An outbreak of ringworm caused by *Trichophyton verrucosum* in a group of calves in Vom, Nigeria

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Accepted 5 February, 2014

An outbreak of ringworm in young calves is reported from Vom in Nigeria. Twelve out of fourteen calves were observed to have skin lesions consistent with dermatophytosis. Lesions were seen mostly around the eyes and neck. Skin scrapings were collected from the affected areas and processed for mycology. *Trichophyton verrucosum* was isolated from all the affected calves. This study has shown that *T. verrucosum* can be a problem to watch for in calves in this particular environment, both as a zoonosis and economic importance as a result of damage to hides and skin. The need to study the prevalence of the disease among the cattle population in the state and country with a view to instituting preventive and control measures was emphasized.

**Key words:** Dermatophytosis, outbreak, calves, Nigeria.

**INTRODUCTION**

Ringworm (dermatophytosis) is an infection of the superficial, keratinized structures of the skin and hair of man and animals. The disease is caused by a group of keratinophilic filamentous fungi called dermatophytes in the Genera *Trichophyton*, *Microsporum* and *Epidermophyton* (Gudding and Lund, 1995).

Animals are infected by contact with arthrospores (asexual spores formed in the hyphae of the parasitic stage) or conidia (sexual or asexual spores formed in the "free living" environmental stage). Transmission between hosts usually occurs by direct contact with a symptomatic or asymptomatic host (Murray et al., 2005). It had been reported that housing animals in close proximity to each other for long periods in the presence of infected debris was responsible for the high incidence of the disease in winter (Al-Ani et al., 2002). However, the disease appears to be more common in tropical than temperate climates, and particularly in countries or areas having hot and humid climatic conditions (Radostits et al., 1997).

The typical lesion in cattle is a heavy, grayish-white crust that is raised perceptibly above the skin, affecting young calves' more than adult cattle (Cam et al., 2007; Akbarmehr, 2011). Dermatophytosis had been considered the most common zoonosis worldwide, affecting more children than adults (Achterman and White, 2012). Studies on human skin infections revealed that dermatophytosis and other superficial fungal infections constitute a major public health problem in Nigeria (Adeleke et al., 2008).

Whereas the literature is replete with information on human dermatophytoses (Ameh and Okolo, 2004; Adeleke et al., 2008; Nweze, 2010), very little information on animal ringworm have been documented in Nigeria. While there are some information on dermato-
phytosis of goats (Chineme et al., 1980) and pet animals (Adekeye et al., 1989), to our knowledge, no studies on ringworm infection in cattle have been published from this country.

This paper focuses on the outbreak of ringworm in a group of calves in Vom, Nigeria.

MATERIALS AND METHODS

Twelve out of fourteen (85.7%) calves aged between four and eight months were observed to have skin lesions consistent with dermatophytosis. The calves were kept indoors and in close contact with each other. They were fed concentrate and hay and allowed to suckle from their dams in the morning during milking. The dams and other adult cattle in the herd were physically examined for the presence of skin lesions. Skin samples were collected from infected animals by first disinfecting the affected area by cleaning it with cotton wool soaked in 70% ethyl alcohol. Skin scrapings were collected by scraping the margin of the lesions using sterile scalpel blade into sterile Petri dishes. Hair pullouts and crusts were also collected from the margin of the lesions as described by Robert and Pihet (2008). Each sample was divided into two parts. One part was used for direct microscopic examination while the second part was used for fungal isolation by culture.

Direct microscopic examination

A portion of each sample was placed on a clean glass slide containing a drop of 10% potassium hydroxide solution and covered with a cover slip. The slides were gently heated over a flame from a Bunsen burner and examined and for the presence of arthrospores and hyphae under a light microscope.

Fungal isolation and identification

Each sample was inoculated onto Dermasel agar (OXOID) containing: Mycological peptone, 10.0 g/L; glucose, 20.0 g/L; agar, 14.5g/L; cyclohexamide, 0.4g/L and chloramphenicol, 0.05g/L, pH 6.9, incubated at 37°C for 2-4 weeks and examined for fungal growth.

Identification of fungal isolates was carried out by both macroscopic and microscopic examination which included growth rate, general topography, surface and reverse pigmentation. Microscopic identification of positive fungal cultures was carried out using the method described by Murray et al. (2005). Briefly, a drop of lactophenol cotton blue stain was placed on a clean glass slide. A portion of mycelium was transferred into the lactophenol cotton blue stain and teased with a 22 gauge nichrome needle to separate the filaments. Cover slip was placed on the preparation and examined under low and high power magnification using a much reduced light for identification.

RESULTS

The skin of affected calves showed circular, circumscribed, grayish-white, thick, hairless, crusty raised lesions (Figure 1). The lesions were mostly seen on the head, face, around the eyes, neck and dewlap. No visible skin lesions were observed on the dams or other animals in the herd. All the 12 samples were positive for fungal elements (ectothrix spores and endotherix hyphae) by direct microscopic examination. The fungus grew slowly on Dermasel agar producing white, cottony, heaped and slightly folded colonies with some submerged growth and yellow reverse pigment (Figure 2). Microscopic examination of isolates stained with lactophenol cotton blue revealed septate hyphae with numerous clavate microconidia borne laterally from the hyphae (Figure 3b), and many chlamydospores arranged in chains (chains of pearls) characteristic of *T. verrucosum* (Figure 3b)

DISCUSSION

*T. verrucosum* was found to be responsible for the ringworm seen on 12 of the 14 calves in this study. Our report is significant as it suggests that dermatophytosis could be a major problem in cattle farms especially in young animals. This report agrees with previous findings (Cam et al., 2007; Shams-Gahfarokhi et al., 2009), that young animals are particularly susceptible to infection by ringworm fungi. This could be as a result of the poorly developed immune system and the high pH of the skin in young animals (Radostitis et al., 1997).

The diagnosis of ringworm in this study was based on clinical signs, demonstration of fungal elements in samples by direct microscopic examination and the isolation of causative agent by culture. *T. verrucosum* had been implicated in ringworm of cattle (Swai and Sanka, 2012; Cam et al., 2007). The main clinical signs observed among the affected calves were circular, circumscribed, grayish-white, thick crusty lesions perceptibly raised above the skin. The lesions were most frequently found on the head and neck especially around the eyes and face. These observations were in agreement with other reports (Cam et al., 2007; Akbarmehr, 2011). The reason for the occurrence of more lesions around the eyes and face in young animals is not well understood. However, the habit of licking and grooming by calves could predispose this part of the animal to infection.

Our results showed that all the samples examined by direct microscopy were positive for fungi. Other researchers found out that direct microscopic examination could provide a positive diagnosis in 60-71% of samples from which dermatophytes were isolated (Sparkes et al., 1993; Al-Ani et al., 2002). In this study, the dermatophyte was isolated in pure culture suggesting that dermatophytes are a suitable selective medium for the isolation of pathogenic fungi.

Colonies of *T. verrucosum* in this report were slow growing, white, cottony, heaped and slightly folded with some submerged growth and yellow reverse pigment. This observation is consistent with the findings of Forbes et al. (2002). In our investigation, microscopic examination revealed septated hyphae and microconidia that were attached laterally to the hyphae. There were numerous chlamydospores mostly in chains (chains of pearls).
Figure 1. Ringworm lesions in a 4 month-old calf. Note thick, crusty, grayish-white lesions around the eye, face, ear and neck (arrow).

This agrees with the report of Shams-Gahfarokhi et al. (2009) who observed chains of chlamydospores as predominant microscopic feature of the fungus in slide culture. Adult cattle had been reported to be less susceptible to the ringworm (Cam et al., 2007) and some of the dams could perhaps be carrying the infection without showing clinical signs and might be a source of infection for the calves. The soil, infected installations and even the house where the animals were kept could be other sources through which the animal could acquire infection since *T. verrucosum* is known to persist in the environment for 5-7 years and have been isolated from the soil (Gudding and Lund, 1995; Mahmoudabadi and Zarrin, 2008; Singh and Kushwaha, 2010). We do not know the actual source of infection for these animals because neither the healthy dams nor any of these materials were sampled and investigated in this study.

The warm and humid climate of our environment could have favored the growth and development of fungal spores thereby predisposing the animals to infection and hence the outbreak in this highly susceptible population.

Cattle ringworm causes high economic losses especially in the livestock and leather industries due to downgrading of hides and skin and decrease in meat and milk production (Gudding and Lund, 1995). In a survey of bovine dermatophytoses in major dairy farms of Mashhad City, Eastern Iran, *T. verrucosum* was the predominant dermatophyte isolated (Shams-Gahfarokhi et al., 2009). A large scale outbreak of the disease involving a dairy herd has recently been reported in Arusha region, Tanzania (Swai and Sanka, 2012). Several other outbreaks of ringworm affecting cattle herds and especially young calves had been documented in Australia (Maslem, 2000), China (Ming and Ti, 2006) and Italy (Papini et al., 2009).

The major problem with *T. verrucosum* infection in cattle farms is that, once the disease is introduced into a farm, it spreads rapidly among susceptible animals. The organism is difficult to eradicate from the environment because of the peculiarity in composition of its spores. Treatment of cattle ringworm is expensive and cumbersome especially on a herd level (Gudding and Lund, 1995). This concern has prompted the need for effective prophylaxis against the disease as hygienic and other preventive measures were often inadequate (Rybnikar, 1992). Vaccination against bovine dermatophytosis had been
considered the most effective way of controlling the infection (Rybnikar, 1992). Immunization of calves with live *T. verrucosum* was found to protect 90% of the vaccinated animals against *T. verrucosum* infection (Mikaili et al., 2012). A nationwide immunization program carried out in Norway where all cattle including none infected animals of all ages followed by vaccination of all calves and purchased animals reduced the prevalence of ringworm from 70% in the year the program started to 0% eight years later (Gudding and Lund, 1995; Mikaili et al., 2012).

Ringworm is enzootic in Nigeria. However, the national prevalence of the disease in the cattle population in this country is yet to be determined.

This study has revealed that *T. verrucosum* could be an important health problem in calves in this particular environment, both as a zoonosis and economic importance as a result of esthetic and damage to hides and skin. There is need to study and understand the disease among the cattle population in this country with a view to Instituting

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**Figure 2.** Colonial morphology of *T. verrucosum*. Note: white, cottony, heaped and folded colony.

**Figure 3.** Microscopic morphology of *T. verrucosum* showing microconidia borne laterally from the hyphae (a) and clamydoconidia in chains referred to as “chains of pearls” (b).
prevention and control measures.

ACKNOWLEDGEMENT

We thank the Executive Director, National Veterinary Research Institute, Vom, Nigeria for permission to publish this work.

REFERENCES


