

Poultry and the Paratyphoids

J. E. WILLIAMS

ALL TYPES of poultry are important reservoirs of paratyphoid infections.

As applied to poultry diseases, the term "paratyphoid" denotes diseases caused by micro-organisms of the *Salmonella* group other than *Salmonella pullorum* (pullorum disease) and *Salmonella gallinarum* (fowl typhoid).

More than 60 of the 200-odd types of *Salmonella* that are known to exist cause diseases in poultry.

With the rapid expansion and increased traffic in the poultry industry in recent years, paratyphoid infections have become a problem of utmost concern. The wide natural distribution of the *Salmonella* organisms has made the establishment of efficient control methods most difficult.

The distribution of paratyphoid infections is worldwide. Unlike pullorum disease and fowl typhoid, which are essentially restricted to poultry, the paratyphoids can infect practically all animal species, including man.

Among avian types, these infections cause severe losses among the young of most domesticated and wild fowl, including turkeys, chickens, pigeons, geese, ducks, quail, canaries, parrots, finches, sparrows, and guinea fowl.

Mammalian types that may be infected with *Salmonella* and transmit the disease to poultry include swine, cattle, horses, sheep, dogs, cats, and foxes. Mice, rats, snakes, flies, and roaches may also carry the organisms.

The discussion that follows is restricted to the disease as it occurs in turkeys; however, paratyphoid infections as they occur in other fowl are quite similar in symptoms, postmortem lesions, treatment, and control.

Micro-organisms belonging to the genus *Paracolobactrum* (so-called paracolons), which are closely related to the *Salmonella*, have been reported as

the cause of a septicemic disease of young fowl. Laboratory procedures are required for accurate identification of this group of diseases. Members of the Arizona group of paracolons are especially pathogenic for young turkeys and may be eggborne. Like the *Salmonella*, the paracolons are distributed in a wide variety of animal species under natural conditions and are usually eliminated in the droppings of infected animals. The symptoms and postmortem lesions as well as the control and treatment of paracolon infections are identical to those described for the paratyphoids.

The microscopic organism that causes paratyphoid infection was first reported in turkeys in 1933. The bacteria can be readily cultivated in the laboratory and through a special procedure, called serological typing, the various types can be identified. Information derived from typing the organism aids in tracing the origin of disease outbreaks and permits men who work to control disease to concentrate their efforts toward the eradication of the more widespread and deadly types.

Salmonella typhimurium is the most frequently encountered paratyphoid in poultry and most other animal species. Other types frequently encountered in turkeys include *S. anatum* (common also in ducks), *S. bredeney*, *S. derby*, *S. newport*, and *S. senftenberg*.

HEAVIEST LOSSES from paratyphoid infections occur among young birds during the first month after hatching. The age at which losses start depends on whether the infection takes place in the incubator or after the young birds are placed in the brooder. The disease spreads rapidly. Deaths may continue for several weeks. Losses vary

widely and may exceed 90 percent of the hatch.

Birds that survive the infection may remain lifetime carriers of the organisms and are capable of laying infected eggs, which may spread the disease to the young.

Paratyphoid is not frequently encountered as an acute disease in adult turkeys. Infected adults generally show no outward symptoms.

Paratyphoid organisms are spread from bird to bird by consumption of litter, feed, or water contaminated with infected droppings. Adult birds may pass large numbers of the organisms in their droppings and readily infect younger birds. Droppings of rodents often contain huge numbers of the organisms. People may carry the organisms when feces and litter adhere to their shoes or clothing.

The infection may be spread also by way of the egg. One way is by direct transfer from the ovary of the infected hen. The other is by penetration of the egg shell by the *Salmonella* organisms that may be present in dirt on the surface of the egg. Only clean eggs should be used for hatching.

THE SYMPTOMS of paratyphoid infection in young poults cannot be told from pullorum disease and fowl typhoid. Diarrhea, weakness, sagging wings, and pasting of feathers around the vent are common. Infected birds often appear to be sleepy. They congregate in groups as if chilled. Surviving birds may be emaciated.

Acute outbreaks of paratyphoid infection in older birds are evidenced by diarrhea, loss of appetite, and emaciation. Death may occur in a few days.

Postmortem findings in young poults include inflammation of the intestinal tract and enlargement of most of the internal organs, including the liver, spleen, and kidneys. Minute white spots may also be seen on various internal organs. The sac around the heart may be filled with a straw-colored fluid. Plugs of dry, cheesy material in the blind sacs (ceca) toward

the end of the intestinal tract are common. Lesions in the lungs and heart are infrequent.

Enlargement of the liver and spleen and inflammation or ulceration of the intestinal tract may be observed in infected adult birds. In grown pigeons the infection may be manifested by the formation of abscesses, which particularly affect the joints of the wings.

Diagnosis of paratyphoid infections depends on isolation and identification of the causative bacteria. Most States have diagnostic laboratories to which infected birds may be sent for examination.

PREVENTION AND CONTROL of paratyphoid infections depend to a large extent on the use of paratyphoid-free stock as a source of hatching eggs and prevention of exposure to the numerous other animal species that serve as reservoirs of the infection.

Adult birds and other animals should be kept confined and separated from poultry-rearing operations. Rats and mice should be eradicated.

Every effort should be made to insure that the infection is not introduced from a source outside the farm.

Diseased birds should be isolated from healthy stock and disposed of as soon as possible, because infected groups should never be maintained as a source of breeders.

Blood testing has never been widely applied against paratyphoid infections of poultry because of the numerous antigenic types of the organism and the wide distribution of *Salmonella* bacteria under natural conditions. The agglutination test for paratyphoids is more complicated and has been subject to more variation than is the one used for pullorum disease and fowl typhoid. Some birds may be intestinal carriers of the organisms and will not react to it.

A few paratyphoid carriers may be detected through the use of pullorum antigen. Anyone who uses the agglutination test for paratyphoid, however, should use antigens prepared from the

particular type or types identified in the flocks to be tested. Thus the services of a laboratory with trained personnel and adequate facilities for paratyphoid testing are essential. Only a few States in 1956 conducted blood testing programs for paratyphoid infections of turkeys. The programs were aimed mostly at the detection of *S. typhimurium* infection.

Treatment of paratyphoid infections is advisable only as a salvage or preventative measure and only for birds that are not to be maintained as breeders, as some of the treated birds may remain permanent carriers of the paratyphoid organisms.

Furazolidone, a chemical derivative of furfural, is effective in treating and preventing acute outbreaks of the disease. It is mixed with the feed.

Several of the sulfonamide drugs (sulfamethazine, sulfamerazine, sulfaminoxaline) and antibiotics (Terramycin, Aureomycin) have been used successfully to reduce death losses.

Bacterins have been found to have little or no value for preventing and controlling the disease.

Salmonella organisms are destroyed readily by the usual disinfectants and direct sunlight, but they may survive for months in soil, manure, and sheltered places.

All equipment used in hatching operations should be frequently washed free of all foreign matter and scrubbed with a 2-percent commercial lye solution or a 3-percent solution of cresol or other acceptable disinfectants.

Formaldehyde gas is effective for fumigating incubators and eggs. Anyone who uses formaldehyde gas should follow closely the recommendations of the manufacturer of the incubator he has. Direct spraying with a 5-percent formalin solution has also been recommended for fumigating incubators.

Poult brooders, brooder rooms, feeders, waterers, and similar equipment should be cleaned frequently by washing and disinfecting with an approved disinfectant.

J. E. WILLIAMS is project leader in the *Bacterial and Mycotic Diseases Section of the Animal Disease and Parasite Research Branch.*

Newcastle Disease

O. L. OSTEEEN

NEWCASTLE DISEASE is a specific, highly contagious disease primarily of chickens and turkeys. Other domestic poultry, various species of wild birds, and people are susceptible to it, but in man it is usually mild and is characterized by inflammation of one eye, seldom both.

Among young chickens the loss may be as high as 100 percent. The average is usually 30 to 40 percent. The death losses may vary greatly from one outbreak to another. Chicks that survive

an outbreak are retarded in growth and efficiency of feed utilization. It requires at least 2 extra weeks to finish birds in affected broiler flocks.

Turkey poults are somewhat less severely affected, but the loss among them may be 15 to 20 percent of the brood.

The death loss among laying birds usually is quite low but occasionally may be as high as 80 percent of the flock. Production and quality of eggs usually drop sharply. The disease in