Tuberculosis in Cattle

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Cattle tuberculosis has affected animal and human health throughout history. Once the most prevalent infectious diseases in cattle and swine in the US, tuberculosis has all but been eradicated in livestock populations. The reactor rate in cattle was reported to be less than 0.02% in 1995 and most states now have "TB-accredited free" status. This is very important because cattle serve as a reservoir for bovine tuberculosis in humans. The main reservoir of *M. bovis* infections in cattle is infected cattle. These infected cattle may also serve as the source of infection for man. Man usually contacts the infections by eating the *M. bovis* bacteria in raw milk and milk products. This is still another reason why dairy workers should not be permitted to take bulk milk from the dairy to their homes for personal use. Controlling tuberculosis in livestock is the most effective way to preventing human infections.

In the past few years, this disease has suddenly emerged in cattle and deer in Michigan. This emergence is thought to be due to humans feeding deer resulting in large congregations of deer in small areas. As the disease spread due to close contact between deer, infected deer transmitted the disease to dairy cattle. In the last few weeks, bovine tuberculosis has been found in the tissues of market cows from a large California dairy herd. Finding tuberculosis in cattle has resulted in the loss of accredited TB-free status for these two states.

Tuberculosis in cattle like Johne's Disease is a chronic disease that usually takes many months to year before the development of clinically evident infections. Most infected cattle only become clinically infected at advanced age. Many infected cattle are only detected when adults in prime body condition are found to be seriously infected at slaughter.

The primary cause of tuberculosis in cattle is the bacteria *Mycobacterium bovis (M. bovis)*. This bacterium is in the same family with Johnes Disease and Leprosy. Adult cattle are usually infected by inhaling invisible droplets containing the bacteria into their lungs while pre-weaned calves are more often infected by drinking contaminated milk. The route of entry will ultimately determine the clinical signs of the disease.

Since the bacterium is usually inhaled into the lungs in adult cows, the most common clinical signs are related to pulmonary tuberculosis. Once the bacteria enter the lungs, they begin to multiply and generally spread to the lymph nodes near the lungs. At this primary site of infection, the lesions can remain quietly inactive or develop further depending on the ability of the cow to fight off the infection. When the immune system of the cow is fully activated, the infection may remain limited to the lungs and could go

undetected for the productive life of the cow. If the infection over-powers the body defenses, the bacteria may be carried to other locations in the body in the lymph or blood circulation. New areas of infection often occur in the lungs, kidneys, liver, spleen and the lymph nodes associated with these organs. In cases allowed to progress over an extended period of time, lesions may be present in the uterus or mammary gland.

When calves are exposed to the tuberculosis bacteria in the milk, the most common lesions are noted in the lymph nodes at the junction of the neck and head around the throat. The main sign may be swelling of these nodes. The primary lesions in calves, however, are most frequently located in the lymph nodes along the intestinal tract.

Other species of Mycobacterium may complicate the diagnosis of tuberculosis in cattle caused by *M. bovis*, but cattle are resistant to these infections and they rarely cause infections with clinical signs. *Mycobacterium avium*, causing infection by ingestion and lesions in the intestinal tract of adult cows, and *Mycobacterium tuberculosis*, the main cause of human tuberculosis, are two of these species. They cause the cattle to be sensitive to tuberculin testing and give false positive reactions when tests are being conducted to find cows with *M. bovis* infections. These other bacteria are more important as causes of infection in swine, sheep, goats and humans.

Live infected cattle are diagnosed as being infected with *M. bovis* with the tuberculin test. The appropriate tuberculin is purified protein derivative (PPD) as it is specific and not costly to produce. In the US, the tuberculin is injected into the caudal fold of the tail near the tail head by a federally accredited veterinarian. A 0.1 ml dose of PPD is injected intradermally. Infected cows will have an allergic type reaction to the PPD at the injection site. The test is read in 72 hours by palpating the injection site for the allergic swelling. When sufficient swelling is found to indicate infection with mycobacteria, follow-up testing is usually performed by state officials to determine that the swelling is due to *M. bovis* and not a different type of mycobacterium.

Nationwide there is active surveillance at slaughter plants. State and federal meat inspectors check the lymph glands and other organs of each cow for signs of tuberculosis. When any signs suspicious of tuberculosis are found, tissues are collected and sent to the National Veterinary Services Laboratories for confirmation. If bovine tuberculosis is confirmed, trace-back studies are performed to find the herd of origin. The most effective means of control in a tuberculosis herd is to depopulate the entire herd and compensate the owners. Otherwise the herd will be quarantined and tested repeatedly until all evidence of infections is eliminated.

For a state to be accredited free of bovine tuberculosis, there must be no confirmed cases of tuberculosis for at least 5 years. Any time a positive case is found, the state will loss its accredited free status and that will impact livestock producers ability to export cattle from that state. Livestock owners may also achieve accredited tuberculosis status for their individual herds.

In summary, bovine tuberculosis is still present in livestock within the US despite many years of concentrated effort to completely eradicate it. As clearly demonstrated by its emergence in the deer of Michigan, it also exits in wild and exotic animals. Cattle populations are increasingly mobile both with the US borders and entering from other countries. Therefore, vigilance must be maintained to keep control over bovine tuberculosis even though the threat may be minimal to livestock and humans.

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