

Pasteurella

Classification

The genus *Pasteurella* belongs to the family Pasteurellaceae under the order Pasteurellales. There are more than 24 species under this genus of which veterinary importance are *Pasteurella multocida* sub-species *multocida*, *Pasteurella multocida* sub-species *gallicida*, *Pasteurella multocida* sub-species *septic*, *Pasteurella avium*, *Pasteurella canis*, *Pasteurella gallinarum*, *Pasteurella anatis* (now under *Gallibacterium anatis*), *Pasteurella haemolytica* (now *Mannheimia haemolytica*), *Pasteurella caballi*.

Morphology and staining

Pasteurella organisms are gram negative rods measuring 0.2 µm wide and 2.0 µm in length. Bipolarity of the cell is demonstrable by staining with polychrome methylene blue stain. Capsule can be demonstrated by staining with Indian Ink and Giemsa stain. The organisms are non motile, non sporulating coccobacilli.

Habitate

Most of the members of this genus are commensal parasite of animals present in upper respiratory tract and digestive tract.

Structure and composition

There are four types of capsular polysaccharide antigen of *Pasteurella multocida* viz A,B,D and E. Based on the somatic antigen eleven groups of *Pasteurella multocida* have been identified. *Pasteurella multocida* Type A contains hyaluronic acid. In some *Pasteurella multocida* and *Pasteurella haemolytica* strains express adhesion. Cell wall of *Pasteurella multocida* contains lipopolysaccharide and protein.

Cell products

Pasteurella produce numbers of substances associated with pathogenicity of the organism. Among the most important are the capsule which is antiphagocytic in nature. The lipopolysaccharide elicit inflammatory response and is toxic to respiratory tract and endothelial cells. Toxic outer membrane protein, iron regulated outer membrane protein, adhesions, leukotoxin and enzymes like hyaluronidase and neuraminidase are released by the organism.

Biochemical characteristics

Pasteurella organisms ferment glucose, sucrose, mannitol, mannose, sorbitol with production of acid.

Reduce nitrate to nitrite, produce hydrogen sulphide, catalase and oxidase positive MRVP . negative. Indol is formed by *Pasteurella* organisms except *Pasteurella haemolytica*.

Resistance to physical and chemical agents

Culture of the organism die within 1 to 2 weeks. Ultraviolet light disinfectants and heating at 55° C for 30 minutes are lethal for this bacteria. In carcasses of birds *Pasteurella multocida* can survive for longer duration of time. *Pasteurella* species especially from food animals increases resistant to tetracycline, penicillin and sulphonamides.

Reservoir

Pasteurellae are carried on mucous of susceptible host species. In fowl cholera one species may serve as reservoir for another.

Transmission

The organism is transmitted by inhalation, ingestion or bites and scratch wound. Environmental contamination contribute in indirect transmission of bovine haemorrhagic septicaemia and fowl cholera.

Growth characteristic

Pasteurellae are aerobes and facultative anaerobes. Grow best in overnight in presence of serum or blood of sheep, rabbit horse and bovine. Produce narrow zone of haemolysis on blood agar. On nutrient agar at 37 ° C produce clear, mucoid, smooth circular colonies. In broth culture uniform turbidity with powdery deposits are seen. *Pasteurella* organisms do not grow in MLA agar.

Disease pattern

The most common form of bovine pasteurellosis, involving *Pasteurella haemolytica* , biotype A serotype (A1), or *Pasteurella haemolytica* Type A (*Mannheimia haemolytica*) is shipping fever, a fibrinous pleuropneumonia or bronchopneumonia seen whenever cattle, especially calves, are transported, assembled and handled under stressful conditions. In sheep and goat septicaemic pasteurellosis occurs with or without intestinal involvement and much lower morbidity. *Pasteurella haemolytica* biotype A is involved in causing enzootic pneumonia in sheep. Gangrenous mastitis in late lactation characterised by acute systemic reactions accompanying disease of the udder is common and later on the part of the udder undergo necrosis (“blue bag”) and may slough. In swine fibrinous pneumonia associated with P. Multocida, often follows viral infections. Atrophic rhinitis in young pigs (3 weeks to 7 months) leads to turbinate destruction and secondary complications results from synergistic nasal infection by *Pasteurella multocida*, and *Brudetella bronchiseptica*. Fowl cholera, a systemic infection due to *Pasteurella multocida* (most commonly capsule Type A) is acquired by

ingestion or inhalation and affects mainly turkeys, water fowl and chickens. *Pasteurella multocida* in cat and *p. Canis* in dog are found alongside predominantly anaerobic flora in wound infections, serositis and foreign body lesions. *Pasteurella caballi* occurs in equine respiratory disease, usually in association with *Streptococcus zooepidermicus*. In small laboratory rodents *P. Pneumotropica*, a common commensal may contribute to opportunistic infections such as pneumonia. *Pasteurella multocida* cause wound infection in human resulting from bites or scratches.

In cattle and buffalo Haemorrhagic Septicaemia is an acute systemic infection with *Pasteurella multocida*, serotype 6:B or 6:E, occurring in tropical areas as seasonal epidemics with high morbidity and mortality. The disease occurs in the age group between 6 months to 2 years. Signs include high fever, depression, subcutaneous oedema, hyper-salivation and diarrhoea or sudden death. All excretions and secretions are highly infectious. Signs of conjunctivitis, sharp drop in milk yield, signs respiratory distress and abortion in pregnant animals are also noticed. In less acute cases localised oedema in subcutaneous region along with rise of temperature, severe dyspnoea and death occurs within 24 hours.

Post Mortem findings

Noticeable post-mortem findings observed are petechial haemorrhages in the serous membranes of thoracic cavity and pericardial sac, hepatisation of lungs, enlarged lymph nodes, congestion of abomasums.

Diagnosis

Provisional diagnosis can be made from the clinical symptoms. Confirmatory diagnosis is done by direct microscopic examination of the smears prepared from exudates, tissue impressions, sediments of transtracheal aspirations by staining with polychrome methylene blue stain and demonstration of bipolar coccobacilli. Isolation and identification of the organism can be done by inoculating oedema fluid and lung tissue on blood agar. Subcutaneous inoculation of the organism into laboratory animals like rabbit and mice cause death within 36 to 38 hours. Fluorescent antibody techniques, indirect haemagglutination and enzyme linked immunosorbent assay is used as diagnostic tool.

Treatment

Sulphonamides is the drug of choice. However, ox tetracycline, chloramphenicol and ampicillin are also useful in combating the infections caused by the organisms. In addition penicillin G can be used in treating the cases of fowl cholera.

Control

Killed *Pasteurella* adjuvant bacterin give protection up to 2 years in calves. Management practices directed at reducing stress are important in preventing pasteurellosis in livestock.

References

1. From Wikipedia, the free encyclopedia.
2. Hirsh, Dwight C.(1999): Veterinary Microbiology, Blackwell Science, Inc.
3. Sarma, D.K. (2008): A Text Book of Veterinary Bacteriology and bacterial Diseases.