

# Cytology of Skin Lesions in Dermatophytosis of Cats and Dogs

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## Abstract

The present investigation focused on the clinical and cytological assessment of dermatophytosis in domestic canines and felines. Veterinary clinics conducted examinations of cats and dogs for lesions indicative of fungal infections. Cellophane adhesive tape strips and impression smears were collected from the affected areas. Samples obtained from these lesions were analyzed using standard culture methods for dermatophytes. Culture results predominantly identified *M. canis* in 9 cats and 9 dogs out of the 150 animals assessed. Clinical evaluations of the animals positive for dermatophytes showed primarily alopecia, followed by erythema, annular lesions, scales/crusts, hyperpigmentation, and a single occurrence of a nodular lesion. Cytological analysis indicated the presence of arthrospores, acanthocytes, keratinocytes, corneocytes, neutrophils, and mononuclear cells. In the cases presented, dogs exhibited more severe lesions with a notably higher count of neutrophils compared to the cats. An arbitrary grading system indicated that the population of corneocytes was greater in the lesions observed in cats.

**Keywords:** Arthrospores, Cats, Dogs, Dermatophyte, *M canis*,

## Introduction

Companion animals, specifically dogs and cats, are integral members of our households, receiving considerable attention and affection from their owners. However, a lack of awareness regarding the potential health risks associated with close interactions with these animals can lead to various zoonotic infections. One notable example is dermatophytosis, a superficial fungal infection that affects the keratinized layers of the skin and hair, caused by fungal genera such as *Microsporum*, *Trichophyton*, and *Epidermophyton*. These fungi exhibit both keratinophilic and keratinolytic properties. Companion animals often serve as carriers of dermatophyte spores, which typically do not penetrate the healthy skin of these animals. Pet cats and dogs have a foremost role in the transmission of dermatophytes primarily that are considered highly contagious and potentially pathogenic for both animals and humans. This is particularly observed where there are unhygienic environmental standards, among the children, elderly patients, and immunocompromised individuals. Cabanes and Seyedmousavi et al. [1,2]. *Microsporum canis* is one of the most frequently recovered fungi among canine and feline ringworm cases. *Microsporum canis* is associated with asymptomatic carriage in pet animals, leading to a potential human health risk. The arthrospores are often present in the environment of the pet animals. Mancianti et al. [3]. Cats are the principal reservoir for *Microsporum canis*, percentages of isolation is higher than 90% from animals with suspected lesions of dermatophytosis. Cabanes [1]. The condition may develop further due to predisposing factors, including immunosuppression, nutritional deficiencies, elevated

environmental temperatures combined with high humidity, and skin trauma. Debnath et al. [4]. Clinical infection of *Microsporum canis* in young, old, and immunodeficient animals usually cause inflammation or infection. Treatment is given either topically or systemically, depend upon the type and distribution of lesions. Paryuni et al. [5]. Cats often developed satellite lesions on the face, ears, or other body regions DeBoer et al. [6]. The current study aimed to determine the comparative clinical and cytological presentation of *Microsporum canis* infection in skin lesion of domestic cats and dogs.

## Material and Method

Study was designed to assess the comparative cytology of dermatophyte lesion in cats and dogs . This study received ethical approval from Institutional Animal Ethics Committee (IAEC) under the guidelines of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), New Delhi

**Sampling and examination procedures :** The animal was examined for the presence of dermatological lesionssuch as alopecia, erythema, crust, scab, scales were subjected to sampling by cellophane adhesive tape technique and impression smears.The skin swabs were collected aseptically from the lesions.

**Impression smear :** The surrounding skin of the lesion was gently pinched to elevate the portion of skin that was to be sampled. The skin was then lightly pressed with a clean glass slide and the smear was air-dried. Stone and Reppas [7].

**Cellophane adhesive tape-strips :** The site of the lesion was first cleaned and the surrounding hairs were clipped with a scissor, then a strip of transparent tape with an adhesive side was applied to the location of the lesion and gently pulled in the direction of hair development .The adhesive side was then pressed onto a glass slide and was examined under the microscope to detect the presence of yeast, mites, conidia or fungal hyphae. Ketzis et al. [8].

**Fungal Culture:** The skin scraping samples were cultured in Sabouraud dextrose broth to enrich fungal organisms. After 18-24 hours of incubation at 28°C, they were streaked onto SDA plates with 0.05% chloramphenicol and 0.5% cycloheximide and also in Dermatophyte test medium (DTM) agar plates. The streaked plates were incubated at 28°C for up to four weeks

The impression smears and cellophane tape preparations from animals found positive for dermatophytes were stained with Giemsa stain and Field stain for cytological examination.

## Result:

A total of 9 cats and 9 dogs each of the 150 cases examined were found positive only for the dermatophyte *M canis*.

In cats found positive for *M canis* head, neck and ears was the most common site of lesion whereas in positive dogs were the most commonly affected site (6/9). Lesions in forelimb/hindlimb were seen in 3/9 cases in both cats and dogs. Lesions in ventral region was seen in 3/9 in cats and 5/9 case in dogs, lesion on dorsal region was observed in 2/9 cats and 3/9 dogs. Lesion on inguinal region was observed only in 1/9 cases of dog. Alopecia was the most common clinical manifestation in both cats and dogs 7/9 cats and 6/9 dogs showed alopecia, Erythema was seen in 5/9 cats and 2/9 dogs, Scales and crusty lesion were manifested by 2/9 cats and 1/9 dogs, hyperpigmentation of the lesion was seen in 1/9 cats and 3/9 dogs, nodular lesion appeared in 1/9 cats and 2/9 dogs. Annular lesion was not observed in cats while it was predominantly seen only in 4/9 dogs.

Microscopic examination of skin impression smears and cellophane tape impressions of dogs and cats stained with Geimsa and Field stain. In both cats and dogs dermatophyte positive cases revealed arthrospores and hyphae along with high count of neutrophils and acantholytic epithelial cells. The annular lesions of the dog revealed severely high count of dermatophyte spores either singly [Figure 1] or in clusters [Figure 2].

The table 1 presents an arbitrary scale of comparative cytology observed between cats and dogs in dermatophyte lesion of alopecia, erythema, annular, crust and nodular. The scale was prepared based on examination of all cytological preparations from positive cases of dermatophytosis. After staining and preliminary scanning of the stained slide under a microscope five fields were examined in each slide under both 40X and 100X magnification.

**Table 1 : Comparative cytology in dermatophyte lesion between cats and dogs.**

Fungal element/ Cell	Concentration of fungal elements and cells									
	Alopecia		Erythema		Annular		Crust		Nodular	
	Cat	Dog	Cat	Dog	Cat	Dog	Cat	Dog	Cat	Dog
Arthrospore and fungal elements	+	+	+	+	-	++	+	+	+	+
Neutrophils	+	+	++	+++	-	+++	+	++	+	+
Macrophage	-	-	+	+	-	+	+	-	++	++
Acantholytic epithelial cells	++	++	++	++	-	+++	++	++	++	++
Corneocyte	++	+	++	+	-	++	++	++	++	++
Keratinocyte	++	++	++	++	-	++	+++ +	++	++	++

**Note: -Negligible; +Mild; ++ Moderate; +++Severe; ++++Very severe**

The dermatophyte positive cases revealed arthrospores and septate hyphae along with fair count of neutrophils and acantholytic epithelial cells. The cell population comprised neutrophils, macrophages, acantholytic epithelial cells and nucleated keratinocytes. The type and concentration of cells varied with the type of gross lesion. In cases of alopecia and erythema mild to moderate population of the cellular and fungal elements were observed in both cats and dogs. Acantholytic epithelial cells were observed in moderate density [Figure 3]. Neutrophil infiltration was more in dogs as compared to cats. Annular lesions were not observed in cats but in dogs the lesions comprised a severe infiltration of neutrophils [Figure 4,5]. with appreciable number of acantholytic epithelial cells. Sheet of keratinocyte cells was seen in lesions in the feline crusts with appreciable corneocytes and acantholytic epithelial cells [Figure 6]. Nodular lesions in both the companion animals comprised moderate number of macrophages, acantholytic epithelial cells, corneocytes and keratinocytes [Figure 7,9]. The density of acantholytic epithelial cells was increased in moderate to severe amount based on the intensity of the severity of lesion in both cats and dogs. As arthroconidias adhere to keratinized surface, they start to penetrate a larger contact area for greater relationship establishment between conidia and skin tissue.

Another observation in the present study was that the degenerated and band neutrophil count was invariably high in the lesions associated with dogs. Moreover, the lesions in dogs were aggravated by mixed bacterial and yeast infections. It was deciphered that dogs skin lesions were mostly septic and showed high bacterial population compared to cats. As such, pyogranulomatous lesions were more common in dermatophytic dogs.

## Discussion

Previous studies also suggest head as the common site for affection of *Microsporum canis* in both cats and dogs. Chang et al. [9]. Alves et al. [10] reported lesions on the head region of a Persian cat that was positive for *M. canis*. Hobi et al. [11] also observed that the cutaneous lesions in dermatophytosis were most frequently located on the trunk, head and neck, especially dorsally.

Infection of *Microsporum canis* shows several clinical manifestation alopecia and erythema was most commonly manifested type of lesion in cats. In dogs alopecia and annular lesion was presented more. Folliculitis is the hallmark of infection by *M. canis*, and clinical lesions include papules, pustules, alopecia, broken hairs, scales, crusts, follicular casts (keratin plugs), and skin hyperpigmentation,. Tainwala et al. [12] Circular alopecia, desquamation and sometimes an erythematous margin around central healing (ringworm) are typical lesions described for dermatophytosis appears as annular lesion Frymus et al. [13]. Pin [14] stated that the manifestations of dermatophytosis lesion are highly variable in the cat. In many cats dermatophytosis is a self-limiting disease with hair loss and scaling only. In immunosuppressed animals, the outcome may be a multifocal or generalized skin lesions. Sattasathuchana et al. [15]

Adhesive tape tests showed slightly greater sensitivity in cats compared to dogs with alopecia. One possible explanation for this could be that cats can be asymptomatic carriers of *M. canis*, leading to a higher fungal load on affected areas when they do display signs of infection. Bouza-Rapti et al. [16] In a recent study, by Vogelnest and Ravens [17] fungal spores were detected in all adhesive tape preparations from cats and in none of the canine cases, while hyphae were present in some of the feline samples and in 80% of the canine ones. Observations in the current research indicated that arthrospores and hyphae were detected in all lesions of dogs and cats that tested positive for dermatophytes through culture.

In severe lesions the acantholytic epithelial cells concentration increased was appreciably more. As arthroconidias adhere to keratinized surface, they start to penetrate a larger contact area for greater relationship establishment between conidia and skin tissue. Adhesion of dermatophytes, release multiple serine-subtilisins and metallo-endoproteases (fungalsins) known as keratinases. Sharma et al. [18]

It is concluded that cytology is important in determining the severity of dermatophyte lesions in companion animals. The presence of viable spores in the lesions also indicates the potential of the fungi to contaminate the environment and spread to pet owners. Dermatophytosis is becoming a major health risk for both humans and veterinary clinics because to the increased intimacy of human-pet contact, which has resulted in closer contact between the two in the same space in households.

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