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Dermatophilosis in Animals Disease Diagnostics

Dr R D Last – MMedVet (Path) - Consulting Specialist Veterinary Pathologist

Introduction

Dermatophilus is a common cutaneous and sometimes subcutaneous condition caused by the Gram positive actinomycetes *Dermatophilus congolensis* and other closely related *Dermatophilus* spp. This bacterium induces disease in a wide variety of wild and captive mammals and reptiles. Disease incidence is highest in the hot humid tropics and subtropics and in areas with heavy prolonged rainfall. In hot monsoon climates, cattle are the primary animals affected, and the disease is endemic in some portions of Africa.

In more temperate climates, sheep and goats are primarily involved. The disease is occasional in horses and camels, is rare in dogs, cats, pigs, African wildlife and humans. There is no apparent sex or age predilection, and neonatal infections have been reported in calves and lambs.

Pathogenesis

Multiple factors appear to be involved in pathogenesis of the natural disease, but the two most important factors are cutaneous trauma and prolonged wetting of the skin. Other predisposing factors include concurrent debilitating diseases, immunosuppression, contact with infected soil and reactivation in latent carriers. Dermatophilus forms part of the normal skin flora and primary sources of bacterial infection are normal carrier animals and crusts from infected animals. Zoospores can remain viable in crusts at temperatures of 28-31° C for up to 42 months.

D. congolensis initially replicates by hyphal growth producing filaments. These filaments undergo transverse and longitudinal septation to form parallel rows of coccoid bodies. The cocci are resistant to unfavourable conditions and are reproductively dormant until the appropriate wet conditions occur, when they are activated to become flagellated cocci (motile zoospores), which are released from the crusts and migrate to new sites on the same animal or onto a different animal.

Zoospores are unable to overcome the protective barriers of the hair, surface lipid film, and stratum corneum, and their entry is facilitated by breaks in the skin surface. Trauma from ectoparasites, shearing, dipping, barbed wire injuries, sharp stones, and scratches from sharp vegetation can act as portals of entry.

These repeated sequences of bacterial invasion, inflammation, and epidermal regeneration produce the thick laminar and parakeratotic crusts characteristic of dermatophilosis.

Dermal crusts that form is composed of alternating layers of keratinocytes, serous vesicles, and neutrophilic infiltrates.

Clinical Presentation

In **cattle** dermatophilosis presents as an acute, subacute, chronic or latent infection, and either localized or generalized in distribution. Lesions in adults are distributed over the head, top line of the neck and body to the tail and dorsal sides. Lesions confined to the face and ears are observed in young suckling calves, while animals in muddy conditions have lesions on legs and ventral aspects of the body (mammary gland, genital areas). In commercial livestock it is an economically erosive condition with decreased meat and milk production, downgrading of hides and infertility.

Severe udder and teat lesions may interfere with suckling by calves and result in decreased growth rates. Affected animals are predisposed to secondary infections. In animals where there is >50% of body involvement weight loss, dehydration and death have been documented. In ruminants there has also been a link between *Amblyoma* sp tick infestations and the development of dermatophilosis.

Two forms of disease are described in **sheep** namely mycotic dermatitis (also known as lumpy wool) and strawberry foot rot.

Lumpy wool is characterized by surface skin crusts and wool matting with exudates over the back and sides of adult animals and involving the face of lambs. The clinical characteristics of strawberry foot rot are crusts and inflammation of the carpus / tarsus and coronary bands of the hooves.

Dermatophilosis in **goats usually** presents as small 2-3 mm crusty lesions on the pinnae and tail of kids and large pyramidal crusts on the dorsal midline, sides, caudal thighs, mammary area and scrotum of adults. Lesions involving the distal limbs resemble strawberry foot rot of sheep. Concurrent infection with contagious ecthyma and pox may occur, and secondary infections with staphylococci, streptococci, or corynebacteria may develop. As is the case with cattle, tick infestations *(Amblyomma variegatum* and *Boophilus decoloratus)* are a risk factor for clinical dermatophilosis.

Dermatophilosis lesions in **camels** are present, especially on the rump, neck, flanks, and lower abdomen. The legs are generally spared. In one study, infected camels were often infested with *Hyalomma* spp. ticks, suggesting that ticks may have an important role in the pathogenesis of dermatophilosis in camels as well.

December 2021

In **equines** chronically affected animals (carrier animals) are believed to be the primary source of infection. These animals are at risk of infection when skin maceration from chronic moisture results in the release of infective zoospores. Mechanical transmission of the organism is by biting and non-biting flies and ticks. Predisposing factors resulting in decreased resistance of the skin is necessary for infection to occur, prolonged wetting by rain being the most important.

Cutaneous lesions are most commonly located on the dorsal aspect of the body and resemble areas of scalding (rain scald). In horses kept in muddy conditions and undergoing leg trauma develop lesions primarily on the distal extremities (greasy heel, mud fever). Frequent high pressure washing of show horses has resulted in some disease outbreaks.

In farmed **crocodiles and alligators**, a *Dermatophilus chelonae* like bacterium (re-classification to *Dermatophilus crocodyli* has been proposed), which is also adapted to growing at low temperature, has been associated with "brown spot disease" a skin condition characterized by brown crusting on the scales, most commonly at the junction between scales.

Distribution of scale lesions is usually restricted to the ventral abdomen. This condition is a common skin condition of farmed crocodiles, resulting in skin condemnations, and is frequently complicated by other bacterial and fungal infections.

This unique species of *Dermatophilus chelonae* adapted to poikilotherms, growing better at lower temperatures than for *D. congolense* and having low infectivity for mammals, has also been documented in **chelonids (turtles, tortoises) and lizards**.

Although not primary hosts, **cats and dogs** can be naturally infected through contact with infected soil, contact with another carrier animal, or reactivation of a latent infection. Dermatophilosis in **canines** is primarily a cutaneous disease.

Trauma associated with insect bites, particularly tick bites, predispose animals to infection and play a role in transfer of infection. Lesions in dogs are frequently found on haired portions of the skin and consist of dry, adherent scabs that become entrapped in surrounding hair.

In **cats** the primary route of infection is by contamination of puncture wounds with development of deep abscesses in subcutaneous tissues, muscle and lymph nodes. These submucosal or subcutaneous pyogranulomas produce chronic draining fistulas. Fever, anorexia, and regional lymphadenopathy with lymhnode abcessation is common in this species. Ulcerative granulomas involving the tongue and / or urinary bladder have also been described.

Dermatophilosis has been described in a wide range of **African wildlife** species including giraffe, antelope, buffalo and zebra.

The **Public Health Significance** of dermatophilosis is low. Humans are accidental secondary hosts of *D. congolensis.*

People handling infected carcasses or tissues, or in physical contact with infected animals, can develop exudative pustular dermatitis. However, clinical disease in people is extremely rare.

Disease Diagnostics

Direct Microscopy:

Small pieces of scab are collected, and the flakes of scab are softened in a few drops of distilled water on a microscope slide.

A smear is then 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. *Dermatophilus congolensis* is filamentous and branching.

Mature filaments are composed of motile, coccal zoospores, arranged in parallel lines, at least two abreast, resulting in a 'tram-track'-like appearance. If the flakes of scab are treated too roughly, when the smears are made, the filaments will disintegrate and only Gram-positive cocci (zoospores) will be seen, the classical tram tracks will not be visible.

The cytological appearance of *D. congolensis* are unique and their detection enables a presumptive diagnosis of dermatophilosis.

Bacterial culture:

The bacterium *D. congolensis* is comparatively easy to culture and grows well on sheep or ox blood agar.

Histopathology:

In most species (cats being the exception) cutaneous pathology is characterised by layered thick crust of alternating parakeratotic and / or orthokeratotic hyperkeratosis and dense accumulations of degenerating inflammatory cells, which are restricted to the epidermis (epidermitis), with minimal involvement of hair follicles or dermis.

Classical and diagnostic filamentous bacteria arranged in paired rows of cocci having a "stacked coins" appearance, visible in H&E, Giemsa and Gram stained sections.

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Figure 1. Bovine calf with crusted alopecic lesions extending dorsally from head, along the dorsal midline and down the sides.

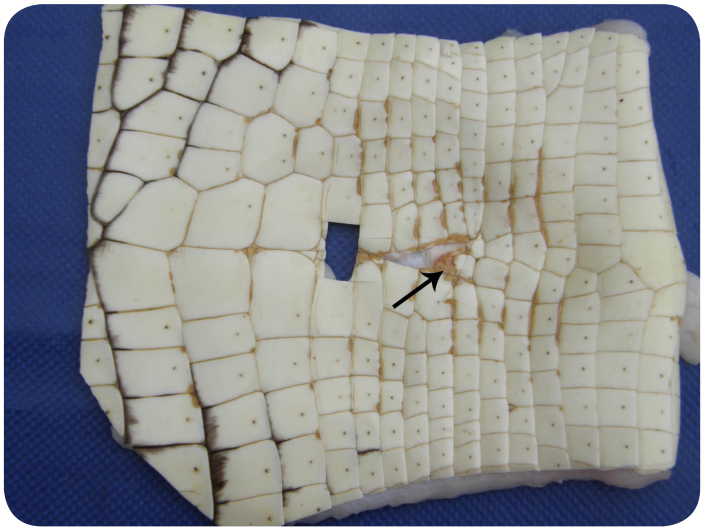


Figure 2. Farmed Nile crocodile ventral abdominal skin. "Brown spot disease" with brown crusting skin lesions predominantly covering junctions between scales (arrow).

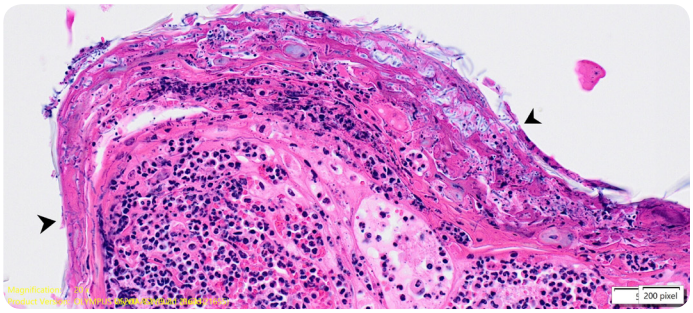


Figure 3. Histopathology of cutaneous dermatophilosis of sheep, H&E stain, demonstrating numerous filamentous bacteria composed of parallel chains of coccoid zoospores (arrows) within the surface parakeratotic crust. Large intra-epidermal pustules composed of predominatly neutrophils, both viable and degenerate.

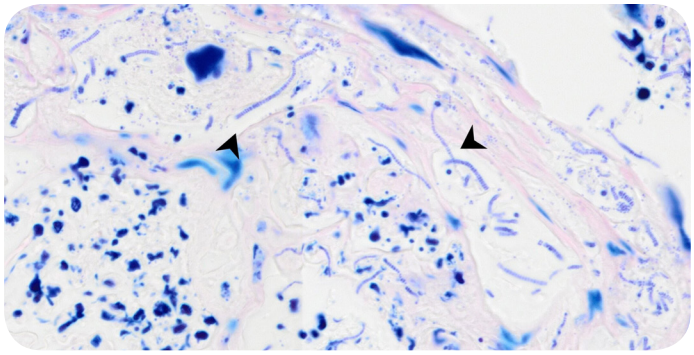


Figure 4. Histopathology of cutaneous dermatophilosis of sheep, Giemsa stain, highlighting the parallel array of coccoid zoospores creating the diagnostic "tram track" / "stacked coins" appearance (arrowheads).



The SAVA Stress Management Hotline is there to assist members who are experiencing personal problems by offering access to professional counselling/advice.

The hotline can assist with referrals or simply offer much needed emotional support when anxiety, depression, anger, grief, loneliness and fear are at their highest.



The following SAVA members are available on the SAVA stress management hotline. If required, they will refer you to professionals.

Ken Pettey	082 882 7356	ken.pettey@gmail.com
Tod Collins	083 350 1662	tcollins@isat.co.za
Aileen Pypers	072 599 8737	aileen.vet@gmail.com
Willem Schultheiss	082 323 7019	willem.schultheiss@ceva.com
Mike Lowry	084 581 2624	mikelowry@sai.co.za

MULTIPLE-CHOICE QUESTIONS

QUESTION 1

In hot monsoon climates, which of the following animal species are most commonly affected with dermatophilosis?
a. Sheep
b. Goats
c. Cattle
d. Pigs
e. Dogs

QUESTION 2

Which of the following predisposing factors are considered the most important to the development of clinical cutaneous dermatophilosis?
a. Concurrent debilitating diseases
b. Cutaneous trauma with prolonged wetting of the skin
c. Underlying immunosuppressive conditions
d. Contact with infected soil
e. Reactivation of infection in latent carriers

QUESTION 3

Which of the following stages of *Dermatophilus congolensis* are infective?
a. Hyphal growth
b. Filament stage
c. Coccoid bodies
d. Flagellated zoospores
e. Tram track stage of filament division

QUESTION 4

What is the most common lesion distribution of cutaneous dermatophilosis in suckling calves?
a. Topline of neck, back and tail
b. Face and ears
c. Dorsal sides
d. Legs
e. Ventral abdomen

QUESTION 5

What is the ideal temperature range for prolonged viability of *Dermatophilus* zoospores within the cutaneous crusts?
a. 20 to 23°C
b. 24 to 27 °C
c. 28 to 31°C
d. 32 to 35°C
e. 36 to 40°C

QUESTION 6

In camels with cutaneous dermatophilosis which of these body areas usually lack lesions?
a. Rump
b. Neck
c. Flanks
d. Lower abdomen
e. Legs

QUESTION 7

What is unique about the *Dermatophilus* species infecting farmed crocodiles?
a. Grows at low temperature
b. Requires high humidity
c. Requires pre-existing format scales
d. Forms part of the normal skin flora
e. Forms infective zoospores

QUESTION 8

What is the primary route of infection of dermatophilosis in cats?
a. Contact with infected soil
b. Contact with a carrier animals
c. Reactivation of latent infections
d. Contamination of puncture wounds
e. Tick bites

QUESTION 9

What is the most common clinical presentation of dermatophilosis in dogs?
a. Lymphadenopathy and lymph node abscessation
b. Dry adherent skin crusts affecting the haired skin
c. Subcutaneous pyogranulomas with fistula formation
d. Pododermatitis
e. Intramuscular abscesses

QUESTION 10

Which of the following stains are considered best for demonstration of *Dermatophilus* bacteria in cytological smears?
a. Gram stain
b. Diff Quick
c. Giemsa
d. PAS
e. ZN

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