

Isolation and Identification of *Microsporium Canis* from cats in Baghdad governorate

Marwah Abdul Hassan Bidewy¹, Saleem Amin Hasso²

^{1,2}Department of Internal & Preventive Medicine, College of Veterinary Medicine, University of Baghdad, Iraq

KEYWORDS

Cat, *Microsporium*
Canis, Dermatophytes,
Skin Scrapings.

ABSTRACT

Microsporium canis is a keratinized skin fungus that causes diseases in animals, especially cats. It is able to infect human causes Tinea corporis and Tinea capitis. The aim of this study is to isolate and identify the dermatophyte fungi *Microsporium canis* from cats in Baghdad / Iraq. This research focused on the epidemiology of *M. canis* found in cats. A total of two hundred and eighty three hair and skin scraping samples were collected from infected cats. Preliminarily examined with 10% KOH preparation, and cultured for fungal identification. For the culture; Sabouraud dextrose agar was used. The results of this study showed that four samples were positive for *M. canis*. The pathogen was found both at the site of the lesion and at other sites in the body. The pathogen can be found in the hair of cats with and without skin lesions.

1. Introduction

Dermatophytosis is the most common skin disease infecting superficial layers caused by many types of Dermatophytes (keratinophilic fungi) (Hasan, and AL-Jubori, 2015). It is zoonotic and widespread skin infection disease in pets (Boehm and Mueller, 2019). Keratinous tissues are target of dermatophytes infection as skin and hair also. Claw, hooves, and horns are degraded by dermatophytes in animals (Behzadi and Ranjbar, 2014); (Mohammed, 2011) and (Minnat, 2019). Three major genera of Dermatophytes are listed; *Microsporium*, *Trichophyton*, *Epidermophyton* based on conidial morphology of them according to Emmon's morphological classification (Rippon, 1988). The most prevalent dermatophyte agent in cats is *M. canis* (Aasi and Al-Aaraji, 2018) and (Saleem *et al.*, 2020). It is very contagious, transmitted easily through direct contact and it is zoonotic in nature but not life-threatening because it can be treated (Moriello, 2014) and (Mohammed, and AL-Jibouri, 2015). The frequency of infection of *M. canis* in cats is mostly higher than those in other pet animals, lesions of dermatophyte are etiologically correlated to this fungus (Cafarchia *et al.*, 2006). Ringworm is commonly circular and there is hair loss, desquamation, with hair fracturing, always an erythematous edge and central curing is the usual sign lesion of *M. canis* in cats. Lesions are single or multiple, often on the head and face localized. Generally, lesions have been appearing on several areas of the body, such as the tail and distal legs (Katirae *et al.*, 2016). The diagnosis was carried out through direct microscopy and cultures the specimens on each Sabouraud dextrose agar (Minnat, 2019). In Iraq, there was little information about the incidence of ring worm in cats; therefore, the goal of this study is to isolate *Microsporium canis* and to assess the incidence of this species in cats.

2. Materials And Methods

Two hundred and eighty-three skin scraping and hair sample was collected from cats with various ages, sex and breed during the duration from April-2022 to the end of March - 2023 from different regions of Baghdad governorate.

Collection of samples:

Clinically, All cats suffered from cutaneous lesions represented by loose hair, regular erythematous or just having itching. These lesions were cleaned with 70% ethyl alcohol to remove any dust and contaminated bacteria and by using the blunt edge of a sterile surgical blade, crusts and skin scales were collected by scraping from the edge of actively growing of the lesions which erythematous and inflamed margin then put onto a clean container. While in case of hair specimen collection, epilating forceps was used to pluck along the base of the hair shaft, then sealed in a sterile container; then labeled with the date of collection, age, animals name, and site of infection sex, then sent to the mycological

testing laboratory. The samples were separated into two parts: one for direct microscopic examination by using KOH 10% and other part for culturing according to (Shalaby *et al.*, 2016).

Diagnosis of *Microsporum canis*

1. Direct examination: The first part of each sample was treated with 10% potassium hydroxide on a clean slide then heated for 5-10 minute and let the slide to cool, and covered by cover slip for identification of fungal elements by using low powers magnification (X10) with light low intensity and lowering of the condenser. Then, use a higher magnification (X40), and higher condenser for better illumination to identify the morphology of the fungus (Kurade *et al.*, 2006) ;(Shalaby *et al.*, 2016)and (Ahmed *et al.* , 2019).

2. Isolation and Identification of *M. canis* : The other part of each sample was cultivated on Sabouraud dextrose agar (SDA) and incubated at 25°C for up to 2 weeks. The fungal growth was examined macroscopically and Microscopically that included large septated Macroconidia which observed by taking small part from fungal growth and mixed with one drop of lactophenol cotton blue and covered with a cover slip and examined under Microscope by using X40 lens according to (Hayyaw, 2012) ; (AL-Tameemi and Khalaf,2013) ;(Shalaby *et al.*, 2016) and (Jameel and Yassein,2021). An oil immersed lens (X100) was used to obtain better clarity for macroconidia of *M.canis*.

3. Results and Discussion

Macroscopic characteristic of *M. canis* infection in cats

Clinical examination of domestic cats suffering from *M. canis* was characterized clinically by circular lesions , focal and multifocal alopecia, itching , and Scaling in different area of body cats typically on the face , neck and back (**Figure 1**). On the other hand, the study showed infected hair by dermatophytosis were characterized enlarged and swollen structures with a rough and irregular surface (**Figure 2**).All fungi (*M.canis*) isolated were from male and female cats with skin lesions.

Macroscopic Characteristic of Colonies Grown on SDA Agar

Macroscopic characteristic of *M. canis* colonies growth on SDA agar at 25°C for up to 2 weeks, white, soft and fluffy in the center with yellow or golden yellowish border closely spaced radial grooves also became white all the top with age 3-4 weeks. While reverse colony color (Undersurface view) represented by yellow that dulls to brown and darker with age as in (Figure 3)

Microscopic Characteristics of Colonies Grown on SDA at 25C°.

Mormphology of *Microsporum canis* macroconidia on lacto phenol cotton blue stained preparations showed rough surface with knob-like end or boat like and separated into segments .Microconidia may absent or present along the length of the hyphae pyriform to round as shown in (Figure 4).

The total number of *M. canis* isolated from cats 4/283 (1.41%) as shown in (Table 1).

On the other hand, the present study demonstrated a relationship between the age of animals and infection rate with *M. canis* which represented a high percentage of infection in young age less than one year and a lower percentage in old age above one year in cats as shown in (Table 2). While the sex relation to *M. canis* infection was observed in female more than male cats with (75%) as shown in (Table 3). According to the anatomical site of lesions in cats with *M. canis*, the most sites of infection were face, neck and back as shown in (Table 4 , Figure 1).

Table 1.Percentage of *M. canis* isolation in cats .

NO. of Animals	No. of <i>M. canis</i> isolates	Percentage
283 /cats	4	1.41%

Table 2. Percentage occurrence of *M. canis* Based on age of cats

Age	<i>M. canis</i> in Cats (n=4)	
	+ ve	%
< 1 year	3	75 %
≥ 1 year	1	25 %
Total	4	100 %

Table 3 . Percentage occurrence of *M. canis* based on sex of cats.

Sex	<i>M. canis</i> in Cats (n=4)	
	+ ve	%
Female	3	75 %
Male	1	25 %
Total	4	100 %

Table 4. Percentage of *M. canis* infection in cats based on Anatomical site.

Anatomical site of lesion	<i>M. canis</i> in Cats (n=4)	
	+ ve	%
Face	2	50 %
Neck	1	25 %
Back	1	25 %
Total	4	100 %

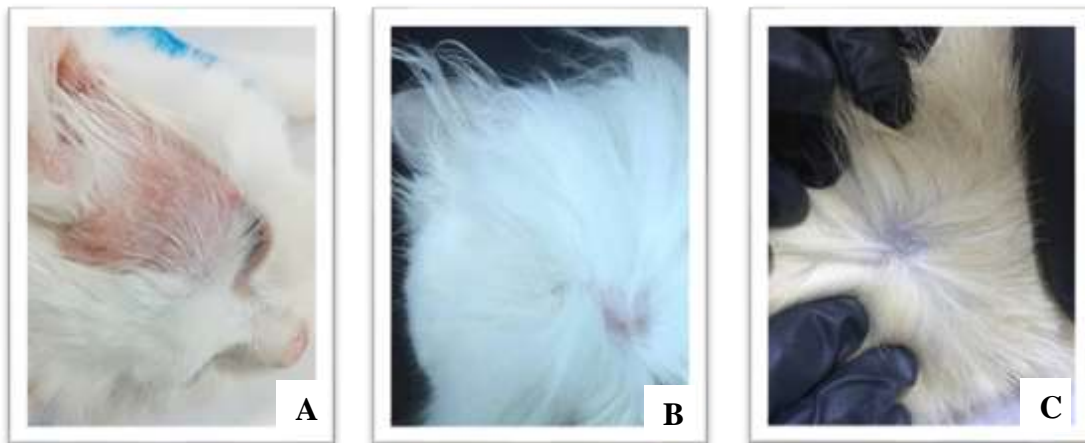


Figure (1): The anatomical site of lesions in cats; (A) Localized circular patch alopecia, crust, scales and redness in face female cat , 8 months old infected by *M. canis*. (B) A neck of female cat, 6 months old infected with *M. canis* (C). Localized circular lesion on back of male cat, 14 months old infected by *M. canis*.

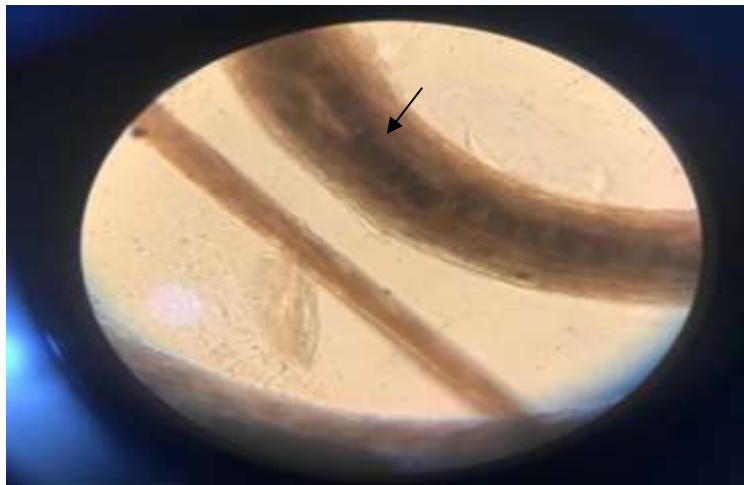


Figure (2): Infected hair by dermatophytosis (*M.canis*) were characterized enlarged and swollen structures with a rough and irregular surface (40X)



Figure (3): Macroscopic characteristic of *M. canis* colony grown on Sabouraud dextrose agar at 25°C for up to 2 weeks (Top view) and (Reverse View).

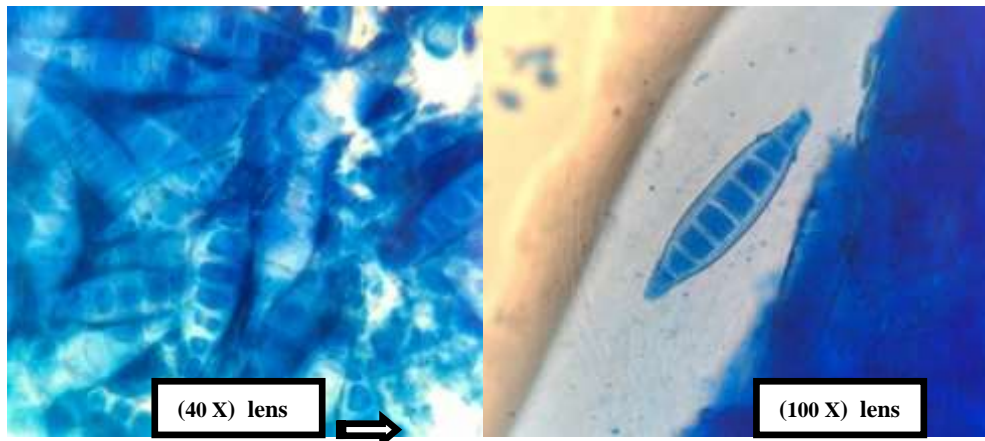


Figure (4): Macroconidia of *M. canis* stained with lactophenol cotton blue under microscope

An epidemiological study by the World Health Organization reported that there are three groups of dermatophytes that can cause infections in both humans and animals. These three groups are divided by the habitat and preferences of the fungus, are (1) anthropophilic dermatophytes, (2) zoophilic dermatophytes, and (3) geophilic dermatophytes (Chupia *et al.*, 2022). Anthropophilic dermatophytes usually cause disease in humans; however, some species in this group can cause disease in animals, since they grow well in keratinized tissue. This allows the infection to spread from person to person via infected scabs or skin fragments. This group includes *Trichophyton rubrum*, *Trichophyton tonsurans*, *Trichophyton megnini*, *Microsporum audouinii* and *Epidermophyton floccosum*. The fungi in the zoophilic dermatophyte group usually cause disease in animals but can also infect humans and cause ringworm. This group includes *Microsporum canis*, *Microsporum equinum*, *Microsporum gallinae*, *Trichophyton verrucosum*, and *Trichophyton mentagrophytes*. The last group is geophilic dermatophytes, which thrive in soil, plants, and environment habitats. Humans or animals can become infected by this group of fungi through contact with the environment or soils, or they may be exposed via abrasions or wounds to the skin. The members of this group include *Microsporum gypseum*, *Microsporum nanum*, *Microsporum persicolor*, and *Microsporum cookei*. Some studies have found that dermatophytes are dispersed across different regions of the world, with the behavior of the population in each area depending on the climate, humidity, and residential characteristics (Zhan *et al.*, 2018). Most fungal skin diseases suffered by cats are caused by *Microsporum canis* (Willemse, 2015), which belongs in the group of zoophilic dermatophytes. The natural habitat of this fungus is in animals; however, this infection can also cause ringworm in humans in different parts of the body, such as the nails and head (Chupia *et al.*, 2022). Therefore, this research aimed to detect this pathogen in cats in Baghdad, which is a pet species that lives very close to humans and may expose humans to diseases. According to this research, the percentage of infection with *M. canis* in cats in Baghdad is (1.41%). Result of *M. canis* isolation of this study represented by a low infection rate in cats compared to other studies. The current study reported 1.41% of ringworm cases were isolated from feline; this result is not consistent with a result of study conducted by (Copetti *et al.*, 2006), which reported the isolation rate was 25.2%. The result of this study was far from (Paixão *et al.*, 2011), who reported that *M. canis* was isolated from cats with (28.6%). but the investigation of (Brilhante *et al.*, 2003), was higher slightly in which from 38 cats, 14 *M. canis* was isolated with (36.8%). While was higher than from the result of two studies; firstly, (Abou-Eisha *et al.*, 2008) recorded that the dermatophytes represented by *M. canis* were (10%) of the examined cats. secondly (Nwiyi and Ottah, 2020) revealed the isolation rate of *M. canis* in cats was 22%. The differentiation in the rate of isolation dermatophyte *M. canis* from cats between researches can be explained by the presence of virulence factors of dermatophytes spp. isolates more than others and the climate condition that is more suitable in some regions than others when these studies were conducted. These findings explain the variation allegedly occurs due to difference in relative humidity, climate, temperature, pollution of the environment and the rainfall between the geographical areas where the studies were executed; (Zenad *et al.*, 2015). According to this research, humans who are close to and exposed to cats should be more aware of animal diseases, especially skin

diseases such as ringworm. Zookeepers, veterinarians, or people who come into contact with these animals should be aware, as contact with infected animals (both at lesions and non-lesion sites) can cause infection. Quick diagnosis leads to rapid treatment, increasing the chance of cats recovering from the disease and reducing the risk of them carrying the pathogen to humans and animals. The current diagnosis method is fungal identification from fungal culture; it takes about 10–14 days for the fungus to fully grow, so the development of a faster diagnostic method would be good for both veterinarians and zookeepers, as well as others who come into contact with animals, as it would reduce the potential risk factors (Chupia *et al.*, 2022). Two case studies reported symptoms such as redness, dandruff, and scabs, showing severe itching (pruritic erythematous scaly plaques), and found that the symptoms of both cases were caused by *M. canis*. Both patients had a cat in their household. The cats were normal, strong, and healthy cats that did not show any symptoms. Preliminary examinations with Wood's lamp method provided positive results and diagnoses of *M. canis*, so it is possible that both of these cases were caused by *M. canis* infection from healthy cats to humans. There were no lesions, making humans think that the cats were uninfected and reducing the care taken when dealing with the animal. This increased the risk of infection. Dermatophytosis is a self-curing disease in most animals and also in cats. Infected cats should be isolated from other pets until the disease is clear (Boothe, 2012).

The findings of this study reported that animals less than one year of age were the most affected, this observation is consistent with previous studies conducted by (Minnat and Khalaf 2019). Increased susceptibility to dermatophytosis in young animals can be attributed to a several factors involving lack of previous immunity, immune system immaturity and microtrauma in skin as ectoparasites or siblings as mentioned (Moriello *et al.*, 2017). The sex with highest susceptibility to infection with *M. canis* were females in cats and this result was agrees with (Nwiyi and Ottah, 2020) and the underlying reason is perhaps the greater contact of females with the contaminating animals in their living sites. The female have more interest for keeping animals such as cats in their living sites as mentioned by (Katirae *et al.*, 2016). Localized signs of *M. canis* are seen in face, neck and back but, mostly seen on face and can be attributed to the between of animals in these region with other animals carrier as mother during feeding or sleeping beside her mother (Mattei *et al.*, 2014). The infected cat should be treated because of the zoonosis characteristic of the disease and treatment is usually recommended to shorten the course of the disease and minimize the pathogen to other susceptible animals or humans. Many antifungal drugs have been used successfully for dermatophytosis. Most commonly used antifungal drugs in veterinary medicine were ketoconazole, fluconazole, itraconazole, griseofulvin and terbinafine (Chupia *et al.*, 2022). Besides the treatment, the prevention is very important; washing hands immediately after contact with animals (with and without skin lesion) every time is necessary when in contact with any animal. The owner should wash/change the bedding frequently because of the contaminated fomite. Mechanical removal of infected organic material/hair and surface washing, with a detergent, is the most important step for environmental cleaning/disinfection. After cleaning, a disinfectant should be used. The veterinarian should educate the owner about the necessity of treatment, control, and prevention of this disease. In Iraq, The incidence of *M. canis* ,even if it is low ,must be taken with caution because of it is possibility of some multidrug resistant strains to transmit to humans (Abulkareem Abdulshaheed, 2009).

3. Conclusion

Microsporum canis is one of the major dermatophytic diseases in cats so; the study recommended to take high precaution toward cats due to zoonotic nature and easy transmitted of their spore.

Therefore; in this research focused on the presence of *M. canis* found in cats, collecting samples from cats with and without lesions of dermatitis. because the pathogen can be found in the hair of cats with and without skin lesions, owners, veterinary staff, and others who come into contact with the animals are at risk of infection if they are not aware or do not take precautions. The zoonotic risk and potential as an etiologic agent for a variety of diseases should be considered and investigated further.

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