Brucellosis
(Infectious Abortion)
in Swine

BY ADOLPH EICHHORN

FEWER SWINE than cattle get brucellosis, but on the other hand half the cases of undulant fever in human beings are due to infection with the swine organism; and the latter also causes a more severe disease in human beings than the cattle organism. Systematic eradication of swine brucellosis, then, is a matter of considerable importance in the public interest.

Following the epoch-making discovery by the Danish investigator, Bang, in 1896, that abortion in cattle may be induced by the micro-organism *Brucella abortus*, the disease, then called contagious abortion, was also found to be present in cattle in the United States. It was not until 1914, however, that a similar disease in swine was reported by Traum, who recovered from the aborted fetuses of a sow an organism similar to that causing abortions in cattle.

Subsequent investigations showed that the organism infecting swine was slightly different from the cattle type. A third type was recovered from goats affected with a similar disease. Therefore the generic name *Brucella* was given to these three closely related germs, the cattle species being called *Br. abortus*, the swine species, *Br. suis*, and the goat species, *Br. melitensis*. The medical term "brucellosis" has been given to the diseases in all animals caused by any and all of the three *Brucella* organisms. More popularly, the three diseases are known respectively as Bang’s disease, contagious abortion of swine, and Malta fever of goats.

From recent surveys brucellosis in swine appears to be much more

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restricted than brucellosis in cattle, the latter unquestionably being one of the most important diseases affecting the cattle industry. The swine disease, however, may become a very serious menace, not only to the swine industry but also to public health, as will be shown later, unless definite, systematic measures of control or eradication are instituted.

Since Traum's discovery of brucellosis in swine, investigations of the disease have been made by the Bureau of Animal Industry and other research institutions in the United States and foreign countries. In 1922 Schroeder showed that the swine species of the *Brucella* organism possesses greater virulence for guinea pigs than the bovine species of *Brucella*. Subsequent investigations conducted by Schroeder and Cotton, Buck, and others in the United States have shown that cattle thoroughly exposed to infected swine do not contract the disease and develop only a temporary reaction to the blood-agglutination test used to detect the presence of the disease.

While some investigators report that as many as 20 percent of all sows are infected, a more careful survey in Iowa showed that only 2.5 percent in that State reacted to the agglutination test. In other localities in the Middle West approximately the same percentage of infection in hogs as in Iowa, or a lower one, was found.

The disease is usually introduced into a herd through the purchase of an infected animal and may be spread through the ingestion by the animals of aborted fetuses and fetal membranes, as well as through contaminated food and drinking water. Infection through the skin and membranes of the eye might also occur in some instances. The possibility of transmission of the disease from cattle to swine through the eating of aborted cattle fetuses and membranes has been suggested, but experimental evidence shows that swine are extremely resistant to the bovine species of *Brucella*.

**LESIONS**

Following infection, the germs of the disease are usually present in the blood, through which they reach the lymph glands, spleen, udder, and bones, causing inflammatory conditions at the points of localization. In the male animals the infection frequently causes a severe destructive inflammation of the testicles and seminal vesicles, which results in a marked swelling of the testes and the epididymis—the tubes at the back of the testes—and may affect the general condition of the animal. Boars so affected are frequently defective in breeding capacity, and the infection may result in impotency if both testicles are affected.

As each fetus in the sow is enveloped in a separate membrane, it is not uncommon for some fetuses in a litter to be born fully developed, while others show that death occurred prior to the termination of pregnancy. Most often the fetuses die following the act of abortion, though mummified fetuses are not infrequent, especially when the fetus has died a considerable time before abortion took place. In cases of abortion, the membranes of the sow disclose
hemorrhages, and there is a grayish-brown exudate, or discharge similar to that observed in the disease in cattle.

Not infrequently the disease is associated with arthritis, resulting in suppuration (generation of pus) at a joint and erosion, or slow destruction of the cartilage. Abscess formations may be observed in the liver, spleen, and other parts of the body. The bones of the spinal column may become affected, and abscesses may develop which in advanced cases are enclosed in a capsule of connective tissue. These changes may become aggravated and result in deformity of the spine and impairment of locomotion.

SYMPTOMS

The symptoms are not unlike those occurring in cattle. (See Brucellosis of Cattle, p. 501.) A day before abortion, there is swelling of the udder and vulva, and milk makes its appearance in the teats. At times the sow shows illness prior to abortion, lying down a great deal of the time and at other times being restless and uneasy, and not infrequently develops a discharge from the vagina. There is rarely any discharge after abortion, except that when abortion occurs during the early stages of pregnancy there may be a dark-grayish discharge several days afterward. The expulsion of the fetus takes some time, and there is no indication of labor pains. The fetuses are expelled in the enveloping membranes and hence there is no retained placenta, or afterbirth, as is often the case in aborting cows. In some instances inflammation of the uterus follows, but usually the sow makes a rapid recovery. The sow usually comes in heat within a few days after abortion, but as a rule several negative breedings take place before she again becomes pregnant. Animals that have aborted once do not usually do so again. The time of the occurrence of abortion varies considerably and is unquestionably dependent on the time and the virulence of infection, but usually it takes place between the sixtieth and ninetieth days of pregnancy.

DIAGNOSIS

It is very essential to examine the boars carefully in all instances of abortion among swine. Diagnosis is made by isolating the \textit{Brucella} organism from the infected animals and also by the agglutination test. Since the organism grows readily on artificial culture media, its isolation is not difficult. The infection is most frequently found in the genitals of reacting boars and in the stomach contents of aborted fetuses. \textit{Br. suis} is often present in pure culture and may be readily identified by appropriate procedures.

Abortions caused by brucellosis should not be confused with abortions from other causes. Mechanical injuries to the sow, the presence of other infections, and vitamin or mineral deficiencies also may cause abortion. It is essential, therefore, to confirm the diagnosis by the isolation of the organism or by positive blood tests. The blood test is unquestionably the most readily available diagnostic method,
but it apparently is not as reliable as the test in cattle. Experiments to establish whether an antigen, or testing agent, produced from swine strains is more reliable than that prepared from bovine strains have not shown any advantage for the former, and therefore the antigen generally employed for testing is prepared from a bovine strain. Other biological tests have been used for the diagnosis of the disease in swine, but they have failed to show any superiority over the agglutination test, or even as much accuracy.

**PREVENTION AND CONTROL**

There is no specific drug or other chemical agent known for the cure of the infection. As in the case of bovine abortion, various remedies for the prevention and treatment of the disease are being exploited, but in all instances they have failed to show any merit. Attention must therefore be directed toward prevention of the disease. Where the infection is suspected, all animals should be subjected to the blood test. Like brucellosis in cattle, the disease in swine tends to be self-limiting. Animals that have aborted may become immune, or even if they should harbor the infection they carry their fetuses through the normal period of pregnancy. It is advisable, however, after the presence of the infection has been established, to eliminate all reacting animals and subject the rest of the herd to frequent blood tests until there is no evidence of a suspicious or reacting animal. This should be accompanied by adequate sanitary measures.

In its resistance to physical and chemical exposure, Brucella suis behaves like the organism of the bovine type. Thus, the article in this book dealing with the disease in cattle should be carefully studied and the sanitary measures recommended for its control should be applied to the elimination of the infection in swine.

While calfhood vaccination for the control of the disease in cattle has given very encouraging results, few experimental data are available on the immunization of swine. In isolated instances cultures prepared from strain 19, used in calf vaccination, have been employed for immunization in swine, but no data are available as to their efficacy. Experimental work is still in progress.

**PUBLIC HEALTH HAZARD**

From a public health standpoint, human infection with the swine type of Brucella is unquestionably more important than human infection with the bovine type. It is a recognized fact that Brucella melitensis, the goat type, induces the most severe type of undulant fever, the disease in human beings. Next in order is the swine type, and last, the bovine type. This fact has been established by isolating the various types of organisms from infected human

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2 Agglutination in dilutions of 1 to 50 or higher is indicative of infection, and agglutination of 1 to 25 should be considered suspicious. Not infrequently the agglutination test shows no reaction until after the animal has aborted. For details of the test and its interpretation, the reader is referred to Farmers' Bulletin 1871. Brucellosis of Cattle.
beings and observing the severity of the disease caused by each of the three species. It has been estimated by Public Health Service officials that about 50 percent of human infection is due to *Br. suis* and is the result of contact with infected swine on farms or in abattoirs. The frequent occurrence of the disease in human beings in swine-raising localities is indicative of the danger, and the disease often occurs among workers in packing houses as a result of handling carcasses of infected swine. Studies have shown that in the Corn Belt more than half the cases of undulant fever are caused by the swine type and that in regions where the infection in hogs is not common this type of infection in man is less frequent.