



# Bacterial Diseases of Poultry

## Excluding Respiratory Diseases

Joe G. Berry  
Extension Poultry Specialist

Delbert Whitenack  
Pathologist, Veterinary Medicine

Bacteria are microscopic living organisms. All bacteria are not detrimental to animal health. In fact, many bacteria are beneficial and necessary for such processes as food digestion, manufacturing of some dairy products, etc. Classification of bacteria into species is done so disease producing organisms may be separated from those that are harmless or beneficial.

Successful control of bacterial diseases entails isolating and identifying disease-producing species, if present, and preventing multiplication and spread of the organism within the animal's body or to other animals.

### Salmonella and Paracolon Infections

There are more than 2,000 species or serotypes of bacteria belonging to genus *Salmonella*; all are potential pathogens of poultry. Systemic effects usually are observed when infection occurs, but because the digestive system is primarily affected, they often are referred to as enteric organisms. The same is true of the group of organisms referred to as paracolons. Because of similarities produced by infections by these organisms, they are grouped under one heading. Both groups are found worldwide.

Pullorum disease and fowl typhoid are infectious, acute, or chronic bacterial diseases affecting primarily chickens and turkeys, but most domestic and wild fowl can be infected.

The causes are bacteria, *Salmonella pullorum* and *S. gallinarum*, respectively. Transmission is primarily through the egg but may occur by other means such as:

1. Infected hen — egg — infected chick — spread in incubator — in chick boxes — in brooder house and on range — survivors become infected breeder birds.
2. Mechanical transmission — carried about on shoes or equipment.
3. Carrier birds — apparently healthy birds which shed organisms.
4. Contaminated premises — from previous outbreaks.

Portal of entry may be the respiratory (as in incubator) or digestive system.

**Signs:** Pullorum disease is highly fatal to young chicks or poults, but mature birds are more resistant. Young birds may die so soon after hatching that no signs are observed. Most acute outbreaks occur in birds under 3 weeks of age. Mortality in such outbreaks may approach 90 percent if untreated. Survivors usually are stunted or unthrifty.

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Infection in young birds may be indicated by droopiness, ruffled feathers, a chilled appearance with birds huddled around the source of heat, white diarrhea with "pasted" down around the vent, and labored breathing. Fowl typhoid primarily occurs in young adults (usually those past 12 weeks of age). Signs include sudden or sporadic mortality, listlessness, green or yellow diarrhea with pasting of the vent feathers, loss of appetite, increased thirst, and a pale, anemic appearance of comb and wattles.

**Diagnosis:** The diagnosis is made by isolating the causative organism. In older birds, blood testing may indicate presence of the disease, but a positive diagnosis depends upon isolation and identification of the organism by laboratory methods.

**Prevention:** Complete eradication is the only sound way to prevent pullorum disease. All hatchery supply flocks should be tested and only pullorum-free flocks used to produce hatching eggs. In Oklahoma, the testing agency is the Animal Industry Division of the Oklahoma Department of Agriculture, Food, and Forestry 2800 N. Lincoln, Oklahoma City, OK 73105. Producers should always purchase chicks or poults from hatcheries that participate in the National Poultry Improvement Plan, which includes an official pullorum disease control program.

**Treatment:** Treatment is primarily a salvage operation and does not prevent birds from becoming carriers. Consequently, recovered flocks should not be kept for egg production.

### Paratyphoid Infection

The term "paratyphoid" first was used to designate a group of human, feverish conditions resembling typhoid fever. Related to poultry, paratyphoid denotes the disease produced by any of the many *Salmonella* species other than *S. pullorum* and *S. gallinarum*. Infection may result in acute or chronic disease. Acute clinical disease is common in young birds and rare in adult birds. Over 2,000 species or serotypes of *Salmonella* organisms are recognized, and most birds, reptiles, and mammals can host one or more species. The disease is of greatest economic concern to the turkey industry.

Most acute paratyphoid infections occur in birds less than 4 weeks old, except in pigeons and canaries in which acute disease and high mortality may occur in any age group.

**Diagnosis:** The disease may be suspected from flock history, signs, and necropsy lesions, but a definite diagnosis depends upon isolation and identification of the organisms by qualified laboratory personnel.

**Treatment:** Proper use of drugs may reduce mortality in acute outbreaks of paratyphoid.

No treatment is known that eliminates infection from the flock following an outbreak, and efforts to test and eliminate individuals harboring the organisms have been unsuccessful. Prevention is of primary importance. Regardless of treatment, infected birds should never be used to supply hatching eggs.

## Paracolon Infections

The paracolon bacteria comprise a large group of related organisms that have certain characteristics in common with the paratyphoids and the common coliforms. Most pathogenic paracolon organisms are placed in the group known as Arizona paracolons. They can be differentiated from the paratyphoids by their biochemical reactions, but the similarity between groups causes some delay and confusion in correct identification. These organisms are distributed widely in nature and have a host range which coincides with *Salmonella*.

Consider the disease produced, symptoms, lesions, transmission, prevention, and treatment as identical to the paratyphoid infections until research clarifies the situation. Differentiation of paracolon from paratyphoid infections now depends on careful laboratory examination with isolation and identification of the causative organism.

## Coliform Infections, Colibacillosis

Coliform infections refer to the many and various disease resulting from infection with *Escherichia coli* bacteria. In recent years these infections have become recognized as a major cause of morbidity, mortality, and condemnations in chickens and turkeys. The incidence and severity of coliform infections have increased rapidly, and current trends indicate they are likely to become an even bigger problem.

The problems attributed to coliform infections are often complex. There is a marked variation in severity. Problems range from severe acute infections with sudden and high mortality to mild infections of a chronic nature with low morbidity and mortality. Infections may result in a respiratory disease from air sac infection, a septicemic disease from generalized infection, an enteritis from intestinal infection, or a combination of any or all of these.

Disease may result from coliform infection alone as in primary infection or in combination with other disease agents as complicating or secondary infection. Secondary infections commonly occur as a part of the classic air sac disease syndrome as a complication of *Mycoplasma gallisepticum* infections.

All ages may be affected; however, it is more common in young growing birds, especially the acute septicemia in young turkeys and air sacculitis in young chickens. High early mortality may occur as the result of omphalitis or navel infections.

**Cause:** The disease is caused by *E. coli* bacteria and from toxins they produce as they grow and multiply. There are many different strains or serological types within the group of *E. coli* bacteria. Many are considered normal inhabitants of the intestinal tract of chickens and turkeys and consequently are common organisms in the birds' environment.

The primary routes of invasion by the organism are the respiratory system and the gastrointestinal tract. Omphalitis and infections in young birds may result from entry of the organism through the unhealed navel or penetration of the egg shell prior to or during incubation.

**Symptoms:** The symptoms vary with the different types of infections. In the acute septicemic form, mortality may begin suddenly and progress rapidly. Morbidity may not be apparent and birds in apparently good condition may die. However, in most cases, morbid birds are evident as listless birds with ruffled feathers and indications of fever.

In the chronic infection, debilitation, and growth retardation are obvious. In the event of respiratory infection, additional symptoms of labored breathing, occasional coughing, and rales may be apparent. In the case of enteritis, diarrhea may be evident. Mortality may be high in recently hatched chicks and poults as a result of omphalitis due to coliform infections.

**Diagnosis:** Differential diagnosis by laboratory means is necessary since coliform infection in its various forms may resemble and be easily confused with many other diseases. Isolation and identification of the organism by culture procedures can be readily accomplished; however, mere isolation is not sufficient to make a diagnosis. One must take into consideration the organ from which the organisms were isolated, the pathogenicity of the particular isolate and the presence of other disease agents.

**Prevention:** Management and sanitation practices designed to minimize the exposure level of these types of organisms in the birds' environment are necessary in any preventive program. In addition, these programs should include avoiding stress factors and other disease agents which may lower the resistance and predispose the birds to infection.

Important points in these management and sanitation practices include providing adequate ventilation, good litter and range conditions, properly cleaned and disinfected equipment and facilities, and feed and water supply free of contamination. In addition, these programs should include avoiding overcrowding and environmental stresses such as chilling and overheating, and avoiding vaccinating and handling at critical times. Proper egg handling, as well as a good hatchery management and sanitation program, are necessary to prevent early exposure.

**Treatment:** The response of coliform infections to various medications is erratic and often difficult to evaluate. Under practical conditions, treatment is disappointing and the results so variable that no one treatment can be recommended. Drug sensitivity varies with the strains, some of which may be partially or completely resistant to many, if not all, of the commonly used antibiotics. Laboratory tests to determine the sensitivity of the organism to the various drugs may prove useful in selecting the most beneficial drugs. When practical, moving the birds to a clean environment may be of more value than medication. For example, when outbreaks occur in growing turkeys in the brooder house, moving to range is often the best treatment.

## Omphalitis

Omphalitis may be defined technically as an inflammation of the navel. As commonly used, the term refers to improper closure of the navel with subsequent bacterial infection (navel ill, mushy chick disease).

**Cause:** Most problems result from mixed bacterial infections including the common coliforms and various species belonging to the genera *Staphylococcus*, *Streptococcus*, *Proteus*, and others. Omphalitis usually can be traced to faulty incubation, poor hatchery sanitation, or chilling or overheating soon after hatching (such as in transit). The significance of isolating one of the bacterial species mentioned above is complicated in that many of the same species can be isolated from the yolks of supposedly normal birds immediately after hatching.

**Transmission:** Omphalitis occurs during the first few days of life, so it cannot be considered transmissible from bird to bird. It is transmitted from unsanitary equipment in the hatchery to newly hatched birds having unhealed navels.

**Symptoms and lesions:** Affected chicks usually appear drowsy or droopy with the down being "puffed up." They also generally appear to be of inferior quality and show a lack of uniformity. Many individuals stand near the heat source and are indifferent to feed or water. Diarrhea sometimes occurs. Mortality usually begins within 24 hours and peaks by 5 to 7 days.

Characteristic lesions are poorly healed navels, subcutaneous edema, bluish color of the abdominal muscles around the navel, and unabsorbed yolk material which often has a putrid odor. Often yolks are ruptured and peritonitis is common.

**Diagnosis:** A tentative diagnosis can be made on the basis of history and lesions. The presence of mixed bacterial infections and absence of any specific disease-producing agent aids in confirming the diagnosis.

**Prevention and treatment:** Good management and sanitation procedures in the hatchery and during the first few days following hatching are the only sure ways to prevent omphalitis. Broad spectrum antibiotics help reduce mortality and stunting in affected groups, but they do not replace sanitation.

## Fowl Cholera

The disease occurs throughout the country wherever poultry is produced and in recent years has become the most hazardous infectious disease of turkeys.

Host range is extensive and includes chickens, turkeys, pheasants, pigeons, waterfowl, sparrows, and other free-flying birds.

**Cause:** The causative organism of fowl cholera is *Pasteurella multocida*, a bacterial organism in the form of a small oval rod, distinctly bipolar when stains are made from blood or tissues.

**Transmission:** *Pasteurella multocida* will survive for (1) at least 1 month in droppings, (2) 2 to 3 months in soil. The organism may enter the body through the digestive tract or the respiratory system. The disease is not transmitted through the egg.

### Major sources of infection are:

1. Body excreta of diseased birds which contaminate soil, water, feed, etc. — this may be from visibly sick birds or apparently healthy carriers.
2. Carcasses of birds which have died of the disease.
3. Contaminated water supplies such as surface tanks, ponds, lakes, and streams.

4. Mechanical transmission by contaminated shoes or equipment.

Recent studies indicate that animals other than birds, such as raccoons, opossums, dogs and pigs may serve as reservoirs of infection and actively spread the disease.

**Symptoms and lesions:** The disease seldom is seen in chickens under 4 months of age, but is commonly seen in turkeys under this age. The usual incubation period is from 4 to 9 days and outbreaks may vary from peracute to chronic in nature. In the peracute form, symptoms may be absent; in the acute form some birds may die without showing symptoms.

**Prevention and treatment:** Bacterins properly applied are helpful in preventing fowl cholera, particularly in turkeys. Their use must be combined with a rigid program of sanitation.

Sanitation practices which aid in preventing the disease are:

1. Complete depopulation each year with a definite break between older birds and their replacements.
2. A good rodent control program.
3. Proper disposal of dead birds.
4. A safe, sanitary water supply.
5. Adequate cleaning and disinfection of all houses and equipment on premises where outbreaks have occurred after disposal of affected flocks.
6. Keeping birds of susceptible age confined to the house.
7. Allowing contaminated ranges or yards to remain vacant for at least 3 months.

Although drugs usually alter the course of a fowl cholera outbreak, the disease has a tendency to recur when treatment is discontinued. This may necessitate prolonged treatment with drugs added at low levels to the feed or water.

## Erysipelas

Erysipelas is a bacterial disease caused by *Erysipelas insidiosus* and was once considered a serious disease only in swine and sheep. The disease affect several species of birds including chickens, ducks, and geese, but the only fowl in which it has been of importance is the turkey. Man is susceptible to infection and may contract the disease from turkeys. Since this organism is pathogenic for man, care should be taken when handling infected birds or tissues.

**Symptoms:** The first indication of the disease may be the discovery of several dead birds. Usually several morbid birds can be found; however, most affected birds are visibly sick for only a short period before death. Symptoms are typical of a septicemic disease and include a general weakness, listlessness, lack of appetite, and sometimes a yellowish or greenish diarrhea. Occasionally, the snood of toms may be turgid, swollen, and purple.

**Diagnosis:** Symptoms and lesions may resemble other diseases so closely that a reliable diagnosis can be made only through isolation and identification of the causative organism.

**Prevention and treatment:** Good management practices which aid in preventing erysipelas include avoiding the use of ranges previously occupied by swine, sheep, or turkeys in areas where erysipelas is known to exist; debeaking; removal of the snoods of toms and other measures which prevent injury from fighting; avoiding overcrowding; and providing well-drained ranges.

Bacterins are available and are useful on premises where history indicates outbreaks may be expected.

Various antibiotics have shown efficacy in the treatment of erysipelas; however, penicillin is best. Injections of 150,000 to 300,000 units of penicillin into leg or breast muscles of visibly sick birds is effective in decreasing mortality. One injection is usually sufficient, but more may be given if necessary. Water and feed medication may be given if necessary. Water and feed medication may be of value under certain conditions. In addition, bacterium may be used on unaffected birds.

## Avian Vibrionic Hepatitis

Avian vibrionic hepatitis is a widespread transmissible disease of chickens primarily characterized by swelling and necrosis of the liver. It may appear in an acute form resulting in death of affected birds, or it may occur in a chronic form and produce economic loss by increasing flock cull rates. Birds of all ages may be affected, but the disease commonly occurs in semi-mature and in mature birds.

**Cause and transmission:** The causative agent of vibrionic hepatitis is a bacterial organism belonging to the vibrio group.

The disease apparently spreads by contact, direct or indirect, between infected and susceptible birds. Ingestion of infectious material is the most likely method of transmission. Some outbreaks present an appearance that suggests possible egg transmission.

**Diagnosis:** The liver is the primary site of infection. Liver lesions are found in birds affected with many diseases. Because of this, vibrionic hepatitis may be confused with diseases such as pullorum, typhoid, bluecomb, hemorrhagic disease, blackhead, and leukosis. Positive diagnosis is established by laboratory means.

**Prevention and treatment:** Routine management and sanitation practices for disease prevention offer the most economical and reliable method of prevention.

Disease outbreaks usually respond to specific treatment with antibiotics.

## Diagnostic Services

When a disease outbreak is suspected, live birds showing typical symptoms of the sick birds should be immediately submitted to a poultry diagnostic laboratory for examination. Such laboratories are equipped to identify disease problems and make recommendations for control. Practicing veterinarians, industry servicemen, and trained extension personnel working with poultrymen and a diagnostic laboratory can bring about a reduction in losses due to disease.

Oklahoma has a diagnostic laboratory available to all poultry producers. This laboratory is the Oklahoma Animal Disease Diagnostic Laboratory located on the Oklahoma State University campus, Stillwater, Oklahoma, telephone (405) 624-6623. This is a well-equipped laboratory manned by competent personnel capable of accurately diagnosing poultry disease problems.

For information concerning the submission of birds to the laboratory refer to OSU Extension Fact Sheet F-8203, Poultry Diagnostic Services, contact an OSU County Extension office or the Diagnostic Laboratory.

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