FOWL TYPHOID AND BACILLARY WHITE DIARRHŒA.

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During recent years both veterinary and medical science have thrown much light on poultry diseases, but only within the last two or three years have veterinary practitioners in South Africa taken an interest in the subject. Progress is especially marked in the United States, where the poultry industry has made rapid strides during the last decade. Veterinarians are the rightful guardians of the health of the nation’s live stock, and are best qualified to render service where diseases of poultry are concerned.

The object of this article is to describe two allied bacterial diseases which are assuming economic importance in this country, and in doing so to discuss briefly the findings of workers in other parts of the world.

FOWL TYPHOID.

Definition.—Fowl typhoid is an acute specific communicable disease, having the general characteristics of a septicaemia. It is caused by B. gallinarum.

Historical.—This disease, first described by Klein (1889) in Orpington, Kent, England, in 1888, under the name of infectious enteritis of fowls, is still known on the Continent as Klein’s disease. He isolated the causal organism which he named B. gallinarum. Later, Moore (1895) described an infectious disease of poultry in the United States. He gave a detailed description of the organism, and designated it Bacterium sanguinarium. According to Hadley (1918), there is very little doubt but that the organisms isolated by Klein and Moore were identical.

In South Africa the existence of fowl typhoid was bacteriologically established in 1924. Previous to this date it appears to have been confused with fowl cholera.† The writer has isolated and studied over thirty fowl typhoid strains from all Provinces of the Union, and not a single case of fowl cholera has been diagnosed.

Occurrence.—When this disease was first introduced into South Africa is not known, but its circle of distribution in the Union seems to widen each year, being at present one of our most destructive bacterial diseases. The mortality is generally very high, varying that it almost resembles a fowl cholera outbreak. Natural outbreaks in the Union have so far been confined to the common fowl, both from 15-85 per cent., and at times it assumes such a virulent form young and adult birds being affected. The organisms can be isolated in pure culture from the blood and all internal organs. The

* The diseases in question were recorded in South Africa for the first time in 1926 and 1927 respectively. Vide Jl. Dept. Agr., U. S. Africa, XII, 298, and Farming in S. Africa, I, 447.
† Spreull, of Capetown, has encountered outbreaks of fowl cholera in the Cape Province, especially in the Peninsula.
Substitute for last paragraph on page 77 the following:

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organisms are never plentiful in a stained blood-smear, but can easily be isolated from the circulation of a sick fowl during the fever reaction.

Symptoms.—The incubation period under experimental conditions varies from two to six days before a rise in temperature is noticed. There is generally a rapid onset of the disease and fowls die in quick succession until the malady has run its course. The sick birds show diminished appetite, increased thirst, and general dullness. The feathers are ruffled, especially round the neck, and the head is held close to the body. The wings often droop, the sick fowl sometimes stands with closed eyes, assuming a moping appearance, and regurgitating movements are frequently noticed. The droppings are of a greenish-yellow colour, and the feathers round the vent are often tinted with soft faeces. There is a high temperature, varying from 107.5 to 111.5° F. The comb is often cyanotic in appearance, due to the damming up of venous blood, on account of cardiac deficiency, but sometimes the comb, and especially the wattles, may be pale. Microscopic examination of the blood often shows a decrease of the erythrocytes and an increase of the leucocytes, especially the neutrophiles and large mononuclears.

Post-mortem Appearances.—Rigor mortis sets in immediately after death. On opening the abdominal cavity yellow or blood-stained fluid is frequently seen. The liver is the most constantly affected organ, being much enlarged, and the surface displaying irregular haemorrhages and yellow patches. In some cases it has a characteristic bronze-like tint. If the disease is of more than a week's duration, multiple necrotic foci are often seen in the liver and throughout the parenchyma, being discrete and sometimes very numerous. The liver on incision is soft and friable in consistence. The kidneys are generally slightly swollen, of a yellowish-brown colour, and often soft in consistence. The intestines are in a rule pale, but often a catarrhal condition prevails with isolated hyperaemic patches on the mucous membrane. The cloaca generally contains soft green faecal matter.

Bacteriology.—The organisms isolated and studied in the Union may be briefly described as irregular non-spore-forming non-motile rods. The colonies on plain agar somewhat resemble \textit{B. coli}, but grow less luxuriantly. On broth there is uniform cloudiness with flocculent sediment. Gelatin is not liquified, milk not coagulated, and indol not formed. Litmus milk is turned acid within 24 hours and becomes slowly alkaline from the third day onwards. On a carbohydrate medium, consisting of distilled water containing 2 per cent. peptone, 1 per cent. Andrade's indicator, and 1 per cent. of the test substance, incubated for 15 days gave the following results:—Arabinose, rhamnose, galactose, glucose, mannite, sorbit, maltose, xylose, dulcite, laevulose, mannose, and glycerol were all fermented without gas-production. Saccharose, dextrine, erythrite, inulin, raffinose, salicin, inosite, nutrose, and lactose were not attacked. All strains show group agglutination reaction with a local strain of \textit{B. typhosus} isolated by Dr. Pyper, and with \textit{B. pullorum}. Of a few strains injected into laboratory animals, rabbits succumbed in two to eight days, but guinea-pigs and pigeons (fed \textit{per os}) were refractory.
Differential Diagnosis.—Fowl typhoid should be differentiated from spirochaetosis, leucaemia, fowl cholera, coccidiosis, and a condition of heavy layers associated with ovarian disturbances and abnormal fatness.

Recommendations for Combating the Disease.—As sanitation is of primary importance in controlling epizootics in poultry, the following measures are advised:

1. Fowls should be penned off from the free range at the time of the outbreak in order to diminish the danger of spread.
2. All in-contact fowls should be segregated, the sick birds killed, and the carcasses, with those which have died from the disease, destroyed by burning.
3. The droppings should be collected daily and burned or sprayed with any of the standard disinfectants.
4. The walls, floors, and perches of the fowl-house should be sprayed with a pump-spray, using any efficient disinfectant.
5. Remove all shade-producing vegetation from the old runs and work in (1 to 2 inches deep) unslaked lime, and if possible allow them to remain unoccupied until after the winter.
6. Add $\frac{1}{2}$ teaspoonful of chloride of lime to every four gallons of drinking water.
7. All receptacles for food and water should be scalded with boiling water as long as the epizootic rages.
8. Spreading of the disease by sparrows or other vectors should be guarded against by the use of suitable netting.
9. Birds which have been purchased from another breeder should be isolated in a separate pen, and removed as far as possible from the fowl-runs for a period of two weeks, in order to guard against the introduction of disease; some fowls undoubtedly act as carriers. Agglutination tests may be carried out to detect carriers.

Vaccine Treatment.—In the past, fowl typhoid vaccine has been issued to poultry men immediately after the disease has been diagnosed, with the request that all healthy fowls be removed to clean ground and vaccinated. Judging from letters received it would appear that vaccine treatment has given encouraging results. The dose prescribed is 1 c.cm. per fowl to be inoculated subcutaneously on the inside of the thigh or under the wing. No experimental evidence has been obtained yet as to the value of the vaccine when used on a large scale.

References.


Bacillary White Diarrhoea of Chickens.

Definition.—Bacillary white diarrhoea, caused by *B. pullorum*, is a highly infectious disease of chicks during the first three days of life. The disease is characterized by severe white diarrhoea, prostration, and high mortality.

Historical.—It was Rettger (1900) who first reported a peculiar disease in chicks. He isolated an organism from various organs and also succeeded in reproducing the disease. Later, he and Harvey (1908) reported further experimental work, and the causal organism was designated *Bacillus pullorum*. Still later it was shown by Gage and Paige (1915) that the organism is localized in the ovary of the hen and transmitted via the egg. Since then Jones (1911-12) and a number of other investigators have substantiated these findings.

The first South African case of white diarrhoea was examined at Onderstepoort during 1926, and had the following history:—The owner bought a batch of day-old chicks. They were sick on arrival, and about 75 per cent. of them died. Later he had bad results from the eggs of the survivors, as, after hatching, the young chicks (one to two days) invariably developed a fatal diarrhoea. The writer examined the last batch of chicks bacteriologically, those examined being from three to ten days old. The clinical picture was that of bacillary white diarrhoea. Cultures were made from the various organs and a non-oerogenous type of *B. pullorum* obtained in pure culture. Sera from four of the six hens responsible for the eggs (from which these chicks were hatched) were submitted to the agglutination test and were markedly positive.

Cause and Nature of the Disease.—The cause of the disease is a minute gram negative bacillus very similar to the typhoid organism of man. It may be grown from various organs and from the bloodstream of affected chickens. Chicks are most susceptible during the first three days after hatching, but seem to acquire more resistance after the fourth day. Those which survive the affection harbour the causal organism in after life and become chronic carriers. The main predilection site in the hen is the ovary. Diseased ova are of a brownish colour and angular in appearance.

Eggs laid by carriers become infected during their formation or during passage along the oviduct. If such eggs are incubated the chicks often die in the shell and those that hatch soon manifest symptoms of the disease. There may be only one infected egg in a brood, but as the organisms are present in great numbers in the droppings, even one chick is a source of infection to the other members of the brood.

This condition may be transmitted in the following ways:

(1) Through the infected eggs.
(2) Through the infected droppings of sick chicks.
(3) Through contaminated runs and incubators.

In one instance the writer has seen a double infection of *B. gallinarum* and *B. pullorum* in the same hen. A pure culture of *B. gallinarum* was obtained from the heart blood, and from the diseased ova *B. pullorum* was isolated.

According to a recent article by Doyle (1925) the organism is not a normal inhabitant of the chick’s intestine. He isolated the organism in 2.6 per cent. of egg-yolks examined, but had no positive
results from the white of eggs. Healthy adult fowls do not become infected from carriers, but may when the chicks heavily infect the ground.

**Symptoms.**—The disease generally appears a day or two after hatching. The affected chickens are drowsy and listless. They often stand for a long time in the same position or sway backwards and forwards. The main diagnostic feature is the presence of creamy and sticky faeces, resulting in the feathers being often gumméd around the vent. The sick chick usually emits a sound of pain during the act of evacuation. The chicks generally die a day or two after the first symptoms have been observed, though sometimes the course is longer. Mortality is very high and is estimated at from 40 to 90 per cent.

**Post-mortem Appearances.**—The main feature at post-mortem was a slight enlargement of the liver, which displayed minute grey specks, which occur under the capsule and in the liver substance. In one specimen caseous nodules were also seen in the lung. The presence of unabsorbed yolk was a constant feature. In some cases it was adherent to the peritoneum.

**Diagnosis.**—A definite diagnosis can only be made in the laboratory. A provisional diagnosis may be made on account of the early appearance of the affection, high mortality, white diarrhœa, and the presence of unabsorbed yolk in the abdominal cavity.

**Differential Diagnosis.**—Not all cases of white diarrhœa in chicks are due to *B. pullorum* infection. Chills and improper feeding sometimes give rise to similar symptoms. Aspergillosis also shows the presence of a white diarrhœa in older chicks, especially during the later stages of the disease. Further, *Coccidiosis* sometimes simulates bacillary white diarrhœa, but symptoms do not appear so soon after hatching.

**Prevention.**—The most essential points in the control of bacillary white diarrhœa are the detection and destruction of the adult carriers, which can be detected by means of the agglutination test. A close relationship serologically exists between *B. pullorum* and *B. gallinarum*, but the organisms can be distinguished biochemically by the fact that *B. pullorum* does not ferment maltose or dulcite, whereas *B. gallinarum* does. At present serological tests will not differentiate a carrier of *B. pullorum* from one of *B. gallinarum*, a fact which is not of much practical importance in view of the danger of both diseases. All should be done to protect the newly-hatched healthy chick from picking up infection. This can be done by spraying at regular intervals all contaminated nests and incubators with a 3 per cent. solution of any of the usual carbolic disinfectants, and burning all poultry litter and carcasses. Avoid buying at random not only day-old chicks, but also adult birds. Often the disease is introduced in a healthy flock through the introduction of a single fowl. This can be avoided by having it tested before purchasing.

**Curative Treatment.**—Treatment is not recommended in an outbreak of bacillary white diarrhœa, as the surviving chick may be a reservoir of infection in adult life.

**REFERENCES.**


FOWL TYPHOID.
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Blood smear in experimental Fowl Typhoid, showing bacteraemia, leucocytosis and phagocytosis. Drawing made from two specially selected fields.

Smear from 24 hour agar culture of Fowl Typhoid organisms first generation. X1000.

Chart showing fever curve in experimental Fowl Typhoid reaction.