A preliminary report on some diseases of chickens

Howard Jay Milks

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A Preliminary Report

ON SOME

DISEASES OF CHICKENS

BY

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SOME DISEASES OF CHICKENS

ENTERO-HEPATITIS OF CHICKENS

BY H. J. MILKS, D. V. M.

This disease has been known as fatal to turkeys for many years. It is characterized by thickening of the walls of the ceca or "blind intestines" and areas of degeneration in the liver.

Cause—In 1896 Dr. Theobald Smith described a micro-organism belonging to the protozoa as the cause of the disease and named it *Amoeba Meleagrides*. He found the parasite in 13 out of 18 cases examined. These parasites were circular, homogeneous bodies with sharply defined borders; within these, and a little to one side of the center, was a group of granular bodies of a nuclear structure. They varied in size from 8 to 14 twenty-five-thousandths of an inch in diameter. Recently, several investigators have announced that the disease is really caused by a coccidium, but so far the writer has been unable to find a description of that organism.

Experiments show that the disease may be transmitted from one animal to another without the intervention of any intermediate host. The natural way of transmission probably is by the parasite passing out with the droppings of an affected bird and being taken up with the food and water of another.

History and Distribution—The disease was found in Rhode Island in 1894. More recently, Chester, of the Delaware Station, reported a similar disease of chickens. Indications are that it is quite widely distributed in certain of the New England States and in some of the Middle and Western States. It has not yet been reported from the South, though doubtless this is due to lack of investigation.

THE DISEASE IN CHICKENS.

In Louisiana the disease among chickens is evidently quite common. The writer has seen it in four quite widely-separated localities. The disease is confined almost entirely to young
chicks. The writer has never seen it in birds more than six weeks old, and it is the general impression of owners that there will be no trouble with birds after six weeks to two months old.

The course of the disease is quite rapid, and the mortality, from thirty to fifty per cent of those hatched. The observations given in this bulletin are based upon the examination of seventeen chicks.

Symptoms—There were no well-marked symptoms peculiar to this disease. In some cases death occurred during the night with no previous signs of sickness. In others there was dullness, stupor, and loss of appetite. Diarrhoea may, or may not, be present. Unless the course of the disease was very rapid, emaciation was marked. Usually the course of the disease was very rapid, lasting not more than a day or two after the appearance of the first symptom. Occasionally one would linger along for four or five days.

Post Mortem Appearances—By post mortem examination the disease was not hard to determine. The ceca, or two blind tubes opening into the intestine, were first attacked. These were very much enlarged and presented a grayish, roughened exterior. The walls were much thickened; mucosa necrotic or detached. They were generally filled with a hard coagulated material, yellowish in color and quite firm. Upon removal of the contents, they remained a cast of the organ.

If the course of the disease was not too rapid, secondary lesions were found in the liver. The areas of disease in this organ were generally circular in outline, though some were irregular and some confluent, grayish or yellowish-white in color. Some even showed a dark center with light periphery. These areas varied in size from one or two millimeters to as many centimeters in diameter. The coloration was not so brilliant, nor was the liver appreciably enlarged, as is the case with turkeys. Fig. 1 shows the diseased liver and ceca of a chick.

Other organs were usually normal, though there was occasionally congestion of the kidneys and spleen. The ureters were usually filled with white urates.

Microscopic examination of sections of the diseased ceca showed the walls much thickened. Purulent infiltration was marked throughout the mucosa and submucosa. Much of the
mucosa was usually detached; blood vessels congested. In the
mucosa and submucosa were many parasites occurring singly or
in groups. Occasionally they were found in the inner muscular
layer. The organisms were surrounded by a connective tissue
reticulum and seemed to take the place of normal tissue.
(Fig. 2.)

Sections of a diseased portion of the liver showed that in the
center of these areas the liver cells had almost entirely disap-
peared, their place being taken by the parasites in a reticulum
of connective tissue (Fig 3). The blood vessels were congested.
Giant cells, which are so numerous in the diseased organs of
turkeys, were almost lacking in the chick.

Description of the Organism Found in Chickens—This organ-
ism is undoubtedly closely related to, if not identical with, the
organism described by Smith.

In fresh preparations of scrapings from the walls of the ceca,
highly refractive bodies, finely granular, or homogeneous in
structure and circular in outline, were found. In stained prepa-
trations they do not take the ordinary amoeba stains well, but
do stain well with Mallory’s Chloride of Iron Hematoxylin.
With this preparation they stain quite evenly except for a num-er of vacuoles present. With Oliver’s modification of Wright’s
stain, they take the eosin well. Usually with this method, a
small pale blue nucleus was found a little to one side of the
center. It was found that if the preparation was made by
diluting the scrapings with water or normal salt solution and
allowing a small drop to dry on a clean cover, the organisms
were usually circular in outline, while, if smeared upon the
glass, they were irregular in shape. Fig 4 is from a micro-
photograph of one of these smears stained with Chloride of
Iron Hematoxylin.

In sections, the parasites appeared as circular bodies, staining
feebly. Within these, and a little to one side of the center, a
very small darker stained nucleus was usually seen. In the tis-
sues they were surrounded by a connective tissue reticulum and
with this appeared to take the place of normal tissue.

Size—In smear preparations their average size was 10.8
microns, while in sections it was from 6.8 to 12 microns in
diameter (average 8). No measurements were made of fresh
preparations.
A complete description of a typical case will be given. A summary of all the cases will be found in Table I.

**Case 1**—Plymouth Rock chick, about one week old, had been sick two or three days.

**Autopsy**—Respiratory system normal. Subcutaneous tissue and peritoneal cavity contained an abundant clear yellow fluid. Crop normal. Small intestines slightly congested along the pancreas. Both ceca much enlarged and hard, filled with a dry coagulum or exudate which, upon removal, remained a cast of the organ and had a tendency to take the mucosa with it. The right cecum grayish white and roughened externally. The left, smooth, dark in color and more normal in appearance.

In the liver extensive lesions were found; fully two-thirds being taken up with grayish white or yellowish areas. For the most part these were circular in outline, though some were irregular. In some places they consisted of a dark center with light periphery. They varied in size from one to two millimeters to as many centimeters in diameter. Fig. 1 is from a photograph of the liver and ceca of this chick.

**Microscopic Examination**—Ceca: Mucosa detached. Purulent infiltration throughout the section, especially marked in the mucosa and submucosa. Blood vessels congested. Many parasites were found in the mucosa and submucosa. These were surrounded by a reticulum of connective tissue. A few were seen in the inner muscular layer.

### Table I. Showing Summary of Examination of Chicks.

<table>
<thead>
<tr>
<th>No.</th>
<th>Source</th>
<th>Age</th>
<th>Diseased Ceca</th>
<th>Diseased Liver</th>
<th>Parasites in Ceca</th>
<th>Parasites in Liver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Baton Rouge</td>
<td>2-3 weeks</td>
<td>Both diseased</td>
<td>Slight</td>
<td>Normal</td>
<td>Numerous</td>
</tr>
<tr>
<td>2</td>
<td>Baton Rouge</td>
<td>2-3 weeks</td>
<td>Both diseased</td>
<td>Normal</td>
<td>Normal</td>
<td>Numerous</td>
</tr>
<tr>
<td>3</td>
<td>Exp. Farm</td>
<td>1 week</td>
<td>Both diseased</td>
<td>Normal</td>
<td>Normal</td>
<td>Fair</td>
</tr>
<tr>
<td>4</td>
<td>Baton Rouge</td>
<td>3 or 4 wks</td>
<td>Both diseased</td>
<td>Slight</td>
<td>Slight</td>
<td>Fair</td>
</tr>
<tr>
<td>5</td>
<td>Exp. Farm</td>
<td>1 week</td>
<td>Both diseased</td>
<td>Slight</td>
<td>Normal</td>
<td>Fair</td>
</tr>
<tr>
<td>6</td>
<td>Exp. Farm</td>
<td>1 week</td>
<td>Both diseased</td>
<td>Normal</td>
<td>Normal</td>
<td>Not examined</td>
</tr>
<tr>
<td>7</td>
<td>Geismar</td>
<td>1 week</td>
<td>Slight in right</td>
<td>Slight</td>
<td>Normal</td>
<td>Not examined</td>
</tr>
<tr>
<td>8</td>
<td>Geismar</td>
<td>4-5 days</td>
<td>Both</td>
<td>Slight</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td>9</td>
<td>Geismar</td>
<td>4-5 days</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td>10</td>
<td>Geismar</td>
<td>1 week</td>
<td>Slight</td>
<td>Normal</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td>11</td>
<td>Geismar</td>
<td>1 week</td>
<td>Slightly</td>
<td>Normal</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td>12</td>
<td>Geismar</td>
<td>1 week</td>
<td>Slightly</td>
<td>Normal</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td>13</td>
<td>Moreauville</td>
<td>3-5 days</td>
<td>Both</td>
<td>Extensive</td>
<td>Extensive</td>
<td>None</td>
</tr>
<tr>
<td>14</td>
<td>Moreauville</td>
<td>1 week</td>
<td>Both</td>
<td>Slight</td>
<td>Slight</td>
<td>None</td>
</tr>
<tr>
<td>15</td>
<td>Moreauville</td>
<td>2 weeks</td>
<td>Left slightly</td>
<td>Extensive</td>
<td>Extensive</td>
<td>None</td>
</tr>
<tr>
<td>16</td>
<td>Moreauville</td>
<td>2 weeks</td>
<td>Both</td>
<td>Extensive</td>
<td>Extensive</td>
<td>None</td>
</tr>
<tr>
<td>17</td>
<td>Exp. Farm</td>
<td>3-5 days</td>
<td>Right slightly</td>
<td>Moderate</td>
<td>Moderate</td>
<td>None</td>
</tr>
</tbody>
</table>
Treatment and Prevention—No work was done with regard to treatment and prevention of the disease. Feeling, however, that something should be said in this connection, the measures recommended in Circular No. 128 of the Bureau of Animal Industry will be given.

Treatment is not very satisfactory. An attempt might be made by the use of calomel, one-tenth of a grain, or a few drops of castor oil containing one or two drops of turpentine. Also 5 to 10 grains of iron sulphate should be dissolved in each gallon of drinking water.

The most successful method of combating this disease is prevention, and even this is not satisfactory. The eggs should be cleansed by wiping them thoroughly in 95% alcohol. If an incubator is used it should be wiped out with some antiseptic and exposed to the sun. The egg tray should be scalded. The floor of the nursery should be movable, so that it may be sterilized, and, if made of burlap, the old piece should be removed and a new one attached to the disinfected frame. The brooders should be cleansed in the same way. The soil to which the chicks have access should be well limed, dug up and exposed to the sun.

If natural incubation is practiced, the hen for a week or more before being set should be dosed with one-fourth to one-half grain of iron sulphate daily and an occasional purgative, such as one grain of calomel or one-half teaspoonful of castor oil to which has been added five or six drops of turpentine. The eggs, after treating as above, should be placed in a clean nest, which may be sprinkled occasionally with lime. After hatching, the hen with her chicks should be placed upon ground, treated as above, and moved frequently to new ground, treated in the same manner, and from which chickens have been debarred.

REFERENCES.


Moore—The Direct Transmission of Entero-Hepatitis of Turkeys, Cir. No. 5, Bureau of Animal Industry.

Moore—Pathology of Infectious Diseases of Animals.

A BACTERIAL DISEASE OF YOUNG CHICKS.

In the early part of January, 1907, our attention was called to a very fatal disease of young chickens. A few days later a few chicks were brought to the laboratory for diagnosis.

**History**—The owner of the affected flock had started in the poultry business several months previous on a rather extensive plan. His incubator capacity was so great that he was using eggs from every available source. During the previous few weeks about 1,500 chicks, or between 50 and 60 per cent, of these hatched. The chicks were given good attention. The feed and sanitary conditions were considered good. None of the neighbors had reported any trouble with their chickens.

The disease was entirely confined to young chicks under five or six weeks old.

**Symptoms**—The course of the disease was so rapid that many chicks died during the night without previously having shown any signs of illness. Others showed dullness and stupor. Diarrhoea was present in some cases. In these cases the appetite was impaired or entirely lost; weakness was often so marked that for several hours before death the bird would lie in a comatose condition.

**Post Mortem Appearances**—Post mortem appearances were not marked but, as a rule, quite uniform. The digestive tract was normal in nearly all cases; the liver constantly enlarged, dark in color and engorged in blood; gall bladder usually filled with dark bile and ureters with white or yellowish waters; lungs normal in all cases.

The heart was filled with blood; its external blood vessels usually congested. In one case grayish-white areas from one to two millimeters in diameter were upon its exterior.

**Microscopic Appearances:** Small Intestine—Section from a congested area showed marked inflammatory conditions. Blood vessels congested, numerous polymorphonuclear leucocytes were found in the mucusa and submucosa. Many were also present in the blood within the blood vessels and even passing through their walls.

A few of the cells of the mucusa showed degeneration, but no necrosis could be found.
Liver—This organ gave the most pronounced lesions. The blood vessels were much congested and the red blood cells were scattered throughout the section. So many red cells were present that they gave the appearance of crowding the rows of liver cells out of place. Some granular degeneration of the liver cells was also seen. These appearances were constant in all cases examined.

Bacteriology—Cultures were made from the liver and heart blood of the chicks. From four (4), pure cultures of bacillus coli were obtained; from six (6), a different organism was obtained. The bacteria were few in number, since they could only be found with difficulty in cover glass preparations, and agar-streak cultures from a loop of blood after 24 hours, usually gave separate colonies.

Technique—The ordinary bacteriological technique was used. The media was made from beef and rendered 1.5 acid to phenolphtalein. The buillon was rendered sugar-free with B. coli, then pepton and salt added. One per cent of the different sugars in sugar-freed bouillon was used to test the fermentative properties. The indol test was made in five-day cultures by the contact method. Gram’s stain was made from 24-hour-bouillon and agar cultures.

DESCRIPTION OF THE ORGANISM.

Morphology—Small rods with rounded ends 1.3—1.8×.5—.7 microns non-motile but with marked Brownian movement. It does not form spores. Usually it stains uniformly with the common dyes, though in some cases a polar stain is seen. It is decolorized by Gram’s method. It is aerobic and facultative—anaerobic; grows best at 37° C., and feebly at room temperature.

Cultural Characteristics: Bouillon—This medium becomes strongly uniformly-cloudy in 24 hours with a white sediment. The reaction remains alkaline throughout but becomes more alkaline after 10 to 14 days.

Agar—Raised, moist, regular growth. Pearly white by transmitted light; dull white or smoky by reflected light.

Gelatin—Is not liquified. The growth is feeble and regular along the middle tract, very slightly spreading on the surface.
Gelatin colonies are yellowish-white, circular with sharply defined edges, finely granular.

Potato—At first a whitish growth, later a yellowish moist growth. The potato is not affected. Often no growth appears on this medium.

Milk—This medium remains unchanged for about two weeks, then becomes more alkaline and is saponified. Boiling does not precipitate the caesin but acetic acid throws it down as a heavy white precipitate.

Litmus Milk—This reacts the same as milk except that the color becomes a deep blue.

Sugar-Free Bouillon—Same general appearance as bouillon. Indol is not produced.

Glucose Bouillon—The medium becomes acid with the production of gas.

Lactose Bouillon—No gas. Culture remains alkaline.
Saccharose Bouillon—No gas. Culture remains alkaline.
Levulose Bouillon—Reaction acid with production of gas.
Mannite Bouillon—Reaction acid with production of gas.

Thermal Death Point—Bouillon cultures resisted boiling for 15 minutes.

Effect of Disinfectants—One per cent of carbolic acid failed to prevent growth after 15 minutes; after 17 minutes no growth appeared. Two per cent carbolic acid prevented growth after 2½ minutes.

The method employed was to add 5 drops of a 24-hour bouillon culture to five cc. of the disinfectant. The mixture was well shaken and subcultures made in bouillon at intervals of 2½ minutes up to 17 minutes. The subcultures were incubated for 5 days at 37° C.

Pathogenesis: Chicks—One-fourth cc. of a 24-hour bouillon culture of the organism was introduced subcutaneously into two chicks. One died in 6 days without showing any signs of illness. The other was sick a few hours before death; was stupid and weak. No rise of temperature occurred; died in 21 days. The organism was recovered from both chicks.

Two other chicks were given milk to which a 24-hour bouillon culture of organism was added. They remained perfectly nor-
mal as far as could be determined. After 6 weeks they were killed and post mortemed. No evidence of disease was then found.

Mice—Mice were inoculated subcutaneously with $\frac{1}{4}$ cc. 24-hour bouillon culture. One died in 20 days with septicaemic lesions and the organism recovered from the liver. The other two survived and showed no effect of the inoculation except abscess formation at the point of inoculation.
FIG. 1.—Liver and ceca of chick, showing diseased conditions found in Entero-Hepatitis of chickens.
FIG. II.—Photomicrograph of diseased cecum of chick, showing the parasites.
FIG. III.—Section of diseased liver, showing the parasites.
FIG. IV.—Organisms found in smear preparations.