Haemophilus *spp*

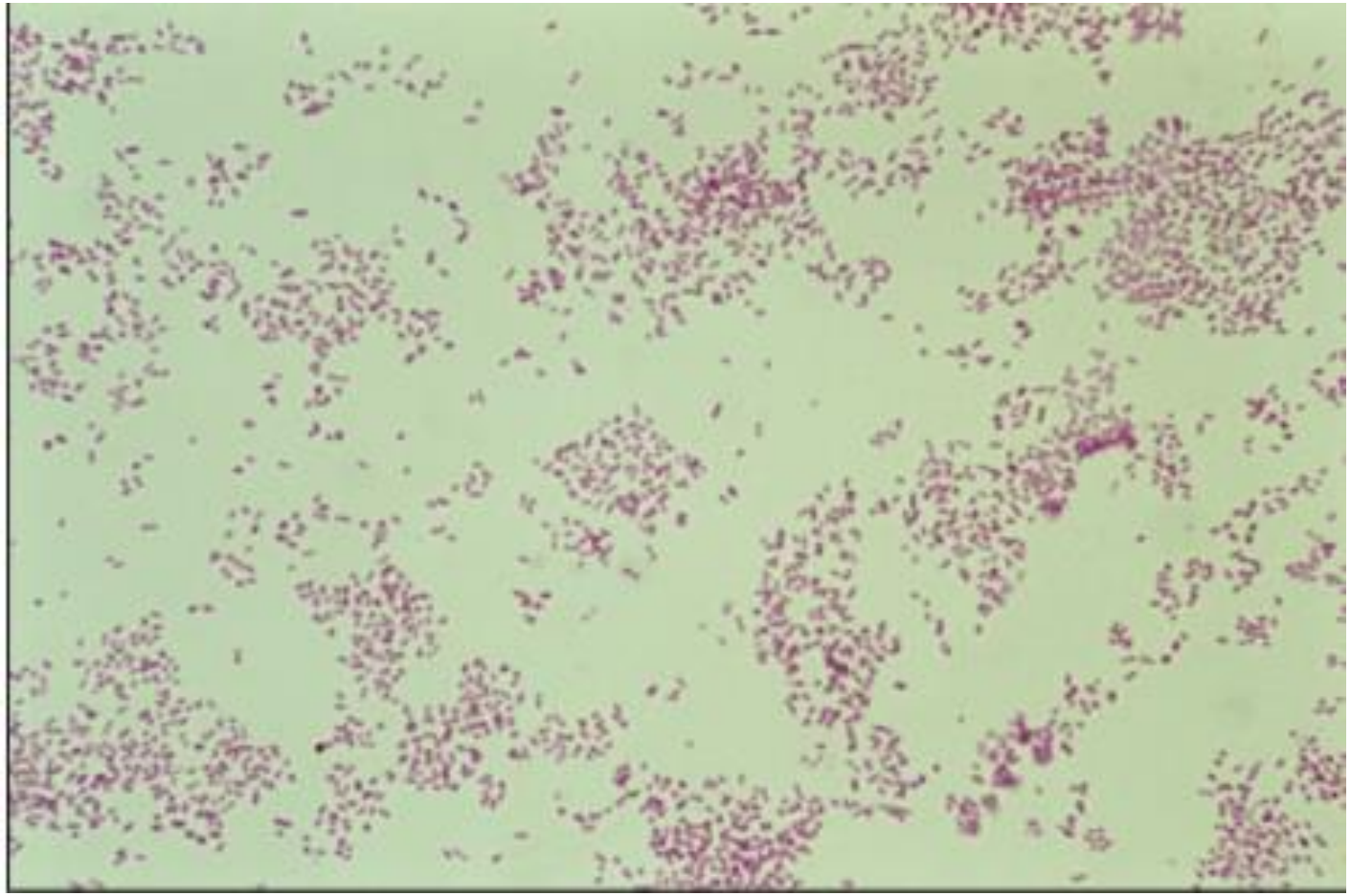
- *Haemophilus* spp. require for propagation one or both of two growth factors: porphyrins or nicotinamide adenine dinucleotide (NAD, NADP), originally called X (heat-stable), and V (heat-labile) factor, respectively.
- *Haemophilus parasuis,* a resident of the normal nasopharynx of swine, can cause septicemic disease or secondary respiratory infections.
- *Haemophilus paragallinarum* causes infectious coryza in chickens.
- *"Haemophilus somnus"* causes septicemic, respiratory, and genital infections in cattle.
- *"Histophilus ovis"* and *"Haemophilus agni"* causes septicemic, respiratory, and genital infections in sheep.

DESCRIPTIVE FEATURES

-Morphology and Staining

- *Haemophilus* spp. are less than a micrometer wide and 1 to 3 µm long, but sometimes form longer filaments.
- Some species *(H. influenzae, H. paragallinarum)* are encapsulated.

Haemophilus spp.
small Gram-negative rods coccobacillary.



-Cellular Constituents and Products

- The cell wall resembles that of other gram-negative bacteria.
- Capsules consist of polysaccharides.
- Heat-labile toxins have been found in *H. paragallinarum.*

-Growth Characteristics

- *Haemophilus* spp. on adequate media produce within 24 to 48 hours

- turbidity in broth and colonies 1 mm in diameter on agar.
- Growth factors may be supplied as hemin and NAD.
- A medium naturally containing them is chocolate agar.

-Biochemical Activities

Haemophilus spp. of animals are

- oxidase positive
- nitratase positive
- ferment carbohydrates.

-Resistance

Haemophilus spp. are readily killed by heat and die rapidly in culture and storage unless freeze dried or stored at - 70°C. At cool temperatures, *H. paragallinarum* survive in exudate for several days.

ECOLOGY

-Reservoir

- *Haemophilus parasuis* lives in the nasopharynx of normal swine.
- *Haemophilus paragallinarum* is more closely associated with the respiratory tracts of sick or recovered animals.
- *Haemophilus haemoglobinophilus, "H. somnus,"* and *"Histophilus ovis"* inhabit the normal lower genital tract.
- *Haemophilus somnus* is also found in normal bovine respiratory tracts.

-Transmission

Transmission of haemophili and related agents is probably

- airborne or by close contact.
- Indirect transmission is likely during epidemics.

Pathogenesis

Mechanisms

- The anti-phagocytic capsules and heat-labile cytotoxic factors of *H. paragallinarum* are suspected virulence factors.
- The lesions of *Haemophilus* infections also suggest endotoxin involvement.
- *"Haemophilus somnus"* adheres to epithelium and endothelium, is toxic to endothelial cells, is resistant to serum and phagocytic killing, and binds immunoglobulins like staphylococcal protein A.

Pathology

- All infections have suppurative components.
- Infection of lungs, body cavities, and joints tends to be serofibrinous to fibrinopurulent.
- Bacterial colonization of the meningeal vessels produces a thrombotic vasculitis leading to encephalitis and meningitis.
- Hemorrhagic necrotizing processes are caused by *"H. somnus."*
- Fowl coryza is marked by catarrhal inflammation with heterophil exudates.

Disease Patterns

- In chickens, infectious coryza (caused by *H. paragallinarum)* is an acute contagious upper-respiratory infection.
- It affects chickens of practically all ages.
- The signs include nasal discharge, swelling of sinuses, facial edema, and conjunctivitis.
- With air sac and lung involvement, rales may be detected.
- In the uncomplicated infection, mortality is low.
- Loss of productivity is the most damaging aspect.

- In cattle, *"H. somnus"* causes a septicemia leading to thrombotic meningoencephalitis and infarcts in brain and cerebellum.
- The pre-encephalitic stage is marked by high fever.
- *Haemophilus somnus"* occurs in pneumonic processes, usually with other agents, for example, *Pasteurella* spp.
- Isolations have been made from normal and inflamed female genitalia and from aborted fetuses.
- It is common in the genital tract of bulls.

- In sheep, *Haemophilus-like* organisms *("H. somnus," "Histophilus ovis", "H. agni")* cause
- respiratory and
- mammary infections,
- epididymitis of immature rams, and
- occasionally septicemias.

infectious coryza (caused by *H. paragallinarum*) is an acute contagious upper-respiratory infection. It affects chickens of practically all ages.

Epidemiology

- All the agents named, except for *H. paragallinarum,* inhabit normal mucous membranes of the respiratory or genital tract. Sources of infection are therefore often endogenous to herds or individuals.
- Respiratory and septicemic" *H. somnus*" infections are similarly related to stress factors, as their predilection for feed lots and the fall and winter months suggests. *Haemophilus spp*. are generally host-specific.

LABORATORY DIAGNOSIS

- Recovery of the organism from infected tissues or fluids is usually required to establish a diagnosis.
- Observation of gram-negative rods in these specimens prior to culture may suggest *Haemophilus* infection.
- Isolation of such an organism is followed by demonstration of a growth factor requirement.

- Organisms requiring X factor cannot convert delta aminolevulinic acid to urobilinogen and porphyrin. The porphyrin test determines this ability and X factor requirement most reliably.
- Definitive assignment to a species usually requires additional tests.
- Fowl coryza can be diagnosed by agglutination, agar gel immunodiffusion, and hemagglutination-inhibition tests.

TREATMENT

Most animal haemophili are susceptible to penicillin G, ceftiofur, and tetracyclines.

Quinn, P. J., Markey, B. K., Leonard,F. C., Hartigan, P., Fanning, S., Fitzpatrick, E. S. (2011). Veterinary microbiology and microbial disease. 2nd ed. Blackwell, UK.