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## Preliminary Observations on a Cattle Disease Frequently Occurring in Iowa

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38. *Amarantus retroflexus*.
39. *Amarantus albus*.
40. *Amarantus blitoides*.
41. *Chenopodium album* (without utricule).
42. *Polygonum persicaria*.
43. *Polygonum hydropiper*.
44. *Polygonum aviculare*.
45. *Polygonum acre*.
46. *Polygonum convolvulus*.
47. *Rumex acetosella*.
48. *Anthemis cotula*.
49. *Ambrosia artemisiifolia* (with utricule).
50. *Rumex crispus*.
51. *Ambrosia artemisiifolia* (naked).
52. *Verbenia bracteosa*.
53. *Chrysanthemum leucanthemum*.
54. *Polygonum convolvulus* (enlarged three times).
55. *Ambrosia artemisiifolia* (enlarged, with involuere).

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PRELIMINARY OBSERVATIONS ON A CATTLE DISEASE FREQUENTLY  
OCCURRING IN IOWA.

BY W. B. NILES.

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This disease is called hydrophobia by the people at large in a majority of cases. By veterinarians it is diagnosed as rabies, cerebro-meningitis, enteritis and impaction of the third stomach.

As regards its distribution, it may be said to occur most frequently north of a line drawn east and west separating the State into halves. In the extreme southern part cases are rarely reported.

*Nature, Symptoms and Course of the Disease.*—In some outbreaks the cattle are reported to have been bitten by a dog, but seldom has the owner been able to positively say that such is the case. In a majority of cases no dog is mentioned in connection with them, and no strangely acting dog has been reported in the neighborhood.

In all outbreaks the disease runs a lingering course in the herd. Several cases occur and the time elapsing between the first and last case extends over several weeks; in some outbreaks over five or six months. The symptoms observed in the different outbreaks are very uniform. So uniform that it is easy in most instances to recognize the trouble from descriptions written by the owner of the cattle.

At first the animal appears uneasy, is alert, taking more notice than common of everything taking place about it, is very attentive if a strange man or dog appears, and a slight switching of the tail is often observed. The eyes soon become staring and wild, and eventually reddened. The animal early refuses food and drink, and as a consequence becomes very gaunt in appearance. Early in the course of the

disease saliva dribbles from the mouth and continues to a greater or less extent until death occurs. Soon after the appearance of the first symptoms the animal begins to bellow or low very much like an animal lost from its fellows. This is continued with intermissions of quiet until the animal dies, and is the most characteristic feature of the disease. Some become quite "mad" or furious and chase anything that comes in their way, man as well as beast; many have been reported to me as having chased their attendants, and I have myself been charged at by a steer which at first sight appeared to be inoffensive. At other times the sick animal has a desire to follow one about—to start after and follow other cattle in the herd without any desire to injure them. Within a short time after the first symptoms appear the animal shows weakness in the hind limbs with a tendency to knuckle over at the fetlocks. This is also often seen in the fore extremities, and as the disease advances becomes more marked until in some cases the animal will when trotting along suddenly go down by first going over on the fetlocks and then down on the knees, chest and abdomen. The animal will get up perhaps to repeat the act again shortly. This, I think, is due to a loss of the co-ordination powers more than to weakness. In many cases during the trouble severe straining occurs, as if the animal were trying to pass dry fæces. Nothing except a small quantity of dark fæces is passed however.

Death occurs in from four to eight days, most cases living about one week. The disease is uniformly fatal. I have yet to hear of the first recovery. In some outbreaks about fifty per cent of the cattle become affected. In a majority of cases, however, the loss is not above ten per cent.

Post mortem examination shows almost uniformly an absence of what are usually called fatal lesions. The liver, spleen, kidney, heart and intestinal tract are usually normal. In a few cases I have found the folds of the abomasum reddened and cedematous, and again the capsule of the kidney has been observed in some cases to detach easily, and on sections of the organ a congested condition of the vessels have been noted, together with several small calculi in the pelvis. The blood, if at all changed from normal, is lighter in color and clots more quickly. The brain and surrounding membranes show the greatest change. On incising the dura mater there is usually an escape of considerable clear serum. On removal of the dura an intense black color of the pia mater covering a large part of the organ is sometimes observed. At other times this dark color is not so marked, and is confined to the anterior portion of the cerebral lobes. A small piece of the membrane placed under the microscope shows the dark color to be due to a great number of minute dark bodies resembling micrococci, situated on the underside of the pia mater. (This black condition I have found in apparently healthy animals slaughtered for food, but present only to a slight extent.) The vessels of the brain are much congested, especially those of the choroid plexus, and those in the region of the fourth ventricle. This condition is even well marked after the animal has been destroyed by bleeding. A section of the organ shows no apparent change in the brain tissue.

What is the disease and what is its cause? Is it rabies, communicated to cattle by the bite of some rabid animal, or is it something very similar to it, contracted in some other way? These are questions not easily answered. It must be admitted that the symptoms are very much like those shown by rabid cattle, yet, when we observe that hydrophobia in man is very rarely met with; that but few rabid dogs are seen; that the disease seems to be a *cattle* disease, and that it ex-

tends over such a long period of time and rarely exists on but one farm in a neighborhood, we are loth to accept the diagnosis of rabies.

Thinking it was possibly a bacterial disease, I have made quite a thorough bacteriological study of the trouble. I have made cultures from the liver, spleen, kidneys, blood, brain substance and brain serum. Some of them have been made in the field and others in the laboratory from tissues carefully removed for that purpose. For culture media, agar-agar, nutrient gelatine, blood serum, bouillon and potato have been used.

Culture tubes inoculated from the spleen, liver, blood and kidneys often remain sterile. In some instances organisms have been obtained from these organs, but no one of these has been met with in a majority of the cases examined. From the brain and brain serum, several chromogenic varieties have been isolated, some of which have been obtained from more than one animal. Rabbits and calves have been inoculated with bouillon cultures of those organizing with negative results.

An organism not chromogenic has appeared in one or more of the culture tubes from four different outbreaks. It has been obtained from the brain, spleen and liver. From its frequency of occurrence it would seem possible that it may have a casual relation to the trouble. Rabbits, calves and one dog have been inoculated subcutaneously and intravenously with bouillon cultures with negative results, and no organism so far observed has proven pathogenic.

The organism last referred to is a micrococcus, considerably larger than the most micrococci. In agar-agar stab-culture it develops slightly along the track of the needle and extends slowly over the surface, forming a raised, soft, tenacious mass. At first white, the growth gradually becomes dirty white or cream colored, bordering on brown. On blood serum the growth does not form a circular confluent mass, but development occurs on the surface in lines extending in different directions from the seat of puncture. It grows better in bouillon than in solid media, and does not produce gas in ordinary media. In bouillon no film forms on the surface, but a sediment forms at the bottom of the flask which in time becomes quite abundant. It grows at the ordinary room temperature, but faster in thermostat at about 37°. In agar-agar I have observed in a few instances individual colonies develop along the track of needle, which eventually became very dark colored, almost black.

Recently an outbreak of the disease near Greene, Iowa, furnished some material for more experiments, and with the assistance of Drs. Moore and Kilborne from the Bureau of Animal Industry, a yearling heifer was inoculated under the dura mater—a piece of bone having first been removed with a trephine—with an emulsion of brain matter from an animal which died from the effects of the disease. On the nineteenth day after the inoculation the inoculated animal began showing symptoms similar to those described heretofore. Death occurred on the sixth day after the first symptoms were observed. A post mortem examination showed much the same conditions met with in regular outbreaks. Before the death of the animal, saliva was collected and a rabbit inoculated inside the thigh under the skin. This rabbit died in nine days. Inoculations have been made from both the calf and rabbit brains, and it is hoped we will now be in a position to say whether the disease is rabies or something else.