



ISSN: 2456-2912

VET 2024; 9(1): 25-27

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www.veterinarypaper.com

Received: 21-11-2023

Accepted: 25-12-2023

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Co-infection status of *Mucor* mycosis and *Microsporium* in a Persian kitten and the associated risk factors for sustenance

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Abstract

A 2 months Old Persian cat presented to the Veterinary Clinical Complex, Apollo College of Veterinary Medicine, and Jaipur with cutaneous lesions all over the body was diagnosed for mucormycosis and microsporium species co-infection status by SDA culture and lacto phenol cotton blue staining. The associated risk factors for the development of cutaneous lesions in the Persian cat analyzed for the co-infection status of mucormycosis and microsporium species infections. In mucormycosis infection, immunitary status and young age were the attributed risk factors. The attributed risk factors for microsporium infection were predisposed long hair status and hereditary predisposition (?) of the Persian kitten for the development of skin lesions.

Keywords: Persian kitten-mucor species-microsporium, risk factors

Introduction

Mucormycosis is defined as an infection caused by fungi of the order Mucorales composed of ubiquitous opportunistic fungi most commonly of the genera *Rhizopus*, *Mucor*, *Rhizomucor* and *Absida*. These fungi are present worldwide in the soil, animal matter and decaying organic materials, such as vegetation, fruits and bread. (Flagothier *et al.* 2006) [3].

Several studies have highlighted the importance of fungal diseases in humans and animals in recent decades. (Guarner & Brandt 2011, Seyedmousavi *et al.* 2018) [6, 14], especially in companion animals, wherein several fungal species are responsible for causing localized and systemic infections. (Galiza *et al.* 2014) [4]. Dermatophytes are a group of imperfect keratinophilic filamentous fungi, invading keratinized tissues of animals and humans causing dermatophytosis. It is a contagious disease of high prevalence worldwide, considered as one of the most common zoonoses (Farias *et al.* 2011) [2].

Mucor mycosis infection in cats.

Flagothier *et al.* (2006) [3] reported the likelihood of mucor mycosis infection in human beings which depends on the host immunitary status and most case reports relate mucormycosis in premature infants. Mosbah *et al.* (2015) [11] reported mucormycosis in cats with enteritis and systemic infections. The skin lesions may include ecthyma-gangrenosum-like lesions, mucocutaneous ulceration and eschar, necrotic papulo nodules, cellulitic plaques, and necrotizing fasciitis or any combination of these (Ram-maert *et al.* 2014; Shields *et al.* 2019; McMahon *et al.* 2020) [13, 15, 10]. Jonathan D Wray *et al.* (2008) [7] cultured mucor species in SDA and identified it by morphological characteristics of the mycelium, yellowish/brown filamentous colony, sporangiophores and spores in a cat from cutaneous lesions. Macroscopically in SDA the colonies first appeared white in color and later converted to greyish. Microscopically the sporangia are round in shape, spongiophores are branched, rhizoids and apophyses are absent. Colonies appeared were greyish and fluffy with fast growth by culture.

Microsporium infection in cats

Karen A Moriello *et al* (2017) [8] reviewed dermatophytosis and reported that Persian cats are predisposed for dermatophytes due to their long hair. The clinical signs in general are hair loss, papules, scales, crusts, erythema, follicular plugging, hyper pigmentation, changes in the nail growth. Pruritis in affected cat is variable. When pruritus present self-trauma develops and it can leads to pyotraumatic dermatitis. Most of the cats showed lesions in the face, ears, muzzle, paws, and other body areas. Nuttall *et al.* (2009) [12] reported dermatophytosis in Persian cats without itchininess due to *M. canis*. The other dermatophytes involved in the infection of Persian cats are *M. Mentagraphytes M. Persicolor* and *T. Mentagraphytes*. Dermatophytosis in Persian cats persists longer and requires treatment for months to years. (Balda: 2009) [1]. Mauldin EA & Peters-Kennedy J (2016) [9] reported a rare atypical form of dermatophytosis associated with *Microsporium canis* infection with predominance in Persian cat, wherein infections are associated with a hereditary predisposition.

Co-existence of fungi and mould

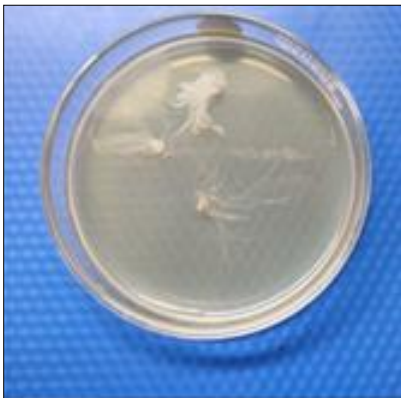
Vipparti 2014 [16]; Gawaz and Weisel (2018) [5] reported co-existence of yeast-like fungi and dermatophytes or mould in the same lesion of the affected cats.

A case report

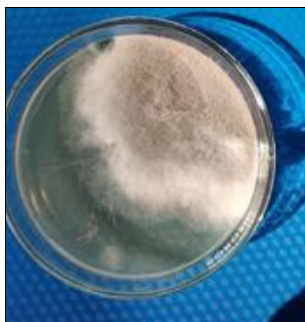
A 2 months old female Persian kitten was presented with cutaneous skin lesions all over the body. Physical examination demonstrated no other abnormalities except for the subcutaneous lesions all over the body. Skin scraping was subjected to SDA culture and lacto phenol cotton blue staining studies as per standard protocol described.

Results

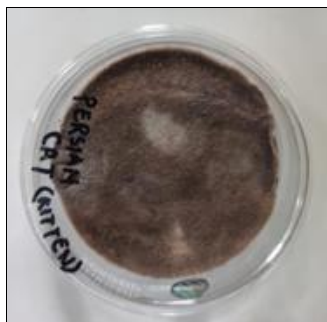
Persian kitten skin samples culture studies in SDA



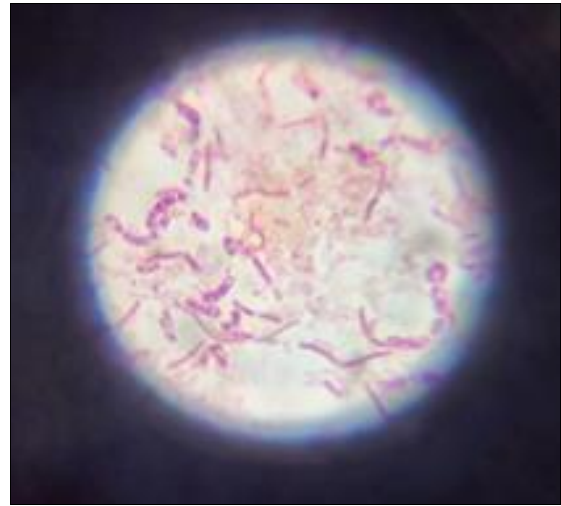
Fourth day culture



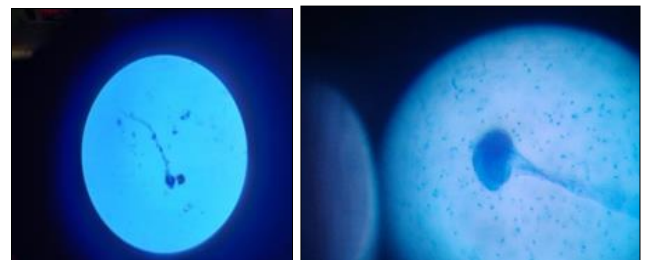
7th day Culture



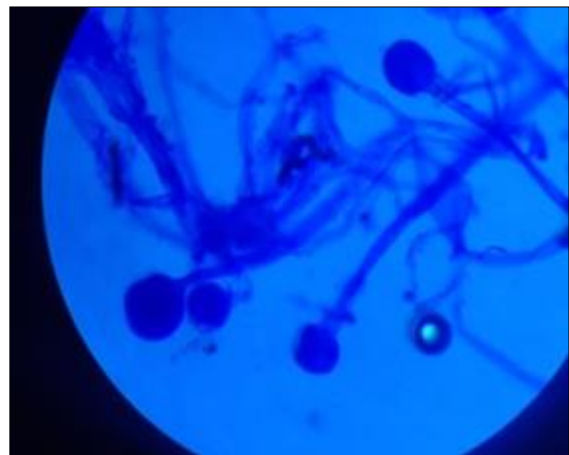
14th day Culture



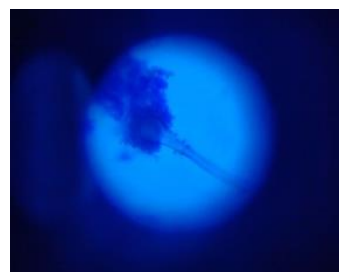
Gram's staining of mycelia of microsporium



Developing stage of sporangia, sporangiophores



Developed mucor mycosis



Release of spores



Spores of mucor mycosis

Discussion

The skin lesions may include ecthyma-gangrenosum-like lesions, mucocutaneous ulceration and eschar, necrotic papulo nodules, cellulitic plaques, and necrotizing fasciitis or any combination of these (Ram-maert *et al* 2014; Shields *et al* 2019; McMahon *et al.* 2020) [13, 15, 10]. Flagothier *et al* (2006) [3] reported the likelihood of mucor mycosis infection in

human beings which depends on the host immunitary status and most case reports of mucormycoses in premature infants. Mosbah *et al.* (2015) ^[11] reported mucormycosis in cats with enteritis and systemic infections. Karen A, Moriello *et al.* (2017) ^[8] reviewed dermatophytosis and reported that Persian cats are predisposed for dermatophytes due to their long hair. These observations are in concurrence with the findings of this study also. Mauldin EA & Peters-Kennedy J (2016) ^[9] reported a rare atypical form of dermatophytosis associated with *microsporum canis* infection with predominance in Persian cat, wherein infections are associated with a hereditary predisposition. In this study the infected Persian kitten possess long hair at the age of 2 months suffered with the skin lesions as reported by Ram-maert *et al.* 2014 ^[13]; Shields *et al.* 2019 ^[15]; McMahon *et al.* (2020) ^[10] and the hereditary predisposition of the kitten was uncertain. Vipparti 2014 ^[16]; Gawaz and Weisel (2018) ^[5] reported co-existence of yeast-like fungi and dermatophytes or mould in the same lesion which was in concurrence with the observation of this study in a 2 months olds Persian kitten.

Conclusion

The study revealed the co-infection state of mucormycosis and microsporum species in a Persian cat suffered with cutaneous lesions all over the body. The study underpins the attributed risk factors associated for the development of these cutaneous infections in Persian cat due to mucormycosis and microsporum and more information's needed on these factors i.e. predisposition of long hair status and hereditary predisposition for dermatophytes infection for microsporum infection and the immunitary status and premature infant stage position for mucormycosis infection in Persian cat population.

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