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PI Ganesan

Professor & Head, Department
of Veterinary Medicine, Apollo
College of Veterinary Medicine,
Jaipur, Rajasthan, India

Anamika Meena

U.G Scholar, Apollo College of
Veterinary Medicine, Jaipur,
Rajasthan, India

Sanskriti Sunil Salutgi

U.G Scholar, Apollo College of
Veterinary Medicine, Jaipur,
Rajasthan, India

Kaushal Kumar Meena

U.G Scholar, Apollo College of
Veterinary Medicine, Jaipur,
Rajasthan, India

Corresponding Author:

PI Ganesan

Professor & Head, Department
of Veterinary Medicine, Apollo
College of Veterinary Medicine,
Jaipur, Rajasthan, India

The multiple infection of an equine with dermatophytosis and its associated risk factors

PI Ganesan, Anamika Meena, Sanskruti Sunil Salutgi and Kaushal Kumar Meena

Abstract

The present study was carried out in an equine affected with wound infection in the pastern and fet-lock regions in proud flesh condition. Materials collected from the chronic wound were subjected to culture studies of both bacterial and fungal infections and antibiogram studies revealed sensitivity to levofloxacin only out of 16 antibiotics used. The horse was treated accordingly and the healing was still incomplete. The culture of the wound lesions with SDA media and staining with LPCB revealed the mixed infections status for *Candida albicans*, *Microsporium nanum*, *Trichophyton rubrum* & *Trichophyton mentagrophytes*, *Alternaria alternata* & *Exserohilum rostratum*. Risk factors associated for the causation of multiple infections in this severely infected equine is discussed in this study.

Keywords: Multiple infections, equine, dermatophytosis, risk factors

Introduction

Dermatophytosis is a common contagious disease caused by fungi known as dermatophytes. A few species normally live in the environment, but occasionally act as parasites. In living hosts, dermatophytes usually remain in superficial tissues such as the epidermis, hair and nails. Infrequently, dermatophytes invade subcutaneous tissues and other sites, especially in immune-compromised hosts. (Spickler, *et al* 2014) [43]. Sravani & Ganesan (2024) [44] reported the concurrent infections of *M. audouinii* and *mucormycosis* in buffaloes and attributed risk factors for mixed fungal infections. OIE (2005) [29] reported the prevalence of *T. equinum* and *M. equinum* in equines infected with skin lesions. Fungal infections are relatively common in healthy and immuno-competent animals, since they are present in the environment in great numbers. (Kohler *e t al* 2015; Gnat *et al* 2020a) [22, 16]. The prevalence of fungal infections is low and recurrent caused by true and opportunistic pathogens, noticed worldwide in animals and human beings. Radostits *et al* (2007) [34] reported the incidences of *Trichophyton* and *Microsporium* infections in infected equine with skin disorders. Dicken M *et al* (2010) [11] reported fungal granulomas due to *Alternaria* spp. infection in a horse in New Zealand. Da Cunha *et al* 2012b) [10] reported *Exserohilum rostratum* in phaeohyphomycosis in human beings. Mahendra Pal & Chang-woo Lee (1994) [25] reported *Exserohilum rostratum* in a 2 years old equine suffered with chronic dermatitis.

Case report

A horse with a history of unhealed wound in the pastern and fet-lock joint for more than 3 months was referred to the Veterinary Clinical Complex Hospital of Apollo College of Veterinary Medicine, Jaipur. The clinical signs revealed normal healthy parameters by blood profile studies. Clinical examination of the infected equine revealed, proud flesh in the pastern and fet-lock region.

Materials collected from the chronic wound were subjected to culture studies of both bacterial and fungal infections and antibiogram revealed sensitivity to levofloxacin out of 16 antibiotic discs used. The horse was treated accordingly and the healing was incomplete.

The culture of the lesions of the infected wound materials in SDA culture (Fig.1) and staining with LPCB revealed the mixed infections of *Candida albicans* along with the dermatophytes which included *Microsporium nanum*, *Trichophyton rubrum* & *Trichophyton mentagrophytes*,

Alternaria alternata & *Exserohilum rostratum*. Identification of these organisms carried out as per the guidelines detailed below. (Fig 2-7)

Candida albicans was identified by its yeast shaped round to oval in shape, known for it's as white cells and the chlamydospores under the wet mounts. (Fig2) (Kalis *et al*, 2014; Sonai Saigal *et al* 2011) [21, 36]. *Trichophyton mentagrophytes* was identified with cigar shaped, thin to thick cell walls, tend to occur in clusters and the spherul shaped microconidia both in single and clusters numerous in numbers, spiral shaped hyphae from which the conidia spores originated. (Fig.3) (Habeab, *et.al* 2016) [19]. *Trichophyton rubrum* was identified as slender organisms, having clavate microconidia, thin walled, cigar shaped macroconidia, some with terminal appendages. (Fig.4) (Hemandes-Hemandes *et al* (2007) [20]. *Microsporum nanum* was identified by its septate hyphae, macroconidia, 1-to 4 celled, thin walled, oval to elliptical in shape and their club shaped microconidia. (Fig 5) (St-Germain, G., R. Summerbell 1996; Sutton, D.A., A.W. Fothergill, and M, G. Rinaldi (ed) 1998; Larone D.H. 1995) [45, 46, 23]. *Alternaria alternata* was identified by its brown conidia with round base and beaked apex, with transverse and oblique separation. Conidial chains were more branched and less tubular. (Fig.6). (Bras Susan *et al* 2015) [4]. *Exserohilum rostratum* were identified by their sympodially elongating conidiophore & conidia. (Fig.7) (Mahendra Pal & Chang-woo Lee. 1994) [25].



Fig 1: Mixed fungal & dermatophytes in SDA

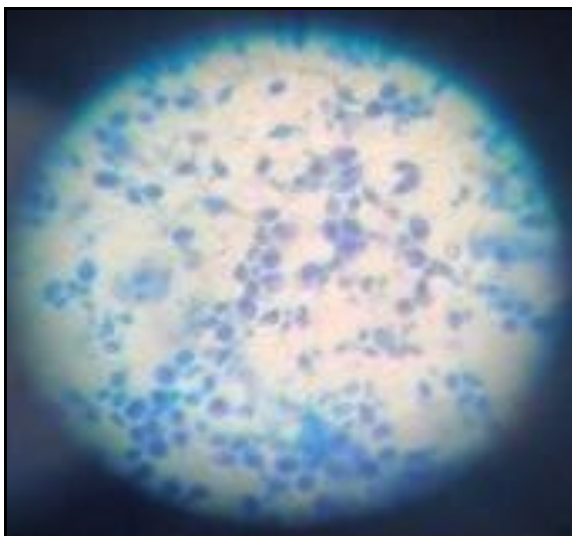


Fig 2: *Candida albicans*



Fig 3: *Trichophyton mentagrophyte*.



Fig 4: *Trichophyton rubrum*

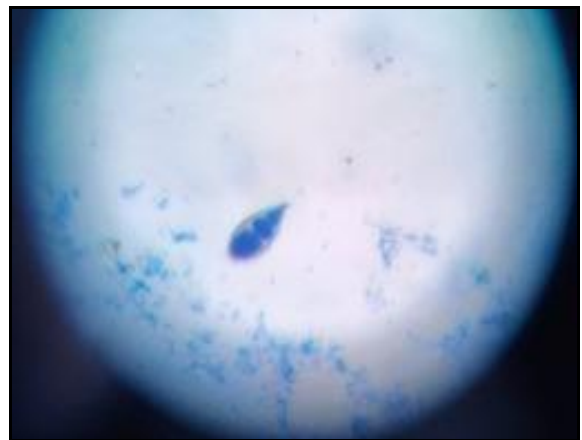


Fig 5: *Microsporum nanum*.

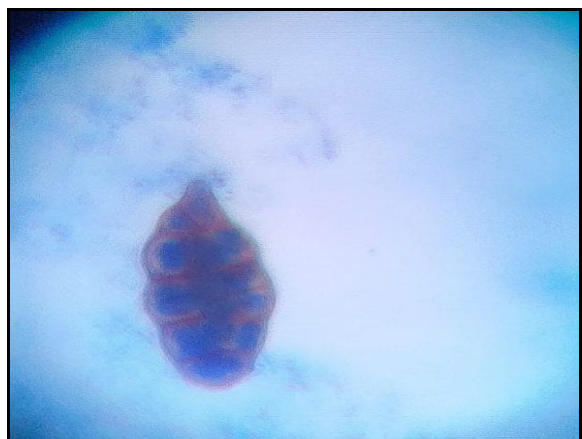


Fig 6: *Alternaria alternata*



Fig 7: Sympodially elongating conidiophore & conidia of *Exserohilum rostratum*

Discussion

a. Clinical examination studies

In this study the infected horse suffered with chronic dermatitis for longer time.

Sahota *et al* (2017) [35] reported subcutaneous tissues and skin with subcutaneous mycoses. Gnat *et al* (2021) [16] reported superficial bright pink-red papules, diaper dermatitis, mucocutaneous white plaques in candidiasis in animals. Smith (2002) [42] reported that the *Trichophyton* and *Microsporium* species are the main causes in horses showing mild or sub clinical disease to severe lesions. Dicken M *et al* (2010) [11] reported fungal granulomas due to *Alternaria* species infection in a horse in New Zealand. Mahendra Pal and Chang-woo- Lee (1994) [25] isolated the *Exserohilum rostratum* in a 2 years old equine with multiple, small, scaly, whitish grey alopecic lesions all over the neck and saddle region and the author indicated *Exserohilum rostratum* as a saprophyte in the soil. In this case study the origin for the wound infection to the infected horse was unknown and the wound was in proud flesh condition when examined.

3b. Mixed infection status of *Candida albicans* and dermatophytes infections in equines.

Cafarchial *et al* (2013) [6] reported the fungal infections *M. canis*, *M. equinum*, *T. equinum*, *Alternaria*, *aspergillus* and yeast species in horse diseases. Prescott J.F (2003) [32] reported candida in dogs and cats and they may get candida disease when their immune system or host integument micro-environment changes occurs. Cabanes F, J 2000; Gangil R *et al* (2012) [5, 14] reported the associated infection status of *Microsporium canis*, *Microsporium gypseum* and *Trichophyton mentagrophytes* in canine population. Sharma *et al* (2010) [39] reported the prevalence of *Microsporium gypseum*, and *Trichophyton mentagrophytes* in cattle in Rajasthan. Vipparti 2014; Gawaz and Weisel (2018) [47, 15] reported co-existence of yeast-like fungi and dermatophytes or mould in the same lesion.

3c. Associated risk factors for the development of skin wound infections.

de Crecy *et.al* 2009; Casadevall *et al* (2019); Casadevall *et al* (2020) [9, 8, 7] opined that the climatic changes associated with anthropogenic pressure led to adaptation of harmless fungal species to become infectious which favor the adaptations of fungal species to become infectious. Friedman and Schwartz (2019) [13] stated that the expansion of the currently known fungal pathogens happens in the areas with higher average

temperatures and wetter environment. Leclair and Hogan, 2010; Nogueira *et al* 2019; Scott *et al* 2019; Amanati *et al* (2020) [24, 28, 38, 2] reported that the yeast and the other filamentous fungi can interact with other prokaryotic micro-organisms. Fisher *et al* 2012; Bisnoi *et al* 2018; Shenoy, M. and Jayaraman, J (2019) [12, 3, 40] & Gnat *et al* (2021) [16] reported a growing tendency of fungal infections diseases caused by true and opportunistic pathogens both in animals and human beings, and the spectrum of microorganisms causing these diseases is very wide, mostly both yeast and fungi. Opportunistic fungal infections are important in the epidemiology of infectious diseases, since they can be caused by exogenous and endogenous pathogens. Peter. G. Pappas, (2012) [31] reported *Exserohilum* Sp. are ubiquitous saprophytes of soil and decaying matter and some are important plant pathogens. Aho R. (1983) [1] reported that in suspected dermatophytosis cases, many saprophytic fungi isolated were present in immunosuppression status, and they can be pathogens, and the saprophytic fungal infections lead to fungal infections if left untreated. Montin M *et al* (2006) [27] reported the co-existent fungal infections status of this *Alternata* Sp. in human beings in cutaneous alternariosis and in tissues these organisms exist as yeast like cells. Queiroz-Telles *et al* (2003) [33] opined that the fungal cutaneous and subcutaneous infections were frequently associated with penetrating injury caused by thorn splinters, nails etc. in human beings. In this studies also the wound infection occurred with *Candida albicans* *Microsporium nanum*, & *Trichophyton rubrum* & *Trichophyton mentagrophytes*, *Alternaria alternate* & *Exserohilum rostratum*, confirms the findings of the above mentioned authors.

Conclusions

The studies of the infected wound in the equine showed the increasing trend for the mixed infections of *Candida albicans*, *Microsporium nanum*, & *Trichophyton mentagrophytes* & *Trichophyton rubrum* *Alternaria alternate* & *Exserohilum rostratum*. Factors associated for the causation of multiple infections in this chronically infected equine is discussed. Studies needed in a larger scale to find out the causative factors associated in this type of wound infections in equines for better management.

Conflict of Interest

Not available

Financial Support

Not available

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