X-DISEASE (Hyperkeratosis) OF CATTLE IN ILLINOIS

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SINCE 1941 A DISEASE OF CATTLE which is causing concern to many people in the livestock industry has been recognized with increasing frequency in the United States. It was first recognized in southwestern New York. Later, three similar outbreaks occurred in eastern New York along the Hudson river. During the next few years it was diagnosed in several more herds in various parts of that state.

First recognized case of X-disease in Illinois, in a dairy heifer. Notice poor condition and wrinkling of the thickened skin on its neck. (Fig. 1)
Animals taken to the New York State Veterinary College for study were depressed and emaciated. Their skins were dry and hard and they had raised, plaquelike areas or growths around their muzzles and in their mouths. Body temperatures were normal. Attempts to transmit the disease to healthy animals failed. The disease was reported in the annual reports of the college (1942-1945) as “The Undiagnosed Cattle Disease of New York State.” Since the cause of the disease remained unknown, veterinarians began to refer to it as “X-disease.”

X-disease was next reported from Texas in 1946, then from the southeastern states. To date it has apparently been recognized in at least thirty-seven states. The first comprehensive description of the body changes caused by the disease was published in 1947 when the name “hyperkeratosis” was applied because of the thickening of the skin and some of the mucous membranes. “Hyper” means excessive and “keratosis” means an overgrowth of the outer layer of the skin.

**CAUSE NOT KNOWN**

The cause of X-disease is still unknown. Although there is little evidence that it is caused by an infection, this possibility has not been eliminated. Attempts have been made to correlate its occurrence with certain soil types, soil-fertilization practices, use of certain insecticides or fungicides, feeding of rare minerals, or the eating of poisonous plants, but so far without success.

The notion that DDT, benzene hexachloride, or chlordane is involved can hardly be accepted, since X-disease appeared before these insecticides came into general use and since these chemicals (especially DDT) have been widely used on many animals over extended periods without causing keratosis. Furthermore chemical analysis of appropriate tissues from six cases of X-disease in Alabama failed to show evidence of the presence of DDT. Many veterinarians and other workers in the field of animal science, however, are still of the opinion that this disease is caused by some toxic agent in the feed or environment. Other workers emphasize the possibility of some disturbance of nutrition.

**X-DISEASE IN ILLINOIS**

The first case of X-disease recognized in Illinois was seen in January, 1948 (Fig. 1). During that year members of the staff of the University of Illinois College of Veterinary Medicine found the disease in animals from twelve herds. Additional cases from different parts of the state continue to be brought to our attention. Since this disease was recognized in Illinois, a re-examination of earlier
This animal, observed in 1941, may have had X-disease, for the skin condition is apparently typical of X-disease without loss of hair. (Fig. 2)

written and photographic records indicates that it may have been present in the state as early as 1941 (Fig. 2).

The number of animals which become sick in a herd is quite variable. An occasional herd may be so severely affected that it appears advisable to kill the sick animals and sell the healthy ones, preferably for slaughter. On the other hand, only a few animals may be affected in a herd of 40 or more.

No accurate information on incidence of (percent of animals affected) and death rate from X-disease in Illinois is available, but a survey made in twenty counties in the southern and eastern states may give some indication. It was found that in twenty-six affected

This steer shows common symptoms of the disease: watering of the eyes and blinking, suggesting increased sensitivity to light, and keratosis accompanied by loss of hair. (Fig. 3)
herds, which normally contained 4,120 head of cattle, 31 percent of the animals were affected and 59 percent of those affected died. The incidence was highest among animals 6 to 12 months old. The death rate was highest in young calves (sometimes as high as 75 to 80 percent in calves less than 6 months old) and declined with age, being lowest in adult cattle (10 to 35 percent, depending on the severity of the outbreak).

The disease, whether fatal or not, may last from a few weeks to several months.

SYMPTOMS OF X-DISEASE

The symptoms generally observed are watery discharge from eyes and nose, poor appetite, loss of flesh, salivation or drooling, depression, progressive thickening of the skin (keratosis) with or without loss of hair (Figs. 2 and 3), raised or thickened areas on the muzzle and in the mouth, weakness, and diarrhea.

Watery discharge from the eyes is often one of the first symptoms noticed and may become quite profuse (Fig. 3). The appetite is generally poor but may fluctuate somewhat. Loss of flesh may not occur but has been present in those of our cases which died.

In several outbreaks in highly conditioned beef animals there was loss of neither flesh nor appetite. In such cases the chief symptom has been that of keratosis. The reason for this modification is unknown. Whether it is due to variation in causative factor (or factors), in the animal’s resistance, or in both, is not clear. In a herd with this type of condition, usually only a few animals are affected. Of course, it may not be true X-disease.

An affected heifer, showing typical drooling and watering of the eyes resulting from infection. (Fig. 4)
Mouth changes in a steer with the disease: on the inside of the cheek (A), the dental pad (B), and the upper lip (C). (Fig. 5)

Salivation or drooling (Fig. 4) is common though usually not profuse. In rare cases animals may die without showing skin changes, yet be affected internally. Diarrhea is not always present; when present, it may be intermittent. Pregnant cows may abort.

**INTERNAL CHANGES**

Most common internal changes (or lesions) are raised or wart-like areas in the mouth (Fig. 5), especially on the tongue, cheek, and dental pad. Ulcers may also occur (Fig. 6). The mouth changes in this animal the mouth changes included ulcers in the pharynx (A) and an abscess in the tongue (B). (Fig. 6)
X-disease caused the raised areas in this esophagus from a cow. (Fig. 7)

sometimes include abscesses of the tongue (Fig. 6) although these are probably due to the presence of bacteria and are not thought to be an essential part of the X-disease picture. Also raised areas or ulcers may be found in the esophagus (Fig. 7), true stomach, or both. Portions of the lining of the intestine may be reddened. The walls of the larger bile ducts may be thickened, and nodular or cystic swellings are often seen in the common and cystic bile ducts (Fig. 8) and gall bladder. Nephritis (inflammation of the kidney), indicated by grayish-white streaks in the outer part of the kidney, may be present (Fig. 9).

Liver and gall bladder from an affected cow. Note the nodular to cystlike swellings within the common and cystic bile ducts. (Fig. 8)
In this kidney from a cow with X-disease, the grayish-white streaks in the outer zone indicate chronic inflammation (nephritis). (Fig. 9)

**PREVENTION AND TREATMENT**

As long as the cause of a disease is unknown, it is difficult and often impossible to prescribe practices which will prevent or control it. Recommendations for prevention of X-disease must therefore be general. They include good care and proper nutrition. Such things as irritating sprays or other chemicals or poisonous plants should be avoided. Treatment of affected animals should include these same points together with treatment by a veterinarian aimed at alleviating and reducing the symptoms by stimulating the appetite, softening the skin, etc.

**MORE INFORMATION NEEDED**

More information about X-disease is needed. With it more effective preventive measures can be devised. At the same time, rational and more effective methods of treatment, aimed at getting rid of the cause, may be developed. Also with more information a more specific name can be applied.

Illinois stockmen are urged to report all suspected cases of X-disease to their veterinarians and to encourage them to contact regulatory and laboratory workers interested in this disease in order that they may accumulate pertinent clinical information on the disease. Information of this type may someday lead to an explanation of the "X" in X-disease.
QUESTIONS AND ANSWERS ON X-DISEASE

Cattle of what age are affected by this disease?
Animals of any age may be affected although most of them are under two years old.

Is X-disease a seasonal disease?
It has been considered chiefly a disease of the winter months, but losses may occur during any season of the year.

Is there more than one form of the disease?
Yes. The chronic form of the disease is more common. It develops slowly. A more acute form is occasionally seen in calves and in cows immediately after freshening.

Is any type or breed of cattle more susceptible than others?
We know of no evidence that type or breed of cattle makes any difference in susceptibility to X-disease.

Can X-disease be confused with other diseases of cattle?
Yes. Mange, ringworm, or sensitization to sunlight may resemble the skin changes caused by this disease. Malignant catarrhal fever, vesicular stomatitis, and necrotic stomatitis may be confused with this disease, as may debilitating diseases such as tuberculosis, Johne's disease, and infestation with internal parasites. Virus diarrhea, another recently recognized disease of cattle, has been confused with X-disease. Virus diarrhea, however, is an acute disease characterized by a high temperature, short course, ulceration (rather than thickening) of the mucous membrane of the upper digestive tract, absence of skin changes, and a low death rate.

Should affected cattle be separated from healthy animals?
It is not known whether this practice will influence the spread of X-disease. However, it is always a good practice to separate healthy from diseased animals on the assumption that the disease may be contagious, especially until a diagnosis can be made and the danger of contagion determined.

Should any treatment be administered to the affected animals?
Various treatments have been used on cattle suffering from X-disease without satisfactory results; however, treatment aimed at alleviating the symptoms may be helpful.