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**In This Issue:**

In response to reader's requests, we have developed articles on Johne's disease of Ruminants and Crohn's Disease in Humans.



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## Johne's Disease (Paratuberculosis) in Cattle

*By Dr. Michael A. Carter, Coordinator of US Department of Agriculture Johne's Disease Program. Dr. Carter has a BS Degree in Animal Science and Dairy Science and a DVM from Virginia Maryland College of Veterinary Medicine.*

### Overview

Johne's disease is a contagious, chronic and usually fatal infection that affects primarily the small intestine of ruminants. Johne's disease is caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP), a hardy bacterium related to the agents of leprosy and tuberculosis. The disease is worldwide in distribution.

Johne's disease can have severe economic impacts on infected herds. Economic impact on the herd increases each year as infection prevalence increases. It is imperative that herds use safeguards against becoming infected. Identifying and protecting non-infected herds will provide a source of breeding stock and replacement animals for other herds, and help to reduce the national prevalence of the disease.

In dairy cattle, the costs to producers are associated with: decreased milk production as the effect on the cow increases with progression of infection, decreased lifetime production of cows due to premature culling, decreased slaughter value, slowed genetic improvement of herd due to involuntary culling, increased herd cull rate, decreased value of seed-stock when buyers learn about Johne's disease status.

In beef cow-calf operations, the costs to the producer include: slows genetic improvement of herd due to involuntary culling and decreases value of seed-stock when buyers learn about Johne's disease status. No documented effects on growth or fertility have been shown.

## Clinical Signs

Signs of Johne's disease include weight loss and diarrhea with a normal appetite. Several weeks after the onset of diarrhea, a soft swelling may occur under the jaw (bottle jaw). Bottle jaw or intermandibular edema is due to protein loss from the bloodstream into the digestive tract. Animals at this stage of the disease will not live very long, perhaps a few weeks at most.

Signs are rarely evident until two or more years after the initial infection, which usually occurs shortly after birth. Animals exposed at an older age, or exposed to a very small dose of bacteria at a young age, are not likely to develop clinical disease until they are much older than two years.

Johne's disease is generally described as having the following stages:

Stage I: Silent, subclinical, non-detectable infection. Typically, this stage occurs in calves, heifers and young stock under two years of age or animals exposed at an older age. Infected animals in this early stage cannot be detected with current tests, including fecal culture and serologic tests. Research is ongoing to develop new tests to detect these animals. This stage progresses slowly over many months or years to Stage II. It is possible that some animals recover from this early phase of infection.

Stage II: Subclinical shedders. This stage usually occurs in heifers or older animals. Animals appear healthy, but are shedding MAP in their manure at levels high enough to be detected. Current blood tests are not reliable to detect animals at this stage. These animals pose a major but often hidden threat of infection to other animals through contamination of the environment. Stage II animals may or may not progress over time to Stage III.

Stage III: Clinical Johne's disease. Animals in this stage have advanced infection and clinical signs are often brought on by stress. Clinical signs at this stage include acute or intermittent diarrhea, weight loss despite a normal appetite, and decreased milk production. Some animals appear to recover, but often relapse in the next stress period. Most of these animals are shedding billions of organisms and are positive on fecal culture. Many are positive on serologic tests. Clinical signs may last days to weeks before the animals progress to Stage IV.

Stage IV: Emaciated animals with fluid diarrhea. This is the terminal stage of the disease, where animals become extremely thin and develop bottle jaw. Animals culled to slaughter in this stage may not pass inspection for human consumption.

In the typical herd, for every animal in Stage IV, many other cattle are infected. For dairy cattle, for every obvious case of Johne's disease (Stage IV) on the farm, 15 to 25 other animals are likely infected. The clinical case represents only the "tip of the iceberg" of Johne's infection.

## Epidemiology

Johne's disease usually enters a herd when healthy but infected animals (Stage I or II) are introduced. Cattle are most susceptible to the infection in the first year of life. Calves most often become infected by swallowing small amounts of infected manure from the calving environment or udder of the cow. In addition, calves can become infected while in the uterus or by swallowing bacteria passed in milk and colostrum. Studies have shown up to 25 percent of calves were infected in utero if the cow was in Stage III of the disease. Calves may become infected by exposure to contaminated manure any time in the first year of life, for


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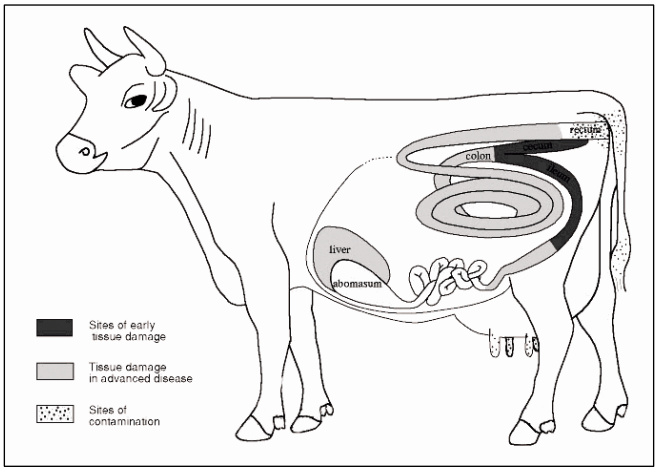
example from manure splatter to calves raised near adult cows.




Cattle of any age can become infected, though some age resistance does occur. This age resistance can be overcome by high doses of bacteria over time from sources such as manure-contaminated feed bunks or water sources. All ruminants are susceptible to Johne's disease. Contamination of the environment by other infected animals can also occur.

## Diagnosis

In the live animal, fecal culture is the most accurate diagnostic test. However, on a herd basis, only about 40 percent of infected cattle will be detected with even the most sensitive fecal culture technique. This is partly because some infected cattle do not shed the agent in the manure and because some animals shed the agent intermittently. MAP is a slow growing organism. Fecal culture with solid media, therefore, requires 12 to 16 weeks for results. New liquid culture systems have decreased the time until positive samples are detected significantly (2 weeks for heavy shedding animals, 6 weeks for light shedding animals). PCR and DNA probes are also being used as confirmation to culture systems or as stand-alone organism detection methods with sensitivities similar to fecal culture methods.

Various serologic tests including ELISA, AGID, and CF detect antibody in the serum and can be used on a herd basis to confirm herd infection. While less accurate than fecal culture, these tests are more rapid and less expensive. Serologic tests also work well in clinical cases.

In the dead animal, Johne's disease may be diagnosed by culture and histopathology of the lower small intestine and associated lymph nodes.

## Prevention

Herds that are not infected should take precautions against introduction of Johne's disease. Such precautions include keeping a closed herd, or requiring replacement animals come from test negative herds. Some countries offer Johne's certification to test negative herds. The key to prevent Johne's is to know that:

- Herds get infected primarily by buying infected cattle,
- Pre-purchase testing for Johne's disease is today's standard of veterinary practice,
- Testing the herd of origin is much more reliable than testing only the purchased cattle.

## Control and Elimination

Critical management points are aimed at protecting young stock from infection and reducing the pathogen load in the environment to reduce risk for transmission. Three keys to controlling Johne's disease include:

**1. Reduce infections by manure management (all manure is suspect).**

Reduce exposure of newborns to *M. avium paratuberculosis* in the maternity area by keeping the maternity area clean and dry, providing clean feed and water to young stock and keeping manure from mature animals separate from young stock.

**2. Reduce infections by colostrum and milk management.**

Feed "low risk" colostrum and milk from healthy cows, negative on recent tests, i.e. no suspicion of Johne's. Avoid "pooling" colostrum and milk (one cow to one calf). Use milk replacer or pasteurized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milk if available. Thoroughly clean the udder and teats before collection to avoid fecal contamination.

**3. Reduce infections by management of infected animals.**
Identify and "remove" clinical and late stage animals as soon as possible. Cull test-positives immediately, or segregate them from maternity areas and young stock. Do not feed their colostrum or milk.

The general strategy for controlling infection is to identify and adopt appropriate management and sanitation procedures for the individual farm. Control is based on improving management and offers the opportunity to capitalize on the decision to manage against Johne's disease. Many health and performance issues involve the same management areas and can be targeted as additional client goals. Examples include reducing risk for other pathogens, improved maternity management, monitoring of fresh cows, improved heifer development, improved feed bunk management, etc. To be effective, the program must be designed to fit the immediate and future goals and resources of the farm.

## International Activities

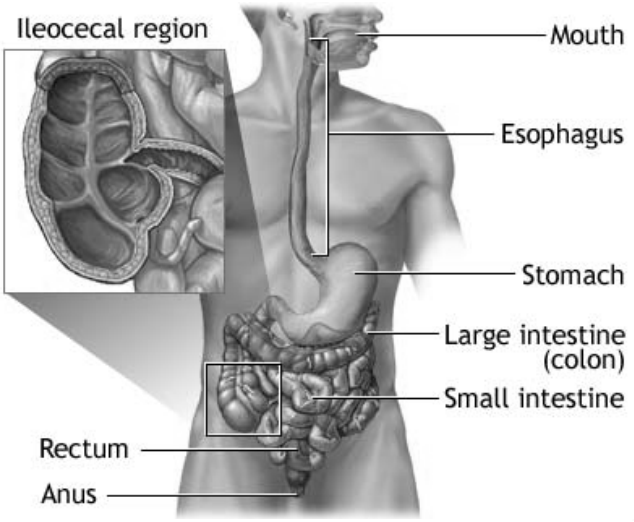
The best source of information on where national programs are at in regards to Johne's disease or other disease programs is the Office of International des Epizooties (http://www.oie.int). Summary information about prevalence and program activities can be found within the OIE website HandiStatus 2 database. Program activities range from stamping out efforts to surveillance to no activities. In general, Johne's disease activities are found in countries with limited international trade of ruminants while countries with the most advanced programs typically involve those with large cattle and sheep industries or those that have limited prevalence of the disease and feel eradication can be achieved in the near future.

# Crohn's Disease (of humans) and *Mycobacterium avium* subspecies *Paratuberculosis* (MAP) of Ruminants

*By Dr. Ernest Hovingh, Extension Veterinarian*

(Abstracted from an article in Veterinary News, Penn State College of Agricultural Science, Cooperative Extension Service, University Park, PA USA 16802, October 2004.)

"Crohn's Disease" was first described, at least in a published report, in 1913. This disease, which has many similarities to Johne's disease in cattle, causes a chronic inflammation in the small intestines, and is usually accompanied by diarrhea and weight loss. It most commonly affects young people and may require surgery to remove a section of the affected intestine. There is no consensus within the medical community concerning the cause of Crohn's disease. Many different theories have been proposed, including that it has an autoimmune, genetic, nutritional or infectious cause. The level of Crohn's disease diagnosed in industrialized countries has increased substantially over the past 30 to 40 years, and a 2001 survey by the CDC estimated that there might be upwards of 500,000 cases of CD in the USA. (www.cdc.gov/foodnet/pub/idsa/201/ashford)




**Crohn's disease usually occurs in the ileum but can affect any part of the digestive tract causing pain and diarrhea.**

While it is difficult to experimentally prove a causative relationship between MAP and CD, there are a number of pieces of evidence, which appear to support a link between the two. For example, a number of studies have shown that a significantly higher percentage of Crohn's patients have evidence of MAP in their intestines than patients who underwent intestinal surgery for reasons other than Crohn's disease. The organism has also been found in the lymph nodes and breast milk of people afflicted with CD.

A recent publication in the Lancet by Naser, et al. (Volume 365, September 18, 2004) reports the findings of a study in which blood samples from 52 participants were examined for evidence of the MAP organism. The bacteria was cultured from the blood of 50 percent (14) of the CD patients (n=28) in the study and from none of the patients who did not have some form of inflammatory bowel disease (n=15). The investigators also found the organism in two of nine (22%) of patients with ulcerative colitis (another type of inflammatory bowel disease). While this does not prove a casual relationship, it does add to the evidence that MAP may play a role in at least a proportion of the CD cases.

But the question might be how could people be exposed to the MAP organism?

Firstly, the MAP organism has been isolated from the unpasteurized milk of infected cows. Research done in the United Kingdom has previously shown that viable MAP organisms could be isolated from pasteurized milk available on grocery store shelves. A subsequent laboratory study undertaken by researchers with the USDA's Agricultural Research Service suggested the MAP does not survive high-temperature, short-time (HTST) pasteurization, which is commonly used in the US for fluid milk.

However, another recently released study by Ellingson and co-workers from the Marshfield

Clinic in Wisconsin, has documented the presence of viable MAP organisms in pasteurized milk purchased from retail stores in California, Minnesota and Wisconsin (presented at the International Association for Food Protection Annual Meeting on August 9, 2004). Almost 3 percent of the 702 samples tested were positive, suggesting that there is the potential for people to be exposed to these bacteria when they consume milk. Admittedly, this does not prove that MAP causes CD, or that this is even the main route by which people are exposed to the organism, but the dairy industry would be remiss to ignore the findings of this study and the one published in the Lancet.

Secondly, the MAP organism is able to spread beyond the intestinal tract in cattle, especially in the latter stages of the disease. A study of "market dairy cows" immediately after slaughter found that very thin cows had evidence of a greater level of this "systemic spread" than did animals that were in better condition. However, the importance of this potential source of exposure is not known since the amount of bacteria in retail meat products is not known and it is quite likely that the organism may be destroyed in the process of cooking.

Finally, potential exposure from a contaminated environment is also a concern. Although there are other domesticated and wild animal species that can also be infected with MAP, cattle can shed billions of organisms in their manure, thereby contaminating their environment. Contamination of surface water by manure – either directly deposited there by the cow, or through runoff from contaminated ground, is also possible. Although the organism does not grow and multiply outside of a suitable host, it can survive for long periods of time in the environment. In fact, in one study viable MAP bacteria were still present in a sample of tap water that had been inoculated more than one year earlier.

It should be pointed out that just as there are researchers who feel there is good evidence establishing a link between MAP in cattle and CD in people, there are those who believe that the available evidence does not support such a conclusion. Although discussions about the interpretation of the data are likely to continue for some time, it seems prudent that the dairy industry collectively and seriously address the issue as soon as possible.

## Practical Information

### Useful Pesticide

*From the publication "Footsteps" published by Tear Fund, UK, Issue No. 60, September 2004. Information sent to "Footsteps" by Dawn Goebbels, BP 55, Abeche, Chad*

Here is a useful and simple recipe for a pesticide using neem leaves. It works on many insects including grasshoppers and beetles.

1. Take a 20-litre container. Fill it with fresh neem leaves. Pour in water until the leaves are covered and leave to soak for 4-6 days.
2. Strain off the liquid through a cloth into a clean container. Add 50 ml of kerosene and 50 ml of liquid soap (or grated soap pre-soaked in water is fine).

3. Spray onto plants, including the underside of leaves whenever insects are evident.

If you have no sprayer or the nozzle blocks frequently, dip a bunch of leaves or bundle of grass into the bucket and shake over the plants. Make sure you wash yourself well afterward.

Note from Footsteps from which this item originated: "Natural pesticides are poisonous. Wear plastic gloves over the hands and wash skin and clothing after use. Wait a week before eating treated vegetables and it would be a good idea to rinse the vegetables well before eating."

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## Filtering Water with Old Clothes to Prevent Cholera

*By Dawn Berkelaar, From ECHO Development Notes, Issue 83*
*Published by ECHO, 17391 Durrance Road, North Ft. Myers, FL 33917 USA*

Filtering water through old clothes can effectively remove many of the copepods (a type of zooplankton) that carry cholera-causing bacteria. Researchers from the University of Maryland, College Park, did a study in Bangladesh comparing the effectiveness of old saris and nylon filters for filtering pond and river water. The study was written up in the *Proceedings of the National Academy of Sciences.* The following information was obtained from a summary by CBC News online staff (http://www.cbc.ca/stories/2003/01/14/sci-tech/cholera031314).

Bacteria called *Vibrio cholera* causes cholera. The bacteria live in standing water, and enter the human body attached to copepods. The bacteria grow in the human gut, releasing a toxin that causes extreme diarrhea leading to severe dehydration. In Bangladesh, where much of the well water is contaminated with arsenic, people end up drinking surface water contaminated with cholera.

Researchers did a study with 44,000 people in different villages; people in some villages filtered water with folded cloth from old saris; people in other villages used nylon filters supplied by the WHO (World Health Organization), and still others gathered water traditionally using no filter. After 18 months, the rate of cholera in villages that used sari filters was 0.65 per 1,000 people per year. The rate in control villages (where people did not filter water) was 1.16 cases per 1,000 people per year.

Saris filtered best when four layers of cloth were used. Any finely woven fabric could be used instead. Old clothes seemed to be most effective at filtering. The fibers of the cloth unraveled slightly, making the holes smaller and more effective at trapping fine particles.

THIS ISSUE is from Echo Development Notes, copyrighted 2004. Subscriptions are $10 per year ($5 for students). Persons working with small-scale farmers or urban gardeners in the third world should request an application for a free subscription. Issues #1-51 (revised) are available in book form as *Amaranth to Zai Holes: Ideas for Growing Food under Difficult Conditons.* Cost is US $29.95 plus postage in North America. There is a discount for missionaries and development workers in developing countries (in North America, US $25 includes airmail).

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# Information Sources

### Featured Web Site – *World's Best Milk Quality Web Site*

***World's Best Milk Quality Web Site***, University of Wisconsin, Department of Dairy Science, Milk Quality Resources. http://www.uwex.edu/milkquality.
Recently updated with a whole new look and additional resources, the ***World's Best Milk Quality Web Site,*** managed by Dr. Pamela Ruegg, provides one stop shopping for a host of milk quality resources.

Of particular interest to veterinarians may be items on the **Udder Health Resources page**, including a *new* Udder Hygiene Scoring Chart; a paper on Milk Quality Diagnostic Tests written by Dr. Ruegg; and various links to valuable milk quality related sites.

The **Library and Media page** provides milk quality videos in both English and Spanish; links to milk quality research reports, including pertinent Journal of Dairy Science papers and numerous newsletters, periodicals and books.

"Financial Impact of Milk Quality" and "Tracking Dairy Efficiency" are two examples for forms and charts that can be found on the **Milk Quality Economic page.**

Visit the ***World's Best Milk Quality Web Site*** to see these and other resources provided on this comprehensive, valuable site.

**Hog Information from *National Hog Farmer***
Your resource website containing links to material prepared at leading universities. www.hoginfo.com
What you will find: Pertinent fact sheets and university research reports for pork production and management.

**Iowa State University, USA, Swine Website**
Offers a variety of swine information on all aspects of production and health for veterinarians, students and farmers, some of which will be provided in Spanish http://www.vetmed.iastate.edu/departments/vdpam/swine
Provided by Dr. John Carr – johncarr@iastate.edu

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