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Full Length Research Paper

Bacteria associated with bovine dermatophilosis in Zaria, Nigeria

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A study was carried out to determine the type of bacteria associated with bovine dermatophilosis in Zaria, Nigeria. Skin samples obtained from two hundred and eleven cattle with skin lesions suspected to be dermatophilosis were processed for bacteriology. One hundred and sixty-seven (79.1%) samples were positive for *Dermatophilus congolensis*, while 44 (20.9%) were negative. Both *D. congolensis*-positive and *D. congolensis*-negative samples were processed for isolation of other bacteria and the data was analyzed using Chi square test. *Staphylococcus aureus, Staphylococcus epidermidis*, *Bacillus subtilis*, *Micrococcus spp, Corynebacterium* spp., *Escherichia coli*, *Proteus* spp and *Pseudomonas* spp . were isolated from both *D. congolensis*-positive and *D. congolensis*-negative scabs. However, the rate of recovery of *S. aureus* from *D. congolensis*-positive cattle was significantly ($P < 0.05$) higher than the rate of its recovery from *D. congolensis* negative cattle. There was no significant difference ($P > 0.05$) between the occurrence of the other isolates in *D. congolensis*- positive and *D.congolensis*-negative cattle. It was concluded that *S. aureus* could be a major complicating factor in naturally occurring dermatophilosis of cattle. The need to investigate the role of bacteria particularly that of *S. aureus* in the development of bovine dermatophilosis was emphasized.

Key words: *Dermatophilus congololensis,* bovine skin, associated bacteria, Zaria, Nigeria.

INTRODUCTION

Dermatophilosis is a contagious zoonotic skin disease caused by a gram-positive *actinomycete*, *Dermatophilus congolensis.* The disease in cattle is characterized by acute or chronic, local or progressive and sometimes fatal exudative dermatitis, which starts as an erythema, progressing through serous exudation, drying to form characteristic matting of the hair (Zaria, 1993; Abdullahi, 2001; Ambrose et al., 1999; Loria et al., 2005).

The type and density of bacteria are determined by anatomic location, local humidity, the amount of sebum and age (Aly, 1991). Persistent colonization is the result of the ability of bacteria to adhere to skin epithelium, grow in a relatively dry acidic environment and rapidly re-adhere during the normal process of desquamation (Feingold, 1986). Resident bacteria on the skin can become pathogenic especially when there is a break in skin continuity (Katarina et al., 2001). Bacteria are capable of producing hypersensitivity reaction just as plant pollens and moulds do. *Staphylococcus aureus* and *Streptococcus pyogenes* produce several toxins that can cause localized destruction or systemic symptoms (Hackett et al., 1993).

Bida (1973) in his reports 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

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result in death due to toxemia.

In a study of bacterial flora of the normal bovine skin in Nigeria, Nwufoh and Amakiri (1981) isolated *Staphylococcus epidermidis*, β-hemolytic *Streptococcus*, *Escherichia coli* and *Bacillus subtilis.* There is a consensus amongst experts in the field that skin samples submitted to the laboratory for isolation of *D. congolensis* were usually contaminated with various species of bacteria. The most common contaminants encountered in the lesion of dermatophilosis include species of: *Staphylococcus*, *Streptococcus*, *Micrococcus, Pseudomonas*, *Proteus* and *E. coli* (Abdullahi, 2001; Chodnik, 1956; Okpa et al., 1991; Sutherland et al., 1983). However, there is paucity of information regarding the most frequently isolated bacteria from dermatophilosis lesions of cattle in the warm climatic zone of Northern Nigeria.

This study was aimed at determining the bacteria that are associated with bovine dermatophilosis in Zaria, a warm climatic zone of northern Nigeria.

MATERIALS AND METHODS

One thousand, nine hundred and twenty cattle from various localities in Zaria were examined for skin lesions. Skin samples were obtained from two hundred and eleven cattle with skin lesions suspected to be dermatophilosis for microbiology. Samples were collected aseptically in sterile containers and submitted to the Diagnostic Microbiology and Histopathology Units of the Veterinary Teaching hospital, Ahmadu Bello University, Zaria for examination and confirmation.

Laboratory examination

Isolation of *D. congolensis*

In order to confirm infection, isolation of *D. congolensis* was carried out using the modified Haalstra's technique as described by Van Breuseghem et al. (1976). Briefly, skin scabs were minced with a sterile scalpel blade and placed in Bijou bottles. Five milliliters of sterile water was added to each of the specimen in the Bijou bottles. The bottles were closed loosely and incubated at 37°C in a candle jar for 30 min. One loopful from the surface fluid in each of the bottles was inoculated on to 7% defibrinated sheep blood agar plate. The inoculated plates were incubated at 37°C in a candle jar for 48 h. The plates were examined for colonies of *D. congolensis*. Smears were made from suspected colonies on each of the plates, gram-stained and examined with the oil emersion objective for morphology typical of *D. congolensis*. *D. congolensis*-positive samples were separated from *D. congolensis*-negative specimens

Isolation and characterization of other bacteria

Both *D. congolensis*-positive and *D. congolensis*-negative samples were inoculated on 7% defibrinated sheep blood agar and MacConkey agar using sterile bacteriological loop. All inoculated plates were incubated aerobically at 37°C for 24 h.

Bacterial isolates were identified as described by Cowan and Steel (2004) and the data was analyzed using the Chi square test described by Thrusfield (1997).

RESULT

Bacteria were isolated from all the 167 (100%) *D. congolensis*-positive scabs, while only 38 (86.4%) of *D. congolensis*-negative scabs yielded bacterial growth, the remaining 6 (13.6%) were negative. *S. aureus* was isolated from 28.0% of *D. congolensis* positive lesions, while *S. epidermis, B. subtilis*, *Micrococcus* spp., *Corynebacterium* spp., *E. coli, Proteus* spp. and *Pseudomonas spp* were recovered from 24.6, 20.4, 10.8, 3.6, 5.0, 5.4 and 2.4% of *D. congolensis* positive lesions respectively. *S. aureus* was isolated from 6.8% of *D. congolensis* negative lesions, while *S. epidermidis*, *B. subtilis, Micrococcus* spp., *Corynebacterium* spp*., E. coli, Proteus* spp. and *Pseudomonas spp* were obtained from 27.3, 25.0*,* 13.6, 2.3, 6.8, 2.3 and 2.3% of *D. congolensis* negative lesions, respectively (Figure 1). There was significant association ($P < 0.05$) between *S. aureus* isolation and *D. congolensis* infection. However, no significant association ($P > 0.05$) was found between the occurrence of the other isolates and dermatophilosis.

A variety of lesions of dermatophilosis were observed. Some of the cattle examined had few papules, together with some hard, dry, crusty lesions which were confined to certain areas of the body, particularly the back (Figure 2). In others, the lesions were generalized and covered the whole body especially the back, neck, the perineal region, lower limbs, tail, mouth and ears of the affected animals (Figure 3).

DISCUSSION

The occurrence of *S. aureus, S. epidermidis*, *B. subtilis*, *Micrococcus spp, Corynebacterium* spp., *E. coli*, *Proteus* spp. and *Pseudomonas* spp*.* in both *D. congolensis*-positive and *D*. *congolensis*-negative scabs, agree with the reports of Okpa et al. (1991) and Abdullahi (2001). Similarly, the rate of recovery of *S. aureus* from *D. congolensis*-positive scabs which was significantly ($P < 0.05$) higher than the rate of its recovery from *D. congolensis*-negative scabs and the non-significant difference ($P > 0.05$) between the occurrence of the other isolates in *D. congolensis*-positive and *D. congolensis*-negative samples, were consistent with previous reports (Okpa et al., 1991; Abdullahi, 2001). This could be attributable to the presence of various toxins and enzymes in *S. aureus* which enables it to invade tissues of humans and animals where it causes a variety of purulent inflammatory diseases (Jones et al., 1997).

Commensal bacteria could protect the host from pathogenic bacteria directly by bacteriocin production, production of toxic metabolites, induction of a low reduction oxidation potential, depletion of essential nutrients, prevention of adherence of competing bacteria, inhibition of translocation and degradation of toxins. Commensal bacteria compete for nutrients, niches and receptors. *S. epidermidis* had been reported to bind

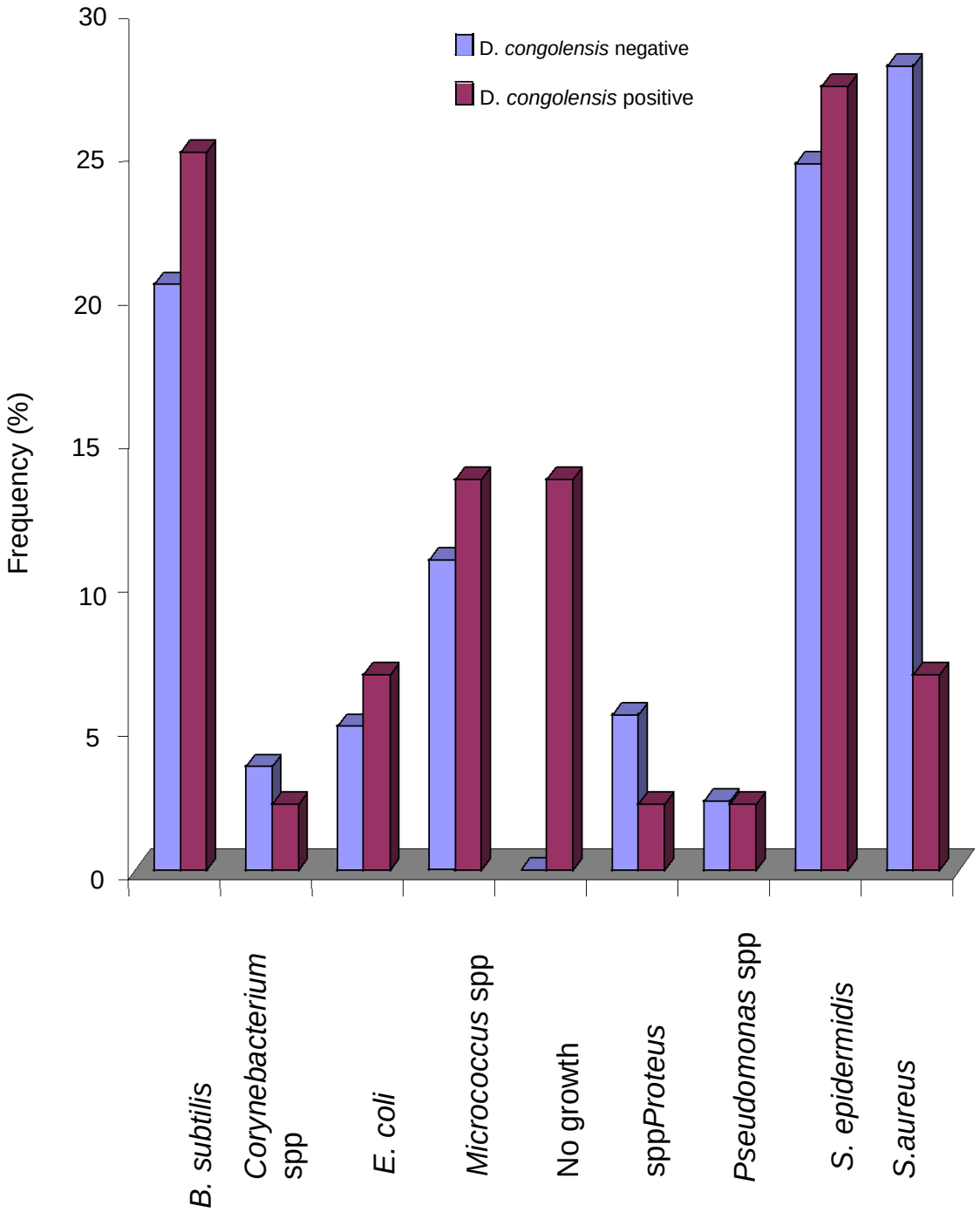

Figure 1. Bacterial Isolates from *D. congolensis* positive and *D. congolensis* negative cattle.

kerotinocyte receptors and inhibit adherence of virulent *S. aureus* (Bibel et al., 1983). They could however, become pathogenic especially when there is a break in skin continuity (Katarina et al., 2001). It is possible that 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).

The occurrence of dermatophilosis lesions on the back, neck, the perineal region and lower limbs agrees with previous finding (Dalis et al., 2009). We conclude that there is a statistically significant association between the isolation *S. aureus* and the occurrence of dermatophilosis

Figure 2. A group of cattle showing lesions of dermatophilosis (arrow).

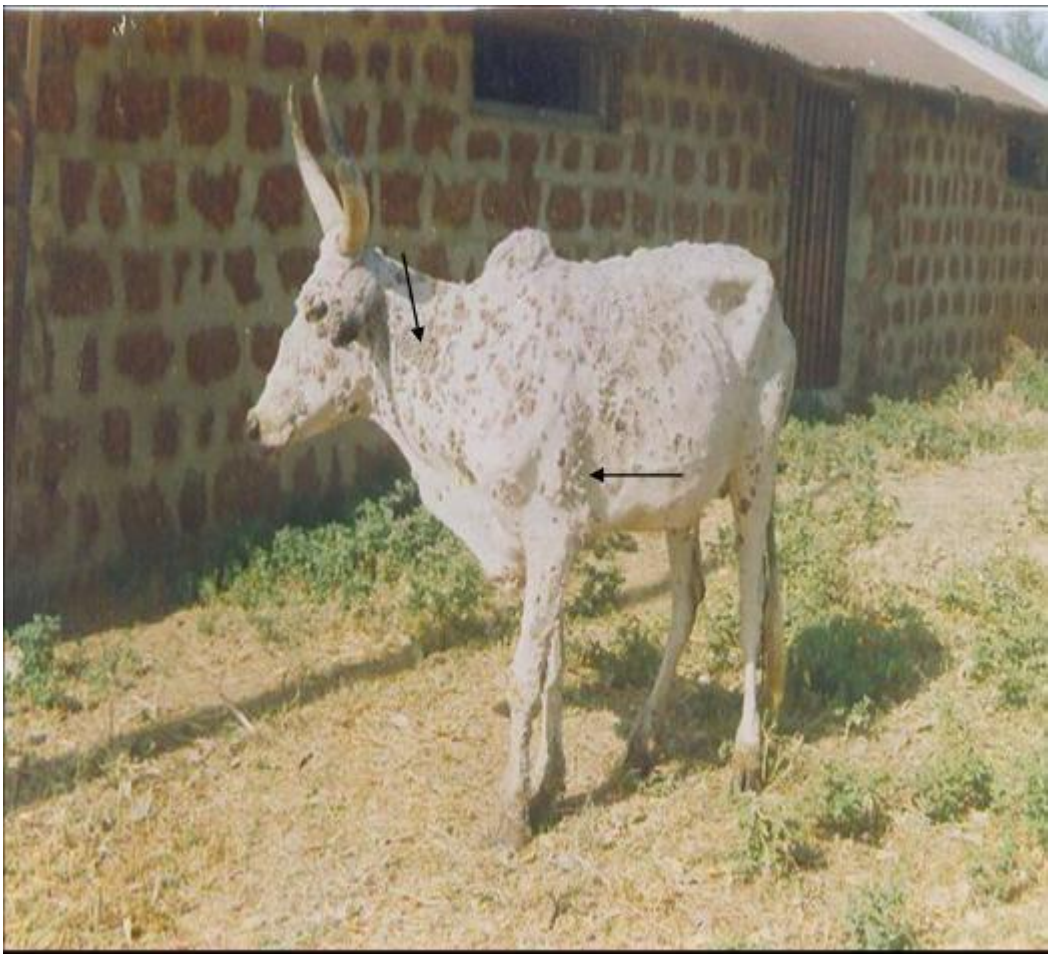

Figure 3. A cow with generalized dermatophilosis lesions (arrow).

in cattle. Therefore, it is possible that *S. aureus* could be a major complicating factor in naturally occurring bovine dermatophilosis. The role of bacteria, particularly that of *S. aureus* in the development of bovine dermatophilosis need to be investigated.

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