


DERMATOPHILUS

Learning objectives

To know in detail about,

- Disease caused by *Dermatophilus species*
- Development cycle of *Dermatophiuls congolensis*
- Tram-track appearance and strawberry foot rot
- Pathogenesis of mycotic dermatitis in sheep
- Haalstra's method for the isolation of *Dermatophilus congolensis*
- Different diagnostic methods of dermatophilosis

SYSTEMATICS

Domain	Bacteria
Phylum	<i>Actinobacteria</i>
Class	<i>Actinobacteria</i>
Subclass	<i>Actinobacteridae</i>
<u>Order</u> 	<i>Actinomycetales</i>
Suborder	<i>Micrococcineae</i>
Family	<i>Dermatophilaceae</i>
Genus	<i>Dermatophilus</i>

- *Dermatophylaceae* is a group of bacteria with mycelial filaments which divide transversely and in at least two longitudinal planes to form masses of coccoid or cuboidal cells, which characteristically become motile.
- They are Gram positive, non acid fast, aerobic and produce aerial mycelium when their growths are stimulated by 10% CO₂.
- *Dermatophilus congolensis*, *Dermatophilus dermatonomus* and *Dermatophilus pedis* are the pathogens causing variety of skin lesions in mammals, including man

HISTORY AND HABITAT

History

- Bovine disease was first described by Van Saceghem in 1915 in the Congo now known as Zaire in Africa.

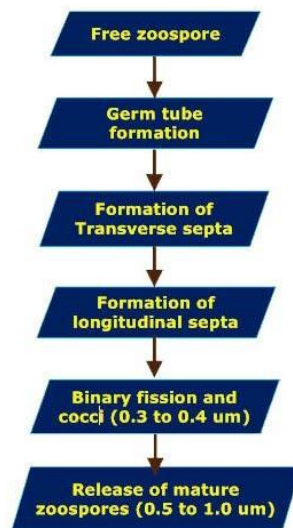
Habitat

- *Dermatophilus congolensis* is the only species in the genus thought to maintain itself in small foci of infection on a carrier animal or within scab particles in dust.
- It can survive in scab material for periods upto 3 years.

MORPHOLOGY

- *D. congolensis* is Gram positive, non acid fast and aerobic to facultatively anaerobic.
- It is filamentous and branching. Mature filaments are composed of motile, coccidial zoospores, in parallel lines, at least two abreast, resulting in a 'tram-track'-like appearance.
- The zoospores are about 1 μm in diameter. If the flakes of scab (collected from infections) are treated too roughly, when the smears are made, the filaments will disintegrate and only Gram-positive cocci (zoospores) will be seen.

Life cycle



- Transverse, horizontal and vertical septa form in the immature filaments dividing it into coccidial zoospores.
- When mature, these zoospores are motile by polar flagella and are infective.

CULTURAL AND BIOCHEMICAL CHARACTERISTICS

Cultural characteristics

- The bacterium is comparatively easy to culture and grows well on sheep or ox blood agar.
- An atmosphere of 5-10 per cent CO₂ enhances the growth of the organism, especially on primary isolation.
- The inoculated plates are incubated at 37°C (Optimum temp. 37°C.) for up to 5 days, although colonies may be seen after 24-48 hours incubation.

Colony morphology

- Small (about 1 mm) greyish-yellow, distinctly haemolytic colonies can be seen after 24-48 hours incubation.
- They are firmly adherent to the medium and are embedded in the agar.

- After 3-4 days, isolated colonies can be 3 mm in diameter and are rough, wrinkled with a golden-yellow colour. Older colonies can become mucoid.
- No growth occurs on Sabouraud dextrose agar.

Microscopic appearance

- Gram-stained smears from colonies do not show the characteristic 'tram-track' appearance seen on direct microscopy.
- Usually the smears reveal uniformly staining, Gram-positive, branching filaments but sometimes coccid forms predominate.

Biochemical characters

- *D. congolensis* is catalase-positive, urease-positive, gelatin-positive and produces acid from glucose, fructose and maltose.
- It is indole-negative, does not reduce nitrate and non-fermentative although acid is produced from certain carbohydrates.

PATHOGENESIS

- *Dermatophilus congolensis* causes very severe clinical disease and its infection is most common in tropical and subtropical regions.

Diseases caused by *Dermatophilus* species

- *Dermatophilus congolensis* mainly affects Cattle, horses, sheep and goats, but many animal species and man can be infected.
- The disease has many names
 - Cattle : Rain scald, Streptothricosis, Dermatophilosis
 - Sheep: Mycotic dermatitis (general infection), lumpy wool (wool- covered skin) and strawberry foot rot (skin of lower leg and coronet)
- The bacterium produces disease in many animal species. It is also a zoonosis.
- The common name for the disease is dermatophilosis or streptothricosis.
- As far as is known the bacterium is considered an obligate parasite, living only on animals.
- Infection is spread by contact, biting insects, fomites and by other unknown means.
- Moist conditions and high relative humidity are known to promote the prevalence of the disease.
- *D. congolensis* causes skin infections most commonly seen in cattle, sheep, goats, horses and polar bears in zoological collections.
- The infection is characterised by the formation of thick crusts which come away easily with a tuft of hair, leaving a moist, depressed area with bleeding points from capillaries.
- Infections can be localised but have a tendency to spread over large areas of the body and the morbidity and mortality can be high, especially in tropical regions.
- The position of the lesions varies with the predisposing conditions.
- In periods of high rainfall the lesions tend to occur along the backs of animals.
- Where there is a heavy infestation with *Amblyomma* ticks the lesions are present in the predilection sites of the ticks: dewlap, axillae, udder and scrotum.
- In the dry season, in tropical regions, when feed is scarce the lesions are on the muzzle, head and lower limbs due to the animals foraging in thorn-covered scrub.
- Though the disease does not lead to death in the adult cattle, deaths in young goats and cattle have been reported.

- In sheep, the disease is called mycotic dermatitis and is seen in three forms

Dermatitis of the wool-covered areas of the body or lumpy wool

- Dermatitis of the face and scrotum; and
- Dermatitis of the lower leg and foot, which may result in severe ulcerative dermatitis referred to as "strawberry foot rot".
- Infections have been reported in dogs and cats. In dogs, spontaneous dermatophilosis has been confined to the integumentary structures, whereas deeper tissue lesions in the form of abscesses have been reported in the felines.
- Lymph node enlargements with draining fistulas of the subcutaneous and submucosal tissues have also been reported in cats.

DIAGNOSIS AND IMMUNITY

Diagnosis

Based on Direct microscopy

- A tuft of hair that is plucked from the lesion usually detaches with scab material adhering to it.
- Grind up a small amount of scab material and place a little in 2 ml distilled water in a container and incubated for 3.5 hours at room temperature.
- Place the container, with lid removed, in a candle jar at room temperature for 15 minutes.
- The motile zoospores are chemotactically attracted to the carbon dioxide-enhanced atmosphere in the candle jar and move to the surface of the distilled water.
- Remove a loopful of fluid from the surface and inoculate a blood agar plate.
- Incubate the inoculated plate at 37°C for 72 hours under 5-10 per cent CO₂.
- Identification of this bacterium does not seem to pose any problems. Lesion and typical morphology are quite diagnostic.

Haalstra's Method for the Primary Isolation of *Dermatophilus congolensis*

- The organism grows well on blood agar plates within 24 to 48 hours as small grayish white colonies turning yellow to orange upon further incubation.
- Although the isolation of *D. congolensis* may not be necessary for a diagnosis of streptothricosis, Scab material contains many contaminants and Haalstra's method was developed to overcome this problem.

Based on Isolation and Identification

- Small pieces of material are shaved from the scab with a scalpel and the flakes of scab are softened in a few drops of distilled water on a microscope slide.
- A smear is made, taking care to leave a few flakes of scab material intact. The smear can be stained by either Giemsa or Gram stains.
- Giemsa is the better stain to show the characteristic morphology of the bacterium.
- Segmenting filaments and coccoid spores stain deep purple. The spores are seen in packets.

Immunity

- There is no known vaccine for immunization against the disease produced by *Dermatophilus*.
- Recovery from the disease seems to confer permanent immunity to reinfection.