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The prevalence of *Trichophyton verrucosum* in Holstein-Friesian cows in an organised dairy farm and its attributed pre disposing factors

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Abstract

Studies on the prevalence of dermatophytosis in Holstein- Friesian cows in an organized dairy farm in a village nearer to Jaipur were carried out. Out of 62 pure H.F cows, 16 were with clinical signs towards dermatophytosis and all these H.F cows were studied for its etiological agent by hair analysis, culture and staining techniques as per standard protocols. The studies revealed the prevalence of *Trichophyton verrucosum* in all these infected cows. The predisposing factors responsible for the attack of this infection in this farm premises revealed lacunae in the managerial practices and the farm authorities were appraised with the facts, in order to take necessary steps to get away from this pathogen by segregation of the infected cows and to proceed with treatment in a positive way.

Keywords: Dermatophyte- *T. Verrucosum* –predisposing factors

Introduction

Dermatophytosis is a common contagious disease caused by fungi known. Most of the fungi reside in the soil and in living tissues. In living tissues dermatophytes remain in superficial tissues such as epidermis, hair and nails. In tropical and sub tropical countries, the disease can result in economic effects, such as damage to the hide in livestock. Zoophilic dermatophytes are adapted to various animal species, while anthropophilic dermatophytes occur in humans. Most or all zoophilic dermatophytes are thought to be zoonotic, although some are transferred to people more often than others. There are numerous species of anthropophilic dermatophytes in the 3 genera *i.e* *Trichophyton*, *microsporum* and *epidermophyton*. (Spickler, *et al* 2014) [17]. Ringworm infection of the man and animals appears to be more in hot and humid conditions (Radostits *et al* 1997 [13] *T. verrucosum* is a cosmopolitan zoophilic fungi causes ringworm in cattle and other farm animals, and human can get the disease (Weber 2000) [22]. Persistent infections of the farm animals with this organisms on cattle can cause zoonosis problem (Nweze, 2010) [10]. Wabacha *et al*, (1998) [20] reported several outbreaks of this disease in animals and their zoonosis in Kenya & China). Prevalence of dermatophytosis in Holstein Friesian dairy cows occurred, which was analyzed in this study with its predisposing factors.

Case studies

A private dairy farm having a total population of 62 pure H.F milchy cows suffered with skin infections. The manager of the farm requested this department to investigate the skin problem, since it happened all of a sudden in many cows. Accordingly clinical history of the farm animals and their management were taken and this was followed by a clinical examination of the affected cows. The main clinical signs were gray-white, crusty, scattered lesion mostly in the head, brisket, dewlap, shoulder and neck regions (Fig. 1-4). A total number of 16 cows out of 62 cows were observed with clinical signs for skin infections during this study period.

Materials and Methods

All the animals were stationed in the cow shed and they were not allowed for pastures, as such facilities were not available.

The animals were vaccinated for H.S; B. Q & F.M.D. Animals were dewormed periodically and were free from tick population. As per the records the feed intake and the weight of the milchy cows reduced in the infected population overall. The owner reported the introduction of 14 numbers of newer cows just before the disease episode.

Sampling for mycological examination

Skin scrapings from the 16 infected cows were collected and stored as per standard procedures for laboratory examination. Hair follicles from the infected cows collected for hair follicular studies.



Fig 1-4: Skin lesions in Holstein Friesian cows



Fig 5-6: *Trichophyton* infected hair follicles



Fig 7: *Trichophyton* infected hair follicle



Fig 8: Methylene blue staining-Macro conidia Direct skin scrapings-*T. verrucosum* -



Fig 9-10: Morphology- *Trichophyton verrucosum* in SDA culture stained with LPCB.



Fig 11: Micro conidia.



Fig 13: Mycelia & Chlamydial spores in chains



Fig 12: Mycelia & microconidia-

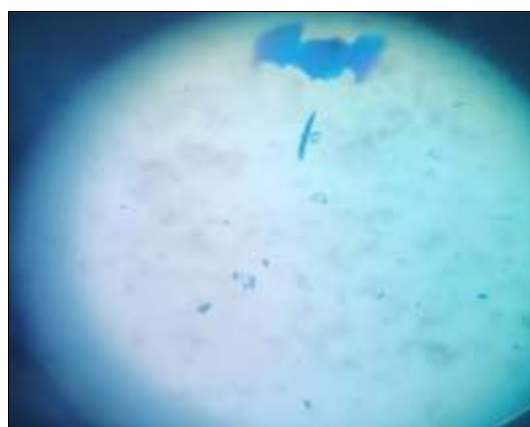


Fig 14: *Trichophyton* - Macroconidia in pencil shape

Results and Discussion

Assessment of the infected cows skin lesions

Out of 62 pure H.F cows, 16 numbers of cows were in infection for *T. verrucosum* in this farm. The lesions were in around the eyes, ears, cervical region, flank, shoulder and dewlap. The lesions were grey-white, crusty confined to the above mentioned areas of the body. The grey- white crust firmly attached with greasy hair fibers and when removed, left a moist epidermis with oozing out blood and serum. The lesions were manifested as discrete, circumscribed, and varied in sizes. They were covered with grey-white crust. Some crusts coalesced to form large lesions covering large areas of the skin. Removal of crusts revealed circumscribed lesions, alopecic, red, keratinized tissue. No pustules observed. Rebel and Taplin (1970) ^[15] & Rippon, (1998) ^[16] reported the above observation in their studies. Radostits *et al* (2000) ^[14] reported that the affected animals initially develop discrete, scaling patches of hair loss with grey-white crust that later become thickly suppurated crust and the location are variable. Dalis J.S *et al* (2014) ^[5] reported the same types of lesion in cattle calves in Nigeria. Akbarmehr, (2011) ^[23] reported the lesion in cattle with heavy, grayish-white, crust, raised above the skin. Swai and Sanka (2012) ^[19] reported bovine *Trichophyton verrucosum* from Tanzania in dairy herds. In this study the authors reported slow growth glabrous, heaped, white to grey raised colonies in 72 hours, which were adherent to the medium by direct microscopic examination of epidermal scales. These observations coincide with the findings of this study.

Hair follicles examination by microscopy

The hair follicles from the affected skin showed the broken hair filled with spores inside the hair follicles when stained in diluted iodine solution. Direct examination of hairs revealed pale and wider hair at 4 X and 40X magnification (Fig 5, Fig 6, & Fig 7). Karen Moriello (2019) ^[8] reported pale and wider infected hair follicles due to dermatophytes in cats and dogs. In this infected cows also the same types of structural changes i.e broad, thick and opaque structures occurred and are visible in microscopic studies. Chao Tang *et al* (2024) ^[3] reported the breakdown of the infected hair follicles in all animal species due to various dermatophytes. Criteria of hair damage i.e damage to the cuticle, medulla were taken as parameters to confirm the infection of infected skin of the affected animals. Hryncewicz-Gwozdz *et al* (2011) ^[7] reported weak ability of *T. verrucosum* to weak hair. Dowd (2014) ^[6] reported both ectothrix and endothrix condition of the infected hair follicle in *T. verrucosum* infection and Warnock (2012) ^[21] explained that a break off in the infected hair or resulting in a black dot just below the opening of the hair follicles. The examination of the hair follicles in this study also observed the same features, which confirms the involvement of the *T. verrucosum* infection in this infected farm cows.

Laboratory examination of the skin samples by direct staining with Methylene blue

Laboratory examination of the direct skin scrapings from the infected cows were stained directly with Methylene blue staining revealed the characteristic pencil shaped macro conidia. (Fig. 8).

Laboratory examination of the culture and its morphology

Laboratory examination of the culture with SDA showed the glabrous, heaped, grey-white colonies adherent to the medium after 72 hours of incubation at 37°C. The texture was waxy;

glabrous to cottony. From the front view, the colors were white, fluffy, folded, with central foiling. (Fig. 9. & 10). Swai and Sanka (2012) ^[19] reported slow growth glabrous, heaped, white to grey raised *T. verrucosum* colonies in 72 hours, which were adherent to the medium. This observation concurs with the finding of this study.

Laboratory examination of the skin samples by culture staining methods

The microscopic examination of the SDA culture isolates stained in LPCB showed, septate hyphae and numerous micro conidia (Fig. 11) mycelia and thin membrane hyphae (Fig 12), and many conidiophores in chains (Fig.13) of *Trichophyton verrucosum* and the macro conidia (Fig.14). Nwiyi P.O *et al* (2021) ^[11] microscopically observed the *T. verrucosum* with septate, conidio spore, macro conidia, micro conidia and arrangement of chlamydo spores. The isolation and morphological identification of *T. verrucosum* by culture and staining methods confirmed the clinical diagnosis in this farm cows and such confirmatory diagnostic reports were presented by Nwiyi P.O.*et al* 2021; Dalis J.S *et al*; 2014) ^[11, 5] & Swai and Sanka (2012) ^[19].

Pre disposing factors associated for the prevalence of *T. verrucosum* in the farm

In this dairy farm management, the introduction of newer animals without screening for skin diseases, close confinement, absence of paddocks, less green fodder supply, pure breed susceptibility i.e. H.F as a host factor, irregular grooming practices, nutrient deficiencies due to less feed intake, exposure of the cutaneous system to the inclement weather were recorded, as predisposing factors in this dairy farm. Moretti *et al* (1988) ^[9] & Papini *et al* (2009) ^[12] opined the above parameters for causation of dermatophytosis due to *Trichophyton verrucosum* in dairy cattle. Svejgaard, 1986; Chermette *et al*. (2008) ^[4] reported *Trichophyton verrucosum* as an acute or chronic skin disease. Al-Ani *et al*., (2002) ^[2] reported that housing animals in close proximity for longer periods in the presence of infected debris was responsible for the high incidences of the disease in winter. Inadequate managerial procedures as discussed above landed in dermatophyte infection in this farm cows is confirmed by this study.

Conclusion

Studies on the prevalence of dermatophyte infection in H.F cows were carried out in an organized dairy farm in a village, nearer to Jaipur city. Out of 62 H.F pure bred cows, 16 cows were found positive for *Trichophyton verrucosum* in this dairy farm. The farm manager was appraised with the predisposing factors for the occurrence of the dermatophyte infection in this farm and requested to avoid such factors to prevent alike incidences in future in this farm and advised to segregate the infected cows to avoid further spread to other healthy cows and to proceed to treat the infected cows.

Conflict of Interest

Not available

Financial Support

Not available

Reference

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