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Johne's Disease: A Threat to the Dairy Industry

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JOHNE'S DISEASE A THREAT TO THE DAIRY INDUSTRY

ASSESSING THE SCOPE OF THE DISEASE IN PENNSYLVANIA

Johne's disease is responsible for a loss of \$1 billion annually to the American livestock industry. The staggering losses occur because of reduced production, higher incidence of infertility and mastitis, weight loss and greater expenses to maintain dairy and beef herds with John's disease. The disease is caused by *Mycobacterium paratuberculosis*, a stubbornly infectious bacillus against which no effective treatment exists.

The disease is found in every state. It is estimated that at least 10 percent of Pennsylvania's cattle are infected and the disease is on the increase. To develop faster, and more accurate tests, and to determine the economic impact and the prevalence of the disease in the state, the Pennsylvania Department of Agriculture has funded a three-year study at the University of Pennsylvania's School of Veterinary Medicine, New Bolton Center. The grant was made possible through the efforts of the Pennsylvania Grange, an organization concerned about the impact and spread of John's disease. The research team is headed by Dr. Robert H. Whitlock, professor of medicine at the School. The other researchers are Dr. John P. Fetrow, Dr. Lawrence T. Glickman, Dr. Charles E. Benson, Dr. Helen Acland, and Mr. James Bruce, Ms. Bobbie Cook and Mr. Sam Schotzberger, research technical assistants. Also part of the team are Drs. Terry Wilson, Larry Hutchinson, Chris Rossiter and Sharon Harmon, all from Pennsylvania State University. Dr. Richard Merkel, NADC, Ames, Iowa, is a collaborator as are Drs. John Dick, David Kriebel and Max Van Buskirk of the Bureau of Animal Industry, Harrisburg, Pennsylvania.

John's disease, a wasting disease, is characterized by severe diarrhea and rapid weight loss in

the later stages of infection. Many of the infected animals develop mastitis and other secondary diseases. The economic loss due to John's may be greater due to these secondary diseases, including infertility, than to the obvious loss associated with muscle wasting and diarrhea. John's disease is seen in all ruminants (it is especially common in goats) and it has spread worldwide, causing staggering losses to the livestock industry, particularly in third world countries.

Often a farmer is not aware that his herd is infected. Usually only one or two cattle exhibit the symptoms of diarrhea and weight loss at any one time. And as these signs can be caused by other illnesses, John's disease is not looked for at first, primarily because farmers are unaware of the disease. Frequently the unproductive animals are culled and sold for slaughter. Then, later a few more animals in the herd may display the same symptoms. John's disease, once in a herd, is hard to eliminate. It has been found that infectious bacilli are shed by a cow for six to eighteen months prior to the appearance of any symptoms; pastures become contaminated and other cattle are exposed to the bacilli. Once the infection becomes well established and symptoms appear,

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granulomas have developed in the animal's intestine interfering with the absorption of protein and other nutrients and, even though the cow consumes its normal ration, weight loss occurs and this causes lowered milk production, a greater susceptibility to disease and frequent infertility.

Researchers found that the greatest risk of infection is to newborn calves and animals under one year of age. Such cattle may become infected at birth or shortly thereafter, but the symptoms will not appear for two to eight years. It has been found that animals over one year of age are more resistant to the organism. It is recommended that all calves be removed from their dam immediately after birth and that they not be permitted to suckle. Her udder may be contaminated with the bacilli which are on the stable floor and in the pasture. The calves should be given colostrum from cows free of John's disease, or pasteurized colostrum. The calves should be raised in individual huts, away from the herd to minimize the chance of exposure to the disease.

The diagnosis of John's disease is made more difficult because it takes four to six months to obtain a positive fecal culture. Currently the state laboratory here in Pennsylvania has a backlog of more than one year for these cultures. The School is planning to offer to do these cultures on a fee basis during the next few months. There are some serologic tests for the disease but these are not totally reliable. One objective of the study is to determine which test is the most accurate. Serologic tests are much faster than the fecal culture and an accurate test would enable the farmer to remove a diseased animal at once.

Herd owners who have John's disease in their cattle may elect to enter a voluntary program with the state. The owners sign a memorandum of understanding which outlines that any cow identified as positive on a fecal culture must be sent to slaughter. If the cow is appraised by a state veterinarian, the farmer may receive an indemnity amounting to 90 percent of the difference between the appraised value and the price he received for meat. The farmer must also agree to continue culturing the adult cattle yearly and to disinfect the area where the positive animals were housed.



A vaccine has been developed against Johne's disease, but its use is restricted to herds where the disease has been diagnosed. It can only be given by a state veterinarian and it is effective only if calves are vaccinated prior to 35 days of age. Data indicate that the vaccine is effective in reducing the incidence or delaying the onset of clinical signs of the infection. Some of the vaccinated animals have been found to have infected intestines and they shed the organism, though they appear to be clinically normal. Also, a lump often forms at the injection site. This can break open and drain and is slow to heal. The vaccine is oil based and veterinarians who accidentally injected one of their fingers developed a chronic infection and the finger had to be amputated.

Once a calf is vaccinated it can test positive not only for Johne's disease but also for tuberculosis. Cattle must be specially identified as vaccinated and a special test for tuberculosis must be done to rule out that disease.

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Aside from vaccination and separation of the calf from the cow soon after birth there are other measures that can be taken to reduce the spread of the disease. Cattle should be fed from a trough or bunk so that feed cannot be contaminated by manure. Water should be provided from tanks or tubs in the pasture, not ponds or streams which

can become contaminated with manure. Barns should be kept clean and the manure collected in the stable should not be spread on pasture land used for grazing; it can be safely spread on cropland. The herd should be cultured frequently (recommended twice per year) and any infected animals should be removed at once. The bacillus is very resistant and can survive in the ground for years making it very difficult to eliminate from a property. However, it is not known how often animals become infected by grazing from contaminated pastures.

The study which began in September 1983 is a big undertaking. During the first phase the researchers will obtain fecal, tissue and blood samples from 1,500 randomly selected cattle brought to slaughter at a slaughterhouse in Wyalusing, Pennsylvania. This facility was chosen because it handles 10 percent of all the United States cull cows, which mostly originate from the northeastern states and Canada. The samples will be studied at New Bolton Center and at University Park; cultures will be done, tissue studies and serologic tests will also be performed on each sample. To get an idea of the scale of the project, there will be 9,000 slides alone for the histology work, 6,000 separate serologic tests will be done, 4,500 cultures and 4,500 tissue samples will be prepared. The results from the serologic tests then will be compared to those from the fecal cultures and it is hoped that this will assist in determining which of the serologic tests is the most accurate.

In addition to these initial laboratory studies, owners of approximately 500 cows from Pennsylvania which were included in the sample will be traced with the help of the Bureau of Animal Industry. These owners will receive a questionnaire, regardless of whether the animal was positive or negative for the disease. It is hoped that owners will cooperate and answer accurately the questions as this information is very important to determine the economic effect of Johne's disease and to gather the factors that contribute to its spread and survival. If a cow is found to be positive, the owner will be informed by the Bureau of Animal Industry. The Bureau will also recommend steps to prevent the spread of the disease in the herd. The finding of a positive Johne's cow at slaughter will *not* affect the eligibility for health charts for other cows from the herd since the positive animal has been removed.

The second phase of the study will be initiated in May 1984. Here researchers will select at random twenty to thirty dairy herds in the state and obtain detailed information such as production and health records. They will also obtain fecal cultures and blood samples on each animal over six months of age on the farm. It is hoped that this phase of the study will provide information about economic losses on a herd basis, and that the incidence of the disease can be discovered. The group hopes to test two to three herds a month. Owners will have to agree to participate and as Johne's disease is a reportable disease, some may have second thoughts.

As the disease is making inroads into Pennsylvania dairy herds, it is hoped that the farmers will cooperate because the information is needed to study the incidence and to determine the economic losses.

The study will also provide information about alternatives to the lengthy fecal culture diagnosis. If a quick serologic test can be found, it will be of great help to the dairyman. Once it is determined where we stand with Johne's disease, we will be much closer to controlling its spread and reducing the losses to Pennsylvania's dairy industry. *Helma Weeks*