Genus : Actinobacillus

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History:

- Organisms of the genus *Actinobacillus* were first described by Lignières and Spitz (1902) in actinomycotic lesions in cattle in Argentina.
- The authors referred to this organism as "actinobacille" based on its morphology and its association with the pathological lesion.
- In 1910, Brumpt proposed the name of *Actinobacillus lignieresii*.

Introduction

- Actinobacillus species are non - motile, Gram - negative rods (0.3 to 0.5 × 0.6 to 1.4µm) which may be pleomorphic and frequently have a coccobacillary appearance.
- In Gram-stained smear, the bacteria show both bacillus and coccus form together, known as 'morse code' appearances (dots and dashes appearance).
- These facultative anaerobes ferment carbohydrates, producing acid but not gas.
- Most species are oxidase – positive, catalase positive, and urease - positive.

Introduction

- The bacteria are non motile (both at room temperature and 37°C), nonsporing and nonacid fast.

- The pili and capsule are found in few strains of *A. pleuropneumoniae.* The slime layer is detected on the surface of other species such as *A. lignieresii, Actinobacillus suis* and *Actinobacillus equuli*.

- The slime layer is associated with stickiness of the bacterial colonies, enhanced resistance against chemical disinfectants, antibiotics and desiccation.

Natural Habitat

- Actinobacilli are commensals on mucous membranes of animals, particularly in the upper respiratory tract and oral cavity.
- As actinobacilli cannot survive for long in the environment, carrier animals play a major role in transmission.

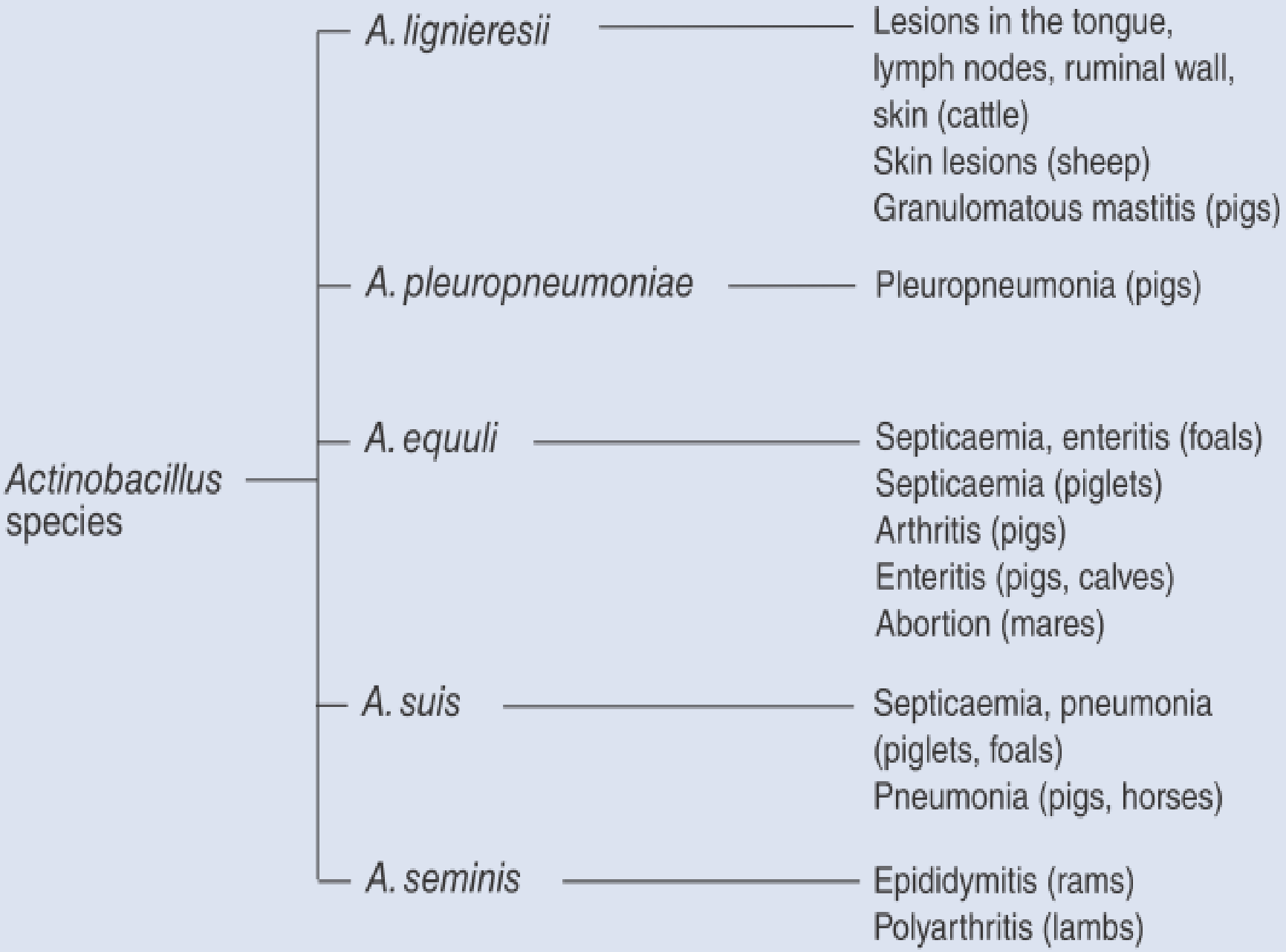
Actinobacillus species
A. lignieresii
Lesions in the tongue, lymph nodes, ruminal wall, skin (cattle)
Skin lesions (sheep)
Granulomatous mastitis (pigs)
A. pleuropneumoniae
Pleuropneumonia (pigs)
A. equuli
Septicaemia, enteritis (foals)
Septicaemia (piglets)
Arthritis (pigs)
Enteritis (pigs, calves)
Abortion (mares)
A. suis
Septicaemia, pneumonia (piglets, foals)
Pneumonia (pigs, horses)
A. seminis
Epididymitis (rams)
Polyarthritis (lambs)

Table 26.1 Differentiating features of *Actinobacillus* species.

Feature	*A. lignieresii*	*A. pleuropneumoniae*	*A. equuli*	*A. suis*
Haemolysis on sheep blood agar	–	+	v[a]	+
Colony type on blood agar	Cohesive	Variable	Cohesive	Cohesive
Growth on MacConkey agar	+	–	+	+
CAMP test with *S. aureus*	–	+	–	–
Oxidase production	+	v	+	+
Catalase production	+	v	v	+
Urease production	+	+	+	+
Hydrolysis of aesculin	–	–	–	+
Acid from:				
L-arabinose	v	–	–	+
lactose	+[b]	–	+	+
maltose	+	+	+	+
mannitol	+	v	+	–
melibiose	–	–	+	+
salicin	–	–	–	+
sucrose	+	+	+	+
trehalose	–	–	+	+

+, over 90% isolates positive. –, less than 10% isolates positive. v, variable reaction.
a, *A. equuli* subspecies *haemolyticus* are haemolytic.
b, slow reaction.

ACTINOBACILLOSIS IN CATTLE (WOODEN TONGUE)

- The aetiological agent, *Actinobacillus lignieresii*, is a commensal of the oral cavity and the intestinal tract.
- It can survive for up to 5 days in hay or straw.
- The organisms enter tissues through erosions or lacerations in the mucosa and skin.
- A localized pyogranulomatous response is associated with club colonies containing the bacteria.
- In addition, spread through the lymphatics to the regional lymph nodes may induce pyogranulomatous lymphadenitis.

- A chronic pyogranulomatous inflammation of soft tissues, is most often manifest clinically in cattle as induration of the tongue, referred to as timber (Wooden) tongue.
- Potentially important lesions occur in the oesophageal groove and the retropharyngeal lymph nodes.
- Animals with timber tongue have difficulty in eating and drool saliva.
- Involvement of the tissues of the oesophageal groove can lead to intermittent tympany.
- Enlargement of the retro-pharyngeal lymph nodes can cause difficulty in swallowing and stertorous breathing.

- Lesions of cutaneous actinobacillosis may be found on the head, thorax, flanks and upper limbs.
- Isolates of *A. lignieresii* obtained from lesions in horses are phenotypically similar to, but genetically different from, those in cattle and have been designated *Actinobacillus* genomospecies 1.

Diagnosis

- Induration of the tongue is characteristic of the disease and there may be a history of grazing rough pasture.
- Specimens for laboratory examination include pus, biopsy material and tissues from lesions at post - mortem.
- Gram - negative rods are demonstrable in smears from exudates.
- Pyogranulomatous foci containing club colonies may be evident in tissue sections.
- Cultures on blood agar (Small, sticky, non - haemolytic) and MacConkey agar (Slow lactose fermentation) are incubated aerobically at 37 ° C for 24 to 72 hours.
- Definitive identification is based on analysis of 16S rRNA gene sequences.

Property	**Wooden Tongue**	**Lumpy Jaw**
Causes	*Actinobacillus lignieresii*	*Actinomyces bovis*
Tissue involvement (Mouth)	soft tissues, especially tongue	Bone (hard) especially maxilla and mandible
Organism	Gram Negative	Gram Positive
Straus Test	Positive	Negative
Sulphur granules	Absent	Present
O_2 Requirement	Aerobic/ Microaerophilic	Anaerobic
Growth on Mac Conkey agar	Present	Absent
Mycelial growth (Filaments)	Absent	Present
G+C content of DNA	40-43mol. %	57-59mol. %
Catalase Test	Positive	Negative

Property	**Wooden Tongue**	**Lumpy Jaw**
Urease Test	Positive	Negative
Spread	Swollen tissue between the two bones of the lower jaw can cause the appearance of "bottle jaw."	begin breaking down the bone -the body tries to repair itself by creating new bone---creates honeycombed bone structures with tiny abscesses filled with pus.

Pleuropneumonia of pigs

- *Actinobacillus pleuropneumoniae* is the only organism within the genus considered to be a primary pathogen.
- Pleuropneumonia can affect susceptible pigs of all ages and occurs in major pig - rearing regions world-wide.
- This highly contagious disease occurs primarily in pigs under 6 months of age and appears to be increasing in prevalence as a consequence of intensive rearing practices.

Sleepy foal disease

- Sleepy foal disease is an acute, potentially fatal septicaemia of newborn foals caused by *Actinobacillus equuli*.
- The species is divided into two subspecies, *equuli* and *haemolyticus*.
- Both subspecies cause disease in horses but subspecies *equuli* has been isolated from septicaemia and abortion in pigs also.

Further Readings

- Clinical Veterinary Microbiology 2nd Edition 2013 By Bryan Markey
- Veterinary Microbiology and Microbial Disease