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Swine Tuberculosis

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Millions of dollars are lost annually by American farmers and the meat packing industry because meat from a large number of slaughtered pigs cannot be sold as roasts, chops or hams. Instead many carcasses must be cooked prior to processing or they may even be condemned. The culprit: swine tuberculosis.

Researchers at the University of Pennsylvania, New Bolton Center, found that the disease, called swine tuberculosis, is minimally contagious in swine herds. "Swine tuberculosis has great economic impact," said Dr. Robert H. Whitlock, professor of medicine at the School of Veterinary Medicine, University of Pennsylvania. "Actually what is called swine tuberculosis is not a tuberculosis in the traditional sense. Instead, these animals have lesions caused by *Mycobacterium avium*, an organism which causes tuberculosis in poultry and wild birds. The swine are healthy and show no clinical signs of disease. When the animals are slaughtered the meat inspector finds the lesions."

M. avium infection is swine causes lesions indistinguishable from those caused by *M. tuberculosis* (TB in humans) or *M. bovis* (TB in cattle). Swine are susceptible to all three infections and, if they contract the latter two, will often show clinical signs of disease.

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Dr. Whitlock explained that tuberculosis lesions caused by *M. avium* in swine are not infectious to humans in general, though there may be some danger to individuals with a compromised immune system. AIDS patients often have mycobacterial infections as complications of the primary disease. "On gross examination the lesions of swine TB cannot be distinguished from those caused by, for example, *M. tuberculosis*. Therefore caution is necessary. The meat is cooked if lesions are found in two body cavities. This, unfortunately, reduces the value of the carcass by 50 percent. If lesions are found in three body cavities, the meat is condemned, causing a total loss."

Pennsylvania is among the top three states with losses due to swine TB. It was found by a Bureau of Animal Industry (Pennsylvania Department of Agriculture) investigation that the most frequent agent causing the infection in this state was *M. avium* serotype 4. Mycobacterial agents in many forms are present in the environment and there are many serotypes of *M. avium*. The organisms are very resistant to temperature changes and can survive a long time in soil, water and bedding.

Researchers at the School received support from the Pennsylvania Fair Fund (Grant #M-44) and the University made additional funds available to initiate a study to determine the age susceptibility of swine, the pathogenesis of infection in piglets, and whether the disease is spread by contact and whether it can be spread to offspring of infected sows.

Piglets in age groups four, eight, 12, 16 and 20 weeks were inoculated with *M. avium* sero-



An experimental swine TB lesion

type 4. A control group of pigs of the same age was also kept. These were not infected. The two groups were kept apart for four weeks and then allowed to mingle. Blood samples were taken from both groups at regular intervals and the animals received the intradermal skin test for TB. The pigs were slaughtered at market weight (about 230 pounds). At time of slaughter blood was drawn for an ELISA test.

***M. avium* infection in swine causes lesions indistinguishable from those caused by *M. tuberculosis* (TB in humans) or *M. bovis* (TB in cattle).**

Researchers found that the pigs inoculated with *M. avium* showed a positive reading to the skin test six weeks after the infections. The control group did not show any positive results to the skin test. Positive readings for *M. avium* infection in the inoculated animals occurred in the ELISA test at about eight weeks after infection. The control group, which had mingled with the infected animals, did not show positive results of the skin test nor could the ELISA test detect any antibodies to *M. avium*.

After slaughter, the pigs were inspected for lesions. The most severe were found in pigs who had been infected at age eight weeks. The lesions were less serious in the animals infected at a later age. No lesions were found in the control group. The results of this portion of the research will be published in the *Journal of Comparative*



The swelling behind the ear denotes a positive skin test

Pathology. The serological results were published in the *U.S. Animal Health Proceedings*.

The researchers concluded that the spread of *M. avium* by contact is minimal. They then investigated whether the disease could be transmitted from dam to offspring. Sows of different ages were inoculated with *M. avium* and then

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bred. The animals and their offspring were examined after slaughter and it was found that the sows had very minimal lesions and that the piglets had none. "Farmers can buy older sows as breeders, even though the animal may test slightly positive on the skin test," said Dr. Whitlock. "The danger of transmitting the disease to the offspring is minimal."

Researchers then examined some herds with a high incidence of swine TB. It was found that these animals were kept on sawdust or bark shavings. Other researchers had discovered that this material frequently contains a high concentration of *M. avium*. "When the bedding material was removed for a new group of pigs the incidence of swine TB in that herd dropped to zero," Dr. Whitlock said.

He advocates the use of the ELISA test to determine whether swine are infected with *M. avium*. "This test is more accurate than the skin test. Unlike the skin test, it could provide indication that one is dealing with *M. avium* and not one of the more dangerous forms of mycobacterial infections. He also advises that farmers not use sawdust or woodshavings as bedding material in the farrow house or where young pigs are being raised. Further he recommends that facilities in which pigs are housed are regularly disinfected and that contact between pigs and poultry or wild birds be minimized.

Drs. Helen V. Acland, Robert Eckroade, Jeffrey I. Everitt, John Dick, Wes Wilcox and Robert H. Whitlock cooperated on this project.

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