

Bacterial and Parasitic Diseases of Anseriformes

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KEYWORDS

- Anseriformes • Avian cholera • Bacteria • Ducks
- Geese • Parasites

Taxonomically, the order Anseriformes contains three families: (i) *Anhimidae*, the screamers, not common to North America but found in other parts of the world, (ii) *Anseranatidae*, which has only one species, the magpie goose (*Anseranas semipalmata*), and (iii) *Anatidae*. This last family consists of the ducks, geese, and swans found worldwide, and it is this family to which the diseases of this article are primarily directed. Waterfowl, in addition to being found in the wild throughout the world, are commonly raised in captivity for food and eggs and kept in zoologic and private collections.

The order Anseriformes is primarily associated with water and wetland habitats. *Anatidae* or true waterfowl, have dense, waterproof plumage, webbed feet, and shortened tarsometatarsal bones. They are strong swimmers and divers, but somewhat less gainly on land, walking with a waddling gait. Generally, waterfowl molt twice yearly. After breeding season they will undergo both a body molt and flight feather molt, becoming flightless for a short period of days or weeks. In the winter, just a body molt will result in birds coming into breeding plumage. From a disease standpoint, the tendency of waterfowl to aggregate in large numbers during postbreeding molt, fall migration, and winter and spring migration can lead to the ready transfer of disease-causing organisms.

AVIAN CHOLERA

Avian cholera, caused by *Pasteurella multocida*, is a highly pathogenic bacterium found in many species, but often associated with large mortality events in waterfowl. Avian cholera is found worldwide. It is more common in the western United States where large die-offs have occurred: greater than 60,000 at Muleshoe Refuge, Texas in 1956 to 1957,¹ 70,000 birds in northern California in 1965 to 1966,² and 80,000 in the Rainwater Basin of Nebraska in 1980.³ However, outbreaks have occurred in

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the east on the Chesapeake Bay in 1970 and 1978,⁴ and in Canada.⁵ Avian cholera is less common in Europe but is present.⁶

Etiology

Pasteurella multocida is a small pleomorphic, gram-negative coccobacillus. It is characterized as bipolar staining, nonhemolytic, aerobic but facultatively anaerobic. The bipolar-staining characteristic can be seen in tissues or body fluids stained with Wright's, Giemsa, or methylene blue stains.⁷ *P. multocida* has variable pathogenicity and host predilection, depending upon the individual strain encountered. Three subspecies, *multocida*, *septica*, and *gallieida* are differentiated by culture and fermentation of sorbitol and dulcitol. Strains are identified by characteristics of the capsule and cell wall with five capsule antigens, identified as A, B, D, E, and F by indirect hemagglutination.⁸ Sixteen somatic antigens have been identified. Strains are characterized by the letter of the capsule antigen and the numbers of the somatic antigens, as some strains can react to more than one somatic antigen. To confuse matters more, sometimes strains with identical antigenic identification will vary in pathogenicity and sometimes epizootics will involve more than one strain.

Epizootology

Potential reservoirs for *P. multocida* include soil, water, and carrier birds.⁹ However, soil and water are probably not year-round reservoirs.⁹ In poultry, chronically infected carriers are important for transmission.¹⁰ Poultry that recover from an infection may continue to harbor *P. multocida* in their nasal clefts and, through nasal discharges, serve as a future source of infection to other poultry. The role and carrier state in wild waterfowl is not as well documented. Among common eiders (*Somateria mollissima*), 1 of 236 apparently healthy birds had *P. multocida* in their tissues and 1 of 357 in the oropharynx.¹¹ Epizootics are associated with dense concentrations of waterfowl and, to some extent, the loss of wetland habitat across central North America has been a factor in concentrating waterfowl and potentiating these epizootics.¹² Again, because of loss of wetland habitat, waterfowl will use a wetland continually during the winter rather than moving among wetlands.⁵ Other factors contributing to avian cholera outbreaks include overcrowding of ducks because of drought or poor management, and inclement weather.¹³ The pathogenesis of avian cholera varies by species of ducks and temporally from year to year in the same location.

Clinical Signs and Pathology

In poultry, avian cholera is seen as both an acute and chronic disease, but in ducks the disease is most often seen as a peracute septicemia with rapid mortality, sometimes in as little as 6 to 12 hours after exposure, but 24 to 48 hours is more common.¹⁴ In fact, very few clinical signs appear, most ducks are simply found dead. Clinical signs that are seen may include diminished normal reflexes, lack of fear, and signs of nervous system involvement, such as abnormal flight and landings.² Captive waterfowl have developed a wasting disease associated with avian cholera characterized by dyspnea and diarrhea, and this is often seen in older birds.⁶ Chronic bilateral caseous infra-orbital sinusitis has been found in emaciated, weak lesser snow geese (*Chen hyperborea hyperborea*).⁷

When *P. multocida* gains entry into susceptible waterfowl, a rapid septicemia ensues, with the bacteria producing an endotoxin that produces fever, systemic hypertension, endotoxic shock, and rapid death.¹⁵ Signs at necropsy can include petechial and ecchymotic hemorrhages, 1-mm to 3-mm pale necrotic foci in the liver, and scattered petechiae on the gizzard serosa, epicardium, myocardium, mesentery,

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