

## BACTERIA ASSOCIATED WITH DERMATOPHILOSIS OF SHEEP AND GOATS IN SABONGARI, KADUNA STATE, NIGERIA

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### ABSTRACT

Dermatophilosis is a contagious zoonotic skin disease affecting a variety of mammalian species with grave consequences on domestic ruminants. Information on contaminating bacteria in lesions of dermatophilosis is scanty. The aim of this study was to isolate and identify bacterial contaminants from lesions of dermatophilosis of sheep and goats in SabonGari, Kaduna State, Nigeria. A total of 122 skin scabs including 102 from goats and 20 from sheep were collected and processed by direct examination and culture for the presence *Dermatophilus congolensis*. Both *D. congolensis* positive and *D. congolensis* negative samples were cultured for isolation and identification of bacterial contaminant. Direct examination revealed Gram-positive filaments having longitudinal and transverse division typical of *D. congolensis*. Colonies on blood agar were small, grayish-white and pitted into the medium..sixty-one (59.8%) goats and 12 (60.0%) sheep were positive for dermatophilosis. *Staphylococcus aureus*, *S. epidermidis*, *Micrococcus sp*, *B. subtilis* and *E. coli* were recovered from *D. congolensis* positive and *D. congolensis* negative sheep and goats. However, *S. aureus* was isolated more frequently from *D. congolensis* positive sheep (66.7%) and goats (50.8%) than *D. congolensis* negative sheep (37.5%) and goats (41.5%). Further work is recommended to determine the role of *S. aureus* in the pathogenesis of dermatophilosis. This paper reports bacterial contaminants in *Dermatophilus* lesions of sheep and goats in SabonGari, Kaduna State.

**Key words:** Bacterial contaminants, dermatophilosis, goats, sheep

### INTRODUCTION

Dermatophilosis is an economically important skin disease caused by a Gram-positive filamentous bacterium, *Dermatophilus congolensis* (Horadagoda *et al.*, 2020). The disease has been reported in different parts of the world affecting a wide range of mammalian species including man (Alejo-Cancho *et al.*, 2015). Dermatophilosis is more prevalent in cattle, sheep and goats especially in countries having warm and humid climatic conditions with attendant grave economic losses (Dalis *et al.*, 2020). Losses resulting from *Dermatophilus* infection especially in the livestock and leather industries are mainly due to poor quality hides and skin, decrease meat and milk production, and death or culling of severely Affected animals (Zaria, 1993).The clinical manifestation and the parts of the body affected may vary in different hosts depending on the nutritional and immune status, high humidity and mechanical disruption of the skin (Vieira *et al.*, 2017)..

It has been reported that chronic lesions as observed on the field do not establish through experimental infection with *D. congolensis* in the laboratory suggesting that development of chronicity under field conditions is therefore under the control of factors yet unknown (Zaria, 1993). Sutherland *et al.* (1983) demonstrated that the presence of *Pseudomonas aeruginosa* as a contaminant at the lesion site attracts *Lucillia cuprina* flies to oviposit and cause strike. Similarly, Bida (1973) observed that most cattle

affected by dermatophilosis did not appear to be clinically disturbed but continued to graze until the disease was complicated by secondary bacterial infection which may result in death due to toxemia. Complication of dermatophilosis by other bacteria that differ in antimicrobial susceptibility from *D. congolensis* may be the reason why treatment of dermatophilosis in ruminants is usually challenging. For instance, Coleman (1967) found that most severely affected animals lose condition and eventually die despite treatment. It is therefore important to identify the type of bacteria commonly found in lesions of dermatophilosis and determine their role in the pathogenesis of the disease in animals.

Whereas the literature is replete with publications on bacteria associated with bovine dermatophilosis (Okpa *et al.*, 1993; Abdullahi, 2001; Dalis *et al.*, 2010), there is a dearth of such information on small ruminants (Abdullahi, 2001). This paper investigates and documents bacteria associated with dermatophilosis of sheep and goats in SabonGari, Kaduna State, Nigeria .

## **MATERIALS AND METHODS**

Samples were collected using purposive sampling technique described by Martin *et al.* (1994). A total of 122 skin scabs (102 from goats and 20 from sheep) were aseptically collected in sterile containers and transported to the Veterinary Microbiology laboratory, Ahmadu Bello University, Zaria for analysis.

### **Laboratory examination**

Direct examination of skin scabs was performed as described by Quinn *et al.* (1999). Briefly, impression smears were made from moist, soft materials obtained from the concave surface of the scabs on clean grease-free glass. The slides were air dried, heat fixed and stained with Gram stain. The stained smears were examined using the oil immersion lens of a light microscope (Nikon, ECLIPSE-E100, 824592, China). The presence of Gram-positive filamentous, branching organism having both transverse and longitudinal septa was considered positive for *D. congolensis*.

### **Isolation of *D. congolensis* in culture**

All the samples including those that were positive and those that were negative by direct examination were processed for isolation of *D. congolensis* using the modified Haalstra's technique as described by Van Breuseghem *et al.* (1976). The plates were examined for small, beta-hemolytic colonies that are pitted into the medium. Smears were made from suspected colonies, Gram-stained and examined using oil immersion objective of a light microscope (Nikon, ECLIPSE-E100, 824592, China) for presence of Gram- positive filamentous organism that divides transversely and longitudinally consisting of four or more transverse rows of cocci.

### **Isolation and Characterization of Aerobic Bacteria from Scabs**

Moist materials from the inner portion of the scabs were inoculated onto both blood agar and MacConkey agar plates and incubated at 37 °C for 24 h. Isolated bacteria were identified as described by Cowan and Steel (2004).

### **Statistical analysis**

Data were presented in percentages and graphs. Chi-square method was used to test for association between bovine dermatophilosis and isolated bacteria. P-values less than or equal to 0.05 were considered significant.

### **Results**

Infected animals observed with thick, crusty lesions involving the ears and muzzle (plate 1A). Out of 122 skin scabs (102 from goats and 20 from sheep) processed by direct microscopic examination, 73 (59.8%) including 61 (59.8%) and 12 (60.0%) from goats and sheep respectively were positive for

*D. congolensis*. Microscopically, a Gram-positive, filamentous organism having both transverse and longitudinal septa typical of *D. congolensis* was seen (plate IB).



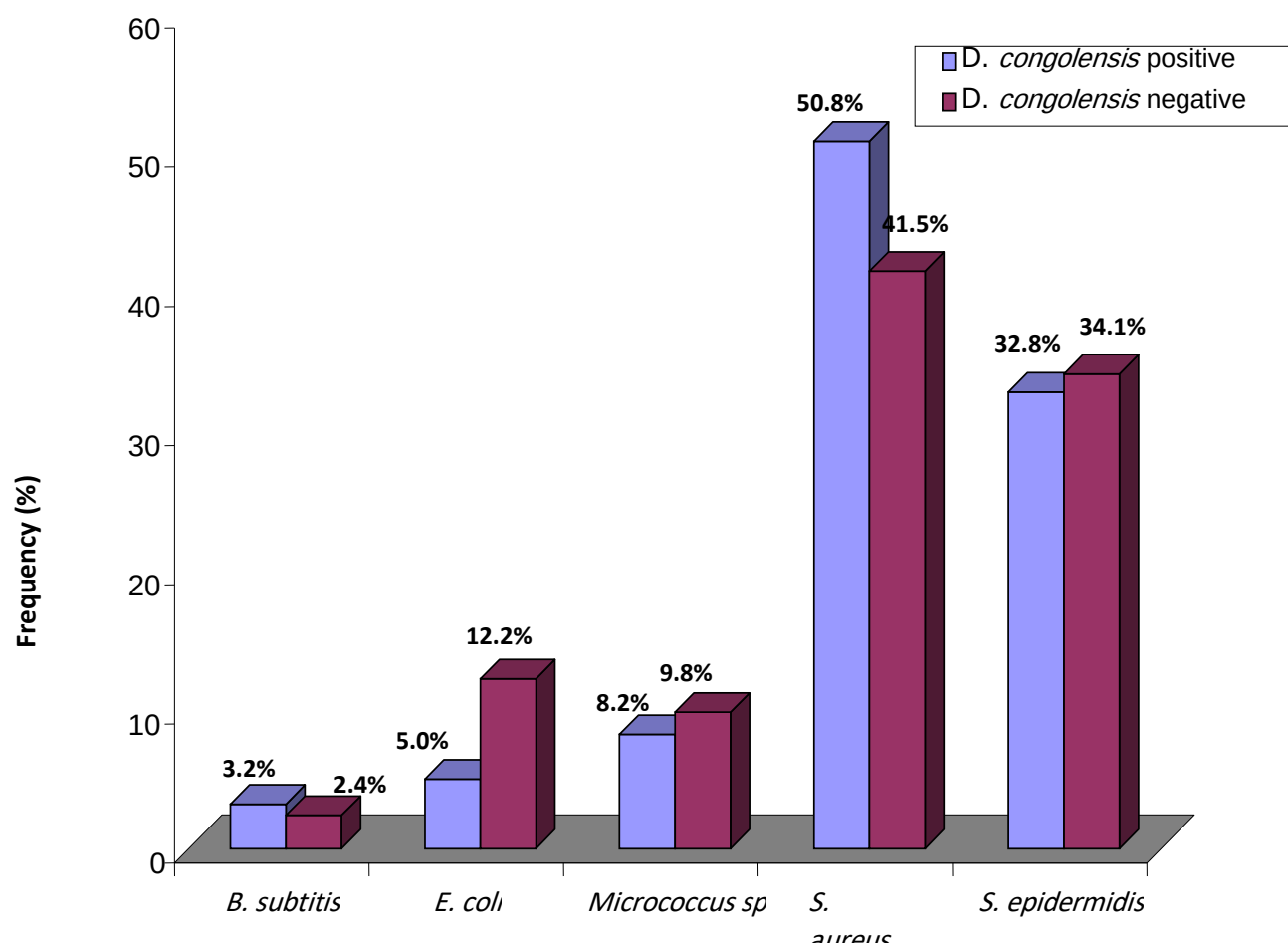
**Plate I:** A) A group of *Dermatophilus* affected sheep, Note the thick, crusty lesion on the muzzle and ears (arrow). B. *fDermatophilus congolensis* stained with Gram-stain (x1000). Note the Gram-positive filaments with multiple rows of cocci (rail road appearance) (arrow).

#### **Isolation of *D. congolensis* in culture**

Out of the 122 skin scabs (102 from goats and 20 from sheep) cultured on blood agar, 65 (53.3%) including 56 (55.0%) and 9 (45.0%) were positive for *D. congolensis* from goats and sheep respectively. Colonies of *D. congolensis* were small, grayish-white and adherent to the medium. All the samples that were negative by direct examination were also negative for culture.

#### **Other bacteria isolated from goats**

Out of the 102 including 61 *D. congolensis* positive and 41 *D. congolensis* negative scabs processed for isolation of other bacteria, *Staphylococcus aureus* was isolated from 31 (50.8%) of *D. congolensis* positive lesions while *S. epidermidis*, *Micrococcus* sp, *B. subtilis* and *E. coli* were recovered from 20 (32.8%), 5 (8.2%), 2 (3.2%) and 3 (5.0%) respectively of *D. congolensis* positive lesions. *Staphylococcus aureus* was isolated from 17 (41.5%) of *D. congolensis* negative lesions while *S. epidermidis*, *Micrococcus* sp, *B. subtilis* and *E. coli* were obtained from 14(34.1%), 4 (9.8%), 1 (2.4%) and 5 (12.2%) respectively of *D. congolensis* negative lesions. There was no significant association between the isolation of these bacteria and *Dermatophilus* infection ( $p>0.05$ ) (fig 1).



### Other bacteria isolated from sheep

Out of the 20 including 12 *D. congolensis* positive and 8 *D. congolensis* negative sheep scabs processed for isolation of other bacteria, *Staphylococcus aureus* was isolated from 8 (66.7%) of *D. congolensis* positive lesions while *S. epidermidis*, *B. subtilis* and *E. coli* were recovered from 1 (8.3%), 2 (16.7%) and 1 (8.3%) of *D. congolensis*- positive lesions. *Staphylococcus aureus* was isolated from 3 (37.5%) of *D. congolensis*- negative scabs whereas *S. epidermidis*, *B. subtilis* and *E. coli* were obtained from 1 (12.5%), 3 (37.5%) and 1 (12.5%) of *D. congolensis*- negative lesions. There was no significant association between the isolation of these bacteria and dermatophilosis ( $p>0.05$ ) (fig 2).

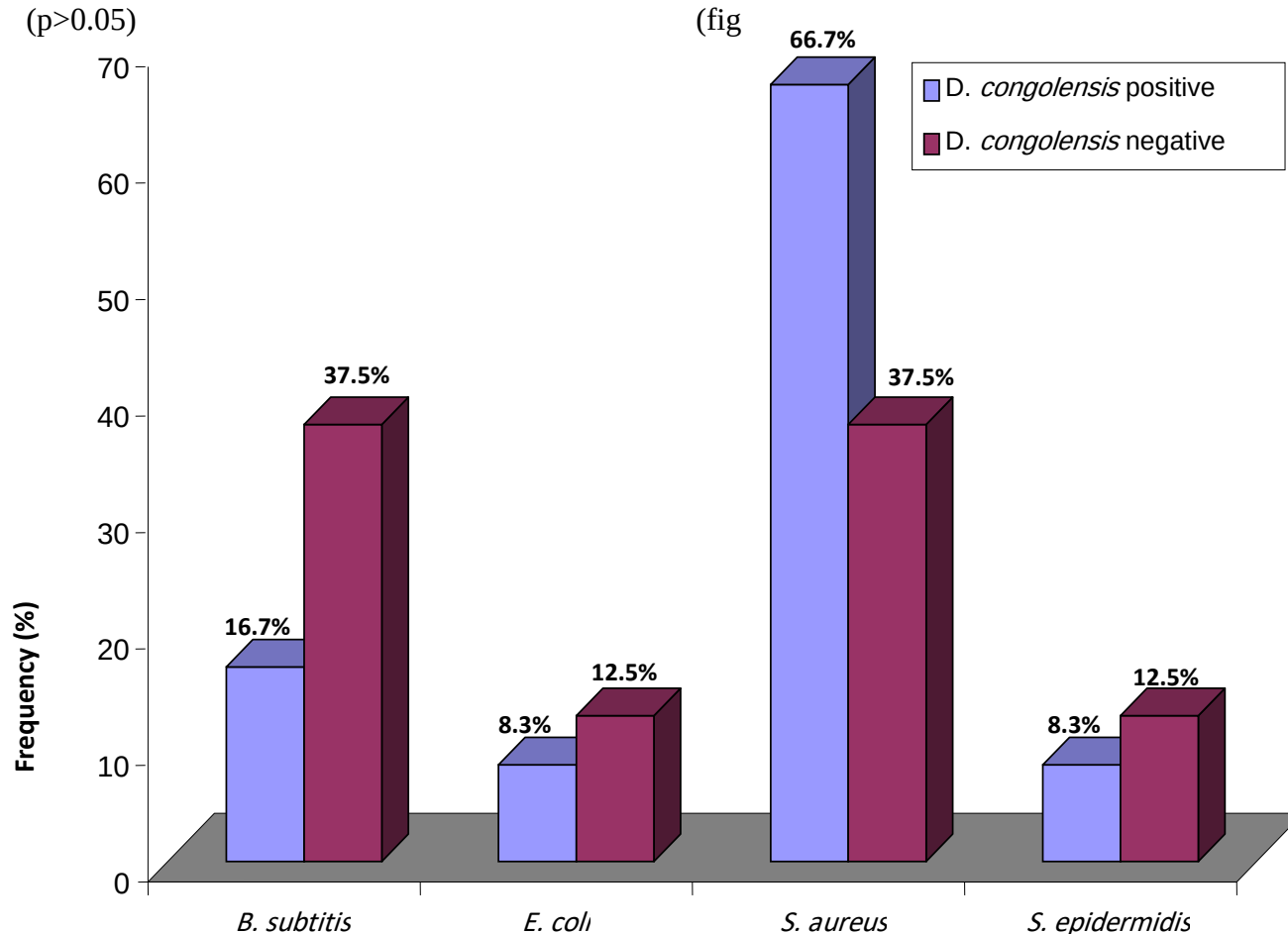


Fig 2: Bacterial isolates from *D. congolensis* positive and *D. congolensis* negative sheep

## Discussion

The detection rates of *D. congolensis* were 60.0% and 59.8% in sheep and goats respectively suggesting that the disease is a health problem among small ruminants in the study area. The diagnosis was based on clinical signs, direct examination and isolation of etiologic agent in culture. The clinical manifestation of dermatophilosis in this study is consistent with the findings of Loria *et al.*, (2005) who described *Dermatophilus* lesions in small ruminants as thick and crusty usually confined to the head region especially around the ears and muzzle.

The microscopic morphology of *D. congolensis* in the present report compares to the branching filaments with cocci arranged in vertical and horizontal rows reported by Chitra *et al.* (2017). This characteristic appearance has been described as diagnostic for dermatophilosis because it differentiates *D. congolensis* from other closely related organisms such *Nocardia* and *Streptomyces* species which do not produce both transverse and longitudinal septa. Occasionally, the distinctive morphology may not be seen in smears made from dried scab material especially from recovering animals. In this circumstance, isolation of the etiologic agent in culture is imperative for confirmation of diagnosis.

The cultural appearance of *D. congolensis* in this study which was small, grayish-white and adherent to medium confirms the report of Chitra *et al* (2017). However, the colony morphology of *D. congolensis* not consistent as a single strain may give rise to different forms under varying conditions (Zaria, 1993).

It is generally agreed that skin samples submitted to the laboratory for the isolation of *D. congolensis* are often contaminated with various species of bacteria (Okpa *et al.*, 1993, Abdullahi, 2001). The isolation of *S. aureus*, *S. epidermidis*, *Micrococcus* sp, *B. subtilis* and *E. coli* from *D. congolensis* positive samples of both sheep and goats in this study confirms the report of Abdullah (2001) that the most common contaminants encountered in the lesion of dermatophilosis are species of *Staphylococcus*, *Streptococcus*, *Micrococcus*, *Pseudomonas*, *Proteus* and *E. coli*.

Although there was no significant association between any of the isolated bacteria and dermatophilosis in both sheep and goats, *S.aureus* was isolated more frequently from *D. congolensis* positive than *D.congolensis* negative sheep and goat samples, suggesting that this bacterium may play some role in the pathogenesis of dermatophilosis in small ruminants. It has been found that *Staphylococcus aureus* and *Streptococcus pyogenes* produce several toxins that can cause localized destruction or systemic symptoms (Hackett and Stevens, 1993). Perhaps the large quantities of secretory metabolites from bacteria contribute significantly in maintaining and sustaining hypersensitivity reaction capable of maintaining *D. congolensis* at the lesion site in natural infection (Davis and Philpott, 1980). Further work should be conducted to determine the role of *S.aureus* in the pathogenesis of dermatophilosis.

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