Importance
Fowl typhoid is an economically important disease of poultry and other birds, with high mortality in young birds. Hens may become chronic carriers and pass the disease to their embryos by egg transmission. Fowl typhoid has been eradicated from commercially raised poultry in the United States and many other developed countries, but may persist in backyard flocks.

Etiology
Fowl typhoid results from infection by *Salmonella gallinarum*, a Gram negative bacterial rod in the family Enterobacteriaceae (serogroup D).

Species affected
Chickens are the natural hosts for *S. gallinarum*; however, the disease can also affect turkeys, ducks, quail, guinea fowl, pheasants, pigeons, and grouse. Outbreaks have also been described in parrots, sparrows, ostriches, peafowl, and ring–necked doves, and cases have been seen in canaries and budgerigars.

Geographic distribution
Fowl typhoid is common in Mexico, Central and South America, Africa, and the Indian subcontinent. In the United States, Canada, Japan, Australia, and most countries in Western Europe, fowl typhoid has been eradicated from commercial poultry. Although the disease may still be present in backyard flocks, no outbreak has been reported in the United States since 1980.

Transmission
*Salmonella gallinarum* is transmitted by both the respiratory and oral routes. Birds may become carriers and pass the organism to their offspring by egg transmission. Fomites, including contaminated feed, water, and litter, can also spread fowl typhoid, and wild birds, mammals, and insects may be important in mechanical transmission. *S. gallinarum* can survive in a favorable environment for several years.

Incubation period
The incubation period is usually 4 to 6 days.

Clinical signs
In chicks and poults, the clinical signs of fowl typhoid can include depression, loss of appetite, somnolence, droopy wings, huddling, dehydration, thirst, ruffled feathers, and weakness. Yellow or green diarrhea with pasting of the vent feathers is common, and there may be blindness or swelling of the joints. Birds that survive may be underweight and poorly feathered, and may not mature into productive adults.

In growing and adult birds, the disease can be inapparent. In symptomatic infections, the clinical signs may include a decreased appetite, depression, dehydration, weight loss, ruffled feathers, pale and shrunk combs, diarrhea, or a droopy appearance. There may also be a decrease in egg production or fertility.

Post mortem lesions
In young birds, the post–mortem lesions can include enteritis, dehydration, and anemia. The liver may be swollen, friable, and bile–stained and may contain white necrotic foci. The spleen is often enlarged and mottled, and the kidneys may be enlarged. Petechial hemorrhages can sometimes be found in the fat and musculature surrounding the internal organs, and the peritoneum, pericardium, and capsule of the liver may contain a fibrinous exudate. In some birds, there are white nodules in the epicardium, myocardium, pancreas, lung, gizzard, and sometimes the cecum; some of these nodules may resemble tumors. The joints may be swollen and contain a viscous creamy fluid. In turkeys, a characteristic sign is the appearance of small, white plaques visible through the wall of the intestine. In guinea fowl, the lesions often involve the respiratory tract.
In adult birds, the gross lesions may be minimal. In some animals, there may be a mottled pancreas, excess pericardial fluid, fibrinous pericarditis, or caseous granulomas in the lungs and air sacs. The tests sometimes contain white foci or nodules. Chronic carrier hens may have nodular or regressing ovarian follicles, or a few misshapen ova among normal ovules. In hens, caseous material is often found in the oviduct, and peritonitis, periregional, or ascites may be seen.

Morbidity and Mortality

Morbidity and mortality vary with the species, age, and breed of the birds, nutrition and management, and concurrent infections. Ducks, geese, and pigeons are relatively resistant to fowl typhoid. Among chickens, the White Leghorn breed appears to be more resistant than Rhode Island Reds or New Hampshires. The mortality rate can range from less than 1% to 100%; morbidity is usually somewhat higher. Mortality is usually highest in checks and poults, particularly in two to three–week old birds.

A vaccine is available. Antibiotics can reduce mortality, but do not eliminate the infection from the flock.

Diagnosis

Clinical

A tentative diagnosis can be made based on the clinical signs, flock history, mortality, and post–mortem lesions, but laboratory confirmation is essential.

Differential diagnosis

Fowl typhoid must be differentiated from infection with other species of Salmonella, Mycoplasma synoviae, Staphylococcus aureus, Pasteurella multocida, Erysipelothrix rhusiopathiae, and fungi including Aspergillus. The white nodules in chicks can be confused with Marek’s disease. In adult carriers, local S. gallinarum infections may resemble infections by Staphylococci, Streptococci, coliform bacteria, other Salmonella, and P. multocida.

Laboratory tests

Fowl typhoid can diagnosed by the isolation of S. gallinarum from affected birds. This organism will grow on most standard nonselective aerobic media, as well as on MacConkey, brilliant green, deoxycholate citrate, and brilliant green sulphanipiridine agars. S. gallinarum is a non–motile facultative anaerobe and grows best at 37ºC. Colonies on nutrient agar are small (1–2 mm), circular, glistening, smooth, translucent, slightly raised, and entire after a 24–48 hour incubation. Treatment with antibiotics during the 2 to 3 weeks before testing may lead to false negatives. Further identification of the organism is by standard biochemical and serologic tests. Polymerase chain reaction (PCR) tests have also been used to detect S. gallinarum.

Fowl typhoid can also be diagnosed by serology. Agglutinating antibodies appear 3 to 10 or more days after infection. The rapid whole blood agglutination test can be used to immediately identify reactors in the field, but is not reliable in turkeys. Other serologic tests include the rapid serum agglutination test, tube agglutination, microagglutination, microantiglobulin, immunodiffusion, hemagglutination, and enzyme–linked immunosorbent (ELISA) assays. Cross–reactions with other species of Salmonella, particularly S. enteritidis, may occur. Testing for reactors should be repeated at three to five week intervals, as a single test may not detect all carrier birds.

Samples to collect

Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease.

Swabs or tissue samples should be collected for bacterial isolation. Samples can be taken from live birds, fresh carcasses, or freshly frozen carcasses. In live birds, swabs should be taken of the cloaca and conjunctivae. At necropsy, swabs may be used to sample the carcass or tissue samples can be collected aseptically from the spleen, liver, gall bladder, kidneys, heart, lungs, digestive tract, ova, testes, or affected joints. S. gallinarum can also be isolated from the contents of the intestine and cloaca. In carriers, S. gallinarum is most often recovered from the liver and feces. In asymptomatic birds, large amounts of homogenized tissues may be needed; the tissues can be pooled from different birds. Serum should also be collected for serology.

S. gallinarum can also be isolated from contaminated material in the birds’ housing, transport boxes, or hatchers. Samples should include moist and dry litter, swabs from open drinkers, and aliquots of fluff, dust, and broken eggshells. Feed may also be collected for bacterial isolation; the total amount should be 25 to 100 grams. Eggs, embryos, and eggshell surfaces should be tested.

Recommended actions if fowl typhoid suspected

Notification of authorities

Fowl typhoid must be reported to state or federal authorities immediately upon diagnosis or suspicion of the disease. Federal: Area Veterinarians in Charge (AVICS) http://www.aphis.usda.gov/vs/area_offices.htm

Quarantine and Disinfection

*S. gallinarum* can be inactivated by direct exposure to sunlight, heat treatment, phenol, formalin, dichloride of mercury, or potassium permanganate. Compounds that contain phenol are the most effective disinfectants under field conditions, but quaternary ammonium compounds and iodospheres are also effective.

Public health

*S. gallinarum* is highly host adapted and is not considered to be a serious public health concern. In one survey, only eight out of more than 450,000 isolations of Salmonella from humans were *S. gallinarum*. Whether these eight isolates caused any symptoms in their hosts is unknown.

For More Information

World Organization for Animal Health (OIE)
http://www.oie.int
OIE Manual of Standards
http://www.oie.int/eng/normes/mmanual/a_summry.htm
OIE International Animal Health Code
http://www.oie.int/eng/normes/mcode/A_summry.htm
Mississippi State University
Cooperative Extension Service
http://www.msstate.edu/dept/poultry/disbact.htm

References


