

Pasteurellaceae: *P. Multocida*, *Avibacterium gallinarum*, *A. paragallinarum*

All the members of the family Pasteurellaceae are gram negative coccobacilli. They are facultative anaerobes, and typically oxidase-positive (which sets them apart from members of the family Enterobacteriaceae).

Morphology and Staining

Members of the genera *Avibacterium*, and *Pasteurella* are gram-negative coccobacilli. Bipolarity, that is, the staining of only the tips of cells, may be demonstrable with polychrome stains (e.g., Wright's stain).

Cell structure

Adhesins. Some and probably all members of the family Pasteurellaceae produce adhesins (and possibly more than one kind). A type 4 fimbria (adhesin) has been described for avian strains of *P. Multocida*.

Capsule. The hyaluronic acid capsule of type A strains *P. multocida* serves as an adhesin. The hyaluronic acid is similar (if not identical) to host tissue components, and is thus poorly antigenic; they also bind complement components poorly (and is therefore antiphagocytic). The hyaluronic acid capsule also serves as an adhesin for respiratory tract epithelial cells as in the case of capsule type A strains of *P. Multocida*

Exotoxin. *Pasteurella* produce a number of proteins with toxic activity. At least two of these are important in the pathogenesis of disease: RTX and Rho toxin

Growth Characteristics

Avibacterium and *Pasteurella* grow best in the presence of serum or blood. After overnight incubation (35–37 °C), colonies are up to 2 mm in diameter, clear to

grayish, and smooth or mucoid. All are gram-negative, nonmotile coccobacilli. They are facultative anaerobes, typically oxidase-positive.

Variability

P. multocida consists of 5 capsular serogroups (A, B, D, E, and F) and 16 somatic serotypes (1–16). Serotypes are often related to host specificity and pathogenicity. The serotype is designated with a letter designating the capsule type and a number designating the somatic type (e.g., A : 1). *A. paragallinarum* is also encapsulated, there are three serotypes of *A. paragallinarum* (serotypes A, B, and C).

Avian Species

Avian Cholera. Avian cholera, a systemic infection due to *P. multocida* ssp. *multocida* (most commonly serogroup A), is acquired by ingestion or inhalation and mainly affects turkeys, waterfowl, and chickens. The peracute form kills about 60% of infected birds without preceding signs of illness. The acute type, marked by listlessness, anorexia, diarrhea, and nasal and ocular discharges, may last several days and be about 30% lethal. The subacute form is mostly respiratory and is manifested by rales and mucopurulent nasal discharges. In chronic fowl cholera, there is localization of caseous lesions. Inapparently infected carrier birds appear to be important in the epidemiology of fowl cholera. *Avibacterium gallinarum* is sometimes isolated from chronic cases.

Infectious Coryza. Infectious coryza (caused by *A. paragallinarum*) is an acute contagious infection of chickens, which is usually confined to the upper respiratory tract. It affects birds of practically all ages. Signs include nasal discharge, swelling of sinuses, facial edema, and conjunctivitis. Air sac and lung involvement may occur in severe cases.

Laboratory Diagnosis

Bacteria in the genera *Avibacterium* and *Pasteurella* overnight (35–37 °C) on media containing blood or serum. Capsule and somatic typing can be done. DNA probes and primers designed to amplify specific regions of the bacterial chromosome by PCR can be used to identify specific species.

Bordetella

Morphology and Staining

Bordetellae are pleomorphic gram-negative coccobacilli. All members of the genus that have been evaluated produce fimbrial adhesins (pili). *B. avium* are motile by peritrichous flagella. *B. avium* grow on ordinary laboratory media (35–37 °C), including MacConkey agar, under atmospheric conditions. *Bordetella* is strict aerobes. *B. avium* is catalase and oxidase positive. Three serotypes, based on surface agglutinins, are recognized in *B. avium*. *B. avium* causes disease mainly in young turkey and causes opportunistic disease in chickens and perhaps other birds.

Turkey Coryza. Turkey infected with *B. avium* develop tracheobronchitis, sinusitis, and airsacculitis. Signs include nasal exudate, conjunctivitis, sneezing, tracheal rales, and dyspnea. Morbidity can be very high, but mortality, except by secondary infection, is generally low (<5%). Chickens and other birds may be infected with *B. avium* and opportunistically causes disease. Tracheal swabs (coryza of turkeys) are cultured on blood and MacConkey agars. Agglutination test is used for serodiagnosis.