling, or separating, offspring of infected mothers.

Control Plan Options

❑ Make management changes only.

It should be noted that these management practices are essential for the success of other program options. Reduce risk to calves by separating new cow/calf pairs from the rest of the herd when possible after birth. Avoid the spread of disease through fecal contamination by using elevated feeding troughs, hay racks and water troughs. Other management changes should include at least four steps:

1. Immediate isolation of any scouring or unthrifty animals;

2. taking samples to diagnose condition;

3. culling of any animal with diarrhea that is unresponsive to therapy and of an unknown cause;

4. culling offspring of infected cattle.

Further management recommendations are to restrict access of susceptible stock to high-risk areas (including swamps and ponds) where infected animals are known or highly suspected to have recently been.

To buy time to clear heavily contaminated pastures, graze non breeding stock on these high-risk areas. Sell these high-risk stock (i.e. cattle less than 12 months old exposed to infection) only through slaughter channels. Finally, keep a closed herd or purchase only from test negative herds.

A management-only choice is generally more affordable than other more stringent choices. Most often it will likely reduce the load of infection in the herd and incidence of clinical cases to a steady state. In some herds, of low-risk and low-prevalence, good management only may eliminate Johne's disease.

A disadvantage to the management-only option may be that costs will not always be evident. These methods are unlikely to work in heavily infected herds or unsuitable environments. For best results, this management only option must become a permanent part the operation. One final note: if the prevalence of infection in the herd is not known, an initial screening test is advised to establish a baseline for the herd. The test-positive animal(s) found by herd screening should be considered for culling.

❑ Test and cull

This option requires adoption of the improved management practices as described. Whole-herd tests are recommended at least

once per year. Confirmed positive cattle and their offspring must be immediately isolated and/or sold through feeder/slaughter channels. In herds with a low prevalence of infection, ELISA-positive test results should be confirmed with a culture test or with appropriate samples collected at slaughter.

This approach permits assessment of the herd status, identification of high-risk groups, and monitoring of progress. Another advantage is the ability to have an objective assessment of herd status for the purpose of selling breeding stock. Managed well, there will likely be a quick reduction in infection and clinical disease, allowing rapid progress toward a test negative status.

A disadvantage may be the cost associated with testing and culling reactors. Further, since some infected cattle will not be detected by the diagnostic tests early in their disease course, this option requires a long term commitment.

Expected outcomes include a rapid reduction in the prevalence of the disease and a decrease of environmental loads of Johne's microbes. Further, this option can assist eradicating infection from most herds. The test and cull approach may be an option for seed-stock beef herds, commercial beef herds selling breeding stock, and some self-replacing herds.

❑ Partial depopulation

This option requires sending high-risk groups of livestock and any other home-bred culls to slaughter only. Cull normally and sell all home-bred cattle through feeder or slaughter channels only. The operator must buy replacement cattle from test-negative herds. Another option is to obtain a written statement from both the herd owner and the veterinarian of record that, to the best of their knowledge, Johne's disease has not been in the herd for the past 5 years. Long-term considerations suggest that management should progressively create low-risk pastures, i.e. grazing with low risk terminal stock. Manage the herd as described above, emphasizing animal identification, record-keeping, whole-farm planning, and risk assessment of operation.

This option generally incurs lower costs as compared with other options and, with good management skills and effective planning, will improve the prospects for overall success.

One disadvantage is that low-risk replacement stock may not be identifiable or available for purchase until herd certification programs are more widely used. However, using this option to eliminate infection may still be possible in most herds. This may be an option for a beef herd where high-risk groups are well defined.

❑ Two-herd program

This option requires producers to rear calves from sero-negative dams in isolation, then gradually depopulate infected animals by selling to slaughter. Restocking occurs after an appropriate time lapse. Maintaining hygiene precautions is essential between the two locations.

This option may be tried with other options as well. It may also provide an excellent means of saving family lines of high genetic merit. As a caution, it should be noted that some infected cows will test negative and a small percentage of calves from these cows may have become infected before birth. These infected calves might not be detected until they are adults. Currently, there are no tests commercially available that detect light infection in animals less than a year old.

❑ Embryo transfer

There is minimal risk of embryos being contaminated. As a precaution, it is recommended to use embryos from Johne's-

negative dams; however, embryos from infected dams may also be harvested with limited risk. Regardless, all embryos must be implanted in uninfected recipients. This option provides a means of saving family lines of high genetic merit. Success will depend on risk and disease freedom of recipients.

- ❑ Vaccinate

Vaccinated cattle may become infected and shed the organism, but vaccination usually results in a reduction of clinical disease in herds. It also reduces the number of cows shedding the microbe. By that the environmental load of Johne's bacteria is also reduced, thus lowering the risk of infection spread to the herd. However, without other management practices, herd infection continues and is maintained at an unknown level.

Vaccination may be an option for any heavily infected herd with a high rate of clinical disease to reduce some impact of clinical disease, but it is not a way to eliminate infection from the herd.

As with all other options, producers will need to adopt improved management as described. Use of the vaccine requires approval from the State Veterinarian and is only available in certain states. Every year, all calves must be vaccinated within 35 days of birth. Some states require permanent identification of all vaccinated cattle.

The expense of vaccination may be a disadvantage for some. The per-dose cost of vaccine may be high as it must be administered by a veterinarian. Further, vaccinated herds may remain infected. Vaccinated cattle may be sensitized to the standard tuberculin (TB) test and require a comparative test to be done. Vaccinates may be false-positive reactors to serological Johne's tests thus limiting the testing options that may be used in a control program. Injection-site lesions are common and severe tissue reactions occur from accidental injections into humans.

Developing a Specific Plan for Prevention or Control

Herd owners and managers must have a long-term commitment to preventing or controlling Johne's disease in their herd. If they are to be successful, some thorough, well-designed plan needs to be fully integrated into management practices. In herds currently free of Johne's disease, the sooner a prevention plan is put to use, the better the chance is for maintaining a free status. For most low-risk, low-prevalence herds, the best time to start a control plan is now! The longer the delay the more difficult and expensive control becomes.

For successful establishment and use of prevention or control plans, one must consider all variables and have full support of all involved. Plans that do not take into consideration long term goals, management, desires, and capabilities of herd owners and others working on or for the operation, are prone to failure due to a noncompliance.

Preventing or controlling Johne's disease can enhance herd protection from other diseases. Remember, management actions designed to prevent or control the disease are simply good management practices that will be effective against other intestinal diseases as well.

Steps to Develop a Farm- or Ranch-Specific Program

Your veterinarian can help you develop a specific program tailored to your operation (Table 4). The following steps provide a practical Johne's disease prevention or control plan:

1. Assess current and long-term goals of the operation's business.

2. Assemble a herd history for probable Johne's disease risk or prevalence.

3. Estimate a most-likely prevalence for Johne's disease in the herd.

4. Identify workplace-specific risks for preventing or spreading the disease.

5. Examine various options to manage identified risks, including costs and benefits.

6. Consider diagnostic and herd testing strategies.

7. Define objectives and time to accomplish.

8. Tailor the program around long term goals, management capabilities, and commitment of personnel.

9. Monitor progress and success of the plan at regular intervals.

Additional considerations in developing a whole ranch or farm plan include the following points:

1. Become familiar with current information about Johne's disease. Thorough understanding of the disease and how it spreads allows a producer to be more aware of the risks associated with different management practices.

2. Learn about your own state law requirements regarding Johne's disease. Some states require reporting of all Johne's disease test-positive results. In addition, some states require official action to be initiated by their Office of the State Veterinarian or Department of Agriculture as a follow up to a positive test report. The presence and confidentiality of these requirements and reports may have an impact on the business of the particular beef enterprise reporting the result. For example, a seed stock producer may wish to be pro active about Johne's disease prevention or control yet is inhibited by the fear that prospective buyers will find out they are testing for Johne's disease and stop buying animals. Safeguards need to be in place in each state to prevent such unfavorable actions from taking place while encouraging producers to address the concerns that Johne's disease poses to their herd. Producers and veterinarians are encouraged to become aware and involved in their own State Johne's disease Advisory Group.

3. Determine what can be expected from prevention or control programs. Herd owners should be aware that different control options have different outcomes and that the plan's success depends largely on the exactness with which control options are applied. Johne's disease prevention, control, or elimination is a long term commitment. In some herds, infection may be prevented or eliminated with management alone. In other herds, strategies to eliminate infection may be prolonged and expensive. It may take years of commitment for a few infected herds to achieve and maintain test negative status. The longer time the infection has had to spread throughout the herd, the more difficult and time consuming it will be to control or eliminate the disease.

4. Decide which strategies may work for your operation. Prevention or control strategies include: changing management, vaccinating, implementing test and cull control programs, and, in extreme cases, depopulating the herd. Treatment is not considered an option for livestock, due to its extremely high cost and uncertain success.

The most appropriate strategy depends on the type of enterprise (commercial cow/calf, purebred, seed stock) and the commitment of the herd owners. These factors determine the outcomes, chance of success and cost benefit of different control strategies. For example, commercial cow/calf producers who have herds with low prevalence of Johne's infection, and sell cattle for slaughter only, may gain maximum economic benefit from management practices that reduce spread

of infection rather than test and cull programs. The downside is that their herd may have a lower value if they choose to sell replacement stock or bulls.

5. Consider owner liability. Owners of infected herds have some liability and responsibility in the sale of animals from their herd. Culture test positive animals from these herds should be sold for slaughter only. Test negative animals may, in some circumstances, be sold for production purposes depending on the herd history, Johne's disease prevalence, previous test results, and individual farm or ranch risk assessment.

6. Keep a written copy of the plan. A written plan should identify the short term (e.g., 12 months) and long term goals of the control program. It should also cover details of the control strategy that the herd owner has elected, its duration, approximate cost and likelihood of success. The plan needs to be reviewed or updated regularly. A regular review may lead to changes in management and/or testing procedures.

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Figure 1. Distribution of cattle herds included in the study according to geographical location. Shaded area designates North Florida; Unshaded area designates South Florida. Beef herds are represented by a circle; Dairy herds are represented by a square.

Table 1. Distribution of Florida cattle included in the study according to county, geographical region, and herd size.

County	Region	Cattle	Herds	Herd size		
				<100	100-500	>500
Alachua	North	577	4	2	2	0
Bradford	North	8	1	1	0	0
Charlotte	South	72	1	1	0	0
Clay	North	1,493	2	0	1	1
Collier	South	5	1	1	0	0
Columbia	North	109	2	1	1	0
Desoto	South	1,217	3	2	0	1
Duval	North	1,571	3	0	2	1
Gilchrist	North	72	2	2	0	0
Glades	South	134	3	3	0	0
Hamilton	North	303	1	0	1	0
Hardee	South	436	2	0	2	0
Hendry	South	67	1	1	0	0
Hernando	North	623	1	0	0	1
Hillsborough	South	282	1	0	1	0
Holmes	North	159	1	0	1	0
Jackson	North	296	3	1	2	0
Lafayette	North	358	2	1	1	0
Levy	North	786	5	3	2	0
Manatee	South	2,145	4	1	1	2
Marion	North	611	7	4	3	0
Martin	South	50	1	1	0	0
Okeechobee	South	17,416	7	1	1	5
Osceola	South	299	1	0	1	0
Pasco	North	277	3	2	1	0
Polk	South	1,175	6	3	2	1
Saint Lucie	South	216	1	0	1	0
Sarasota	South	428	2	0	2	0
Suwannee	North	806	3	1	1	1
Washington	North	20	1	1	0	0
Total		32,011	75	33	29	13

Table 2. Raw data, apparent sample prevalence estimates and herd prevalence estimates of Johne's in Florida cattle according to herd size, type, and geographical location.

	Total	Herd size			Herd type		Region	
		<100	100-500	≥500	Beef	Dairy	North	South
Cattle tested	32,011	1,109	6,918	23,984	6,450	25,561	8,069	23,942
Positive test results	2,089	67	527	1,495	477	1,612	539	1,550
Sample prevalence (%)	6.5	6.0	7.6	6.2	7.4	6.3	6.7	6.5
Prevalence range within herds (%)	0-28.6	0-28.6	0.9-19.2	3.5-15.8	0-28.6	0-15.8	0-28.6	0-20
Herds tested	75	33	29	13	49	26	41	34
Positive herds	62	20	29	13	37	25	31	31
Herd size range	5-8,921	5-75	102-469	544-8,921	5-1,153	40-8,921	7-1,171	5-8,921
Mean herd size	427	34	239	1,845	132	1,014	197	704
Herd prevalence(%)	82.7	60.6	100	100	75.5	96.2	75.6	91.2

Table 3. Least squares means sample prevalence estimates and herd prevalence estimates of Johne's disease in Florida cattle by herd size, type and geographical location.

Prevalence category (%)	Beef	Dairy	All cattle
Individual	7.2	7.6	–
Herd	75.5	96.2*	–
Herd region			
North	64.0[b]	93.8	75.6[a]
South	87.5	100	91.2
Herd size			
<100 head	58.6[c]	75[a]	60.6[c]
100-500 head	100	100	100
>500 head	100	100	100

*Values for beef and dairy herd prevalence differ significantly (P=0.02).

[a,b,c]Values for least squares means within columns differ significantly ([a]P<0.10, [b]P<0.05, and [c]P<0.01).

Table 4. Example Beef Herd Management Plans for different levels of aggressiveness for control after infection.

	Aggressiveness of control plan desired		
	Low	Moderate	High
Test selection	• can use least-expensive test	• recommend combination of tests	• recommend combination of tests
Test strategy	• initial mature herd screen • partial herd (high-risk animals) • monitor clinical suspects	• 1-2 times/yr >20-24 mos of age • serology, fecal culture; serial or alternating • clinical suspects	• 2-4 times/yr >18-24 mos of age • multiple tests; maximize sensitivity, specificity
Test result use: Cull test + animals	• clinical suspects • high-risk test positives	• clinical suspects immediately • subclinical test positives priority by test result, other problems, production, economics • consider culling offspring of clinical dams	• clinical suspects immediately, segregate prior to decision • aggressive early culling of subclinical positives before infection advanced or clinical disease • consider for offspring of test-positive dams • consider not raising replacements until prevalence is reduced
Test result use: Manage test + animals	• monitor positives for clinical signs • use for culling criteria	• identify for long term segregate or group • do not breed higher-risk positives	• same as for moderate, more aggressively • base on frequently updated test results • separate calving area
Mgt. concerns and areas to address	• calving area density and cleanliness • remove newborn calf pairs • minimize weaned stock contact with adults and their manure • minimize feed and water contamination	• calving area density/ hygiene • remove new cow/calf pairs • immediately separate weaned stock and adults with barrier or in separate facility • prevent feed and water contamination	• superior calving management and cleanliness • remove all new cow/calf pairs • immediately separate weaned stock from adults • completely eliminate feed and water contamination
Other mgt. choices to aid income	• improve general management in priority areas: near term cows, calving, developing heifers, nutrition	• focus management to improve performance in related areas: dry cow nutrition, calving, calves, developing heifers, reproduction	• improve health and performance in other areas to offset effects of JD; i.e., calf performance, nutrition costs, replacement heifers • optimize management; i.e.,feeding and nutrition, dry cows and pre-calving heifers, calf mgt. minimize stressors

Notes: