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## DERMATOMYCOSIS — A POTENTIAL SOURCE OF ZONOTIC INFECTION IN CITIES

**ABSTRACT:** Skin infections in animals and humans represent a complex syndrome that is, from etiological point of view, often hard to solve. Skin is one of the largest organs and plays an important role in the organism of mammals. Depending on the age, it presents 5—8% of total body mass in humans, 12% of adult animals, and even up to 24% in newly born animals.

The population of pets and stray dogs in cities provides a possibility for contacts between animals and/or humans, which is a mode of transmission for some diseases. Fungal diseases in dogs caused by dermatophyte are zoonosis, contagious infections that affect dogs and cats, but also other animals, as well as humans. There has been an overall increase in the number of the cases caused by anthropophilic fungi from the strain of *Microsporum* spp. and *Trichophyton* spp.

Our research was related to animals with different changes on skin manifested by hairless surfaces, dandruff, red skin and extensive pruritus. The objective of our examination was the analyses of scarified samples and swab from canine skin with the aim to determine whether the changes were caused by dermatophytosis. Our aim was to point out the possibility of transmission of mycotic infections from animals to humans in households.

For this mycological examination swabs and skin scarifications from dogs, were used. The samples were streaked on Sabo and dextrose agar and incubated at 25°C for at least 21 days. In one year period 81 samples were collected out of which 11 (13.58%) were positive for dermatophyte. In all samples *Microsporum canis* was isolated.

The findings of *Microsporum canis* in 13.58% of the examined samples indicate the importance of mycological skin disorder in pets. Having in mind that this is a zoonosis, the findings point to a possibility of exposing the humans to fungal infection, affecting almost all pet owners, especially in urban environment.

**KEY WORDS:** dermatophytes, dogs, zoonosis, city

## INTRODUCTION

Humans have moved to cities from smaller settlements, where life style was closely connected to nature. However, in the cities nature is preserved only in a form of small green areas, parks or gardens. Human need for nature is obvious, so there is a constant striving to maintain some parts of nature in

the surrounding. Part of this is the practice of co-habiting with different pets. It is questionable whether the owners are informed about the unwanted consequences of keeping the animals in their households. Urban environment has specific characteristics when speaking about raising the pets: households are not large, what gives a possibility for closer interaction between humans and animals; they spend more time together than when living in natural environment. The potential for human exposure to transmitting of different microorganisms and parasites (L e f e b v r e a et al., 2006) from animals is very high and vice versa.

Over 300 species of fungi have been reported to be animal pathogens (O u t e r b r i d g e, Catherine A., 2006). Actual mycological pathogens of skin can be divided based on what layers of the skin they infect: surface layer — cutis, hair coat or claws. Superficial mycosis include dermatophytosis (predominantly *Microsporum* and *Trichophyton* species, but also *Malassezia* spp. and *Candida* spp. and *Trichosporon*) (O u t e r b r i d g e, Catherine A., 2006, P o p o v i ć, N., L a z a r e v i ć, M., 1999). Subcutaneous and deep systemic mycosis will not be reviewed in this paper. Cutaneous tissue may be infected when fungal organisms contaminate or colonise epidermal surface or hair follicles. When the integrity of skin barrier is disrupted, than the host is disposed to the infection. Canine and feline skin and hair coats can be transiently contaminated with a large variety of saprophytic fungi from the environment and some of them can cause opportunistic infections (S t o j a n o v et al., 2007, O u t e r b r i d g e, Catherine A., 2006).

Based on the experiences and data from literature, the objective of our research was to examine scarification and swabs from changed skin, with the aim to point out a possibility of transferring fungi infection from animals on humans in specific urban conditions of pets co-habitation.

## MATERIAL AND METHODS

Our research was done on dogs with different skin infections. Clinical findings were not specific, and the etiology of a disease could not be determined. Effective therapy could not be applied. The findings differed in the intensity and type of changes that were manifested as more or less pronounced hair loss (sometimes even more than 50% of body). The signs of dandruff or seborrhea were visible and separated from deeper layers of cutis. The skin was reddish, with purulent pustules and expressed pruritus. In one year period there were 81 samples collected. Swab and scarifications of dog skin (C a b a n e s, F. J. et al., 1996) brought to the laboratory were used for the determination of the etiology of the disease. The samples were streaked on Saboraud dextrose agar and incubated at 25°C for 10 to 21 days. The colonies were identified according to their shape and colour, and the classification was done according to their conidia, macroconidia and conidiophores (Q u i n n, J. P. et al., 2002).

## RESULTS AND DISCUSSIONS

From the total 81 of samples, there were 11 (13.58%) samples positive on the presence of dermatophyte. Beside the fungal organisms that are the causal agent of superficial mycosis, the presence of a large number of different saprophyte fungi was determined originating from the environment, but not dermatophyte. They were present in more than 90%, i.e. in 74 samples (91.35%) isolated in single or mixed microflora nondermatophyte fungi. The results are displayed in Table 1.

Tab. 1 — The results of the examination of swabs and skin scarifications

Isolate	Number of the samples	Number of positive findings (%)
<i>Microsporium spp.</i>	81	11 (13.58%)
<i>Trichophyton spp.</i>	81	Not isolated
Saprophytic fungi	81	74 (91.35%)

The most important dermatophyte that cause the infections of skin are those that belong to keratophyl *Microsporium*, *Trichophyton* and *Epidermophyton* spp. The mentioned dermatophyte were divided in 3 or 4 groups depending on the natural environment where they can be found. In Table 2 the most important kinds of dermatophyte depending on their natural environment are displayed (O u t e r b r i d g e, Catherine A., 2006, C h a b a s s e a, D., P i h e t a, M., 2008).

Tab. 2 — Most important dermatophyte kinds, depending on their habitat and host

Habitat of dermatophyte	Dermatophyte	Host
Zoophilic dermatophyte	<i>Microsporium canis</i>	Dogs and cats
Geophilic dermatophyte	<i>Microsporium gypseum</i> <i>Trichophyton mentagrophytes</i>	Soil
Sylvatic (forest) dermatophyte (specially adapted zoophil dermatophyte)	<i>Trichophyton mentagrophytes</i> <i>Trichophyton erinacei</i> <i>Trichophyton persicolor</i>	Rodents and hedgehogs
Anthrophilic dermatophyte	<i>Trichophyton tonsurans</i> <i>Epidermofyton floccosum</i>	Humans (dogs and cats)

In this study, the presence of only one dermatophyte of *Microsporium* (*Microsporium canis*) was detected. No fungi from *Trichophyton* were cultured. According to the data in literature *Microsporium canis* is responsible for 97–100% of cutaneous mycosis in Italy (M a n c i a n t i et al., 2003).

Saprophyte fungi, i.e. fungi from the soil and the environment were isolated in a high percentage (91.35%) and the most frequent were *Aspergillus* sp., *Penicillium* sp., *Alternaria* sp., *Mucor* sp. and *Fusarium* sp. Their presence was determined in mixed and single flora in the material where dermatophyte was not isolated, however, they were present, though in a smaller quantity, in the materials that were positive on the presence of causal agents of dermatomycosis. The growth of saprophyte fungi was so abundant, that the precise identification of dermatophyte colonies was often difficult.

In our study only one kind of dermatophyte *M. canis* was isolated and this finding corresponds to data reported by a group of authors (Mancianti et al., 2008) who examined different kinds of therapy. It is important to stress that these authors isolated *M. canis* from the surface of fur, i.e. from the skin of many asymptomatic animals. The findings of dermatophyte on the skins of dogs with no clinical symptoms were also reported by other authors (Ates et al., 2008) in 2.6% cases. However, in their examination the presence of zoophilic dermatophyte *M. canis* was not detected, but geophylic (*M. gypseum*) and forest dermatophyte (*Trichophyton mentagrophytes*) were isolated. The authors (Ilkit et al., 2007) in an area where dogs were analysed on the presence of dermatophyte, also analysed the etiology of dermatological infections in children. It was reported that the changes on the skin, first of all on the head, were caused by the infection with *Microsporum canis*. The results of two aforementioned research point out that dogs can be the carriers of different dermatophyte, but are not a direct cause of dermatomycosis in the humans. Fungi superficial in the humans may be caused by geophylic, zoophilic and anthropilic dermatophyte (*Microsporum canis*, *Microsporum gypseum*, *Trichophyton mentagrophytes*, *Trichophyton tonsurans* etc.) (Tomson, Neviana, Sterling, Jane C., 2007).

An overwhelming survey on different dermatophytes in pets is displayed in the work of Hoppmann and Barron (2007), where the presence of dermatomycosis was studied in rodents. In the urban environment there are many different exotic animals and one of them are the rodents. Mice, rats, hamsters, gerbils, chinchilla and other animals are often kept as pets. They may be symptomatic or asymptomatic carriers of different dermatophyte (*M. gypseum*, *T. mentagrophytes*, *M. canis*). The owners of these pets are not often aware of their exposure to these zoonosis, because clinical signs of dermatomycosis in the exotic animals is a consequence of stress, bad feed and immunodeficiency.

There are authors (Chen Cheng-Hsu et al., 2008) who explained the risks of keeping pets in the urban environment and found a connection between the skin infection of a patient and her dog pet. Before the clinical symptoms were obvious, the patient with renal transplantation received immunosuppressive agents. The causal agent of changes on skin was fungi *M. canis* that was also found on her pet dog, which was however asymptomatic. The author's opinion is that dermatomycosis would not have occurred if there was not a disbalance of immune system caused by immunosuppressive agents. This finding points to a continuous exposure to dermatophyte and risks in the cases of co-habiting pets.

## CONCLUSION

In our research dermatophyte was determined in 13.58% of samples. The etiology of the disease pointed to these microorganisms, so the therapy could be prescribed. One kind of fungi, from the genus of *Microsporum* (*Microsporum canis*), was detected. Saprophyte fungi were isolated in a great number (91.35%) of samples which revealed contamination of fur and skin in

dogs. However, the presence of dermatophyte may also be “hidden” under this finding.

The presence of dermatophyte without symptoms points out the risk of keeping pets in the urban conditions, where the humans are exposed to closer contact with the animals than it is usual in nature. Therefore, it is important that every pet owner should be acquainted with the risk of keeping pets.

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## ДЕРМАТОМИКОЗЕ ПАСА КАО ИЗВОР ЗООНОЗА У ГРАДСКОЈ СРЕДИНИ

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### Резиме

Болести коже животиња и људи чине комплексан синдром који етиолошки често није јасан и који из тих разлога није лако решити. Кожа представља један од највећих органа чије су многобројне физиолошке функције важне за организам сисара. У зависности од старосне доби њена маса се може кретати од 5—8% укупне телесне масе код људи, до 12% код одраслих животиња и чак до 24% код новорођене штенади.

Присуство кућних љубимаца у градској средини као и паса луталица, може допринети већем међусобном контакту животиња и/или људи, чиме се повећава вероватноћа преношења неких од биолошких фактора болести коже. Гљивична обољења коже паса узрокована дерматофитима је зоонозна, контагиозна инфекција која угрожава, поред паса и мачке, друге животиње укључујући и људе. Највећи број микоза паса изазван је гљивицама које проузрокују *Microsporium* spp. и *Trichophyton* spp.

Наше истраживање је било везано за псе који су имали различите форме промена на кожи које су се манифестовале појавом обездлчених површина, перутањем коже, црвенилом и израженим пруритусом. Предмет испитивања је била миколошка анализа узетих скарификата и брисева са промењених места на кожи паса са циљем да се утврди да ли су настале промене изазване дерматофитима и, ако јесу, о којим се врстама ради. Исто тако циљ нам је да укажемо и на могућност преношења гљивичних инфекција са животиња на људе у специфичним градским условима одгајања кућних љубимаца.

За миколошко испитивање користили смо брисеве и скарификате коже паса који су долазили на лабораторијску анализу како би се утврдила етиологија обољења. Узети узорци засејани су на Сабуро декстрозни агар и инкубирани на 25 степени најмање 21 дан. У току једне године испитан је 81 узорак од којих је 11 (13,58%) било позитивно на дерматофите. Код свих позитивних налаза изолован је *Microsporium canis*.

Налаз *Microsporium canis* код 13,58% испитаних узорака показује да су дерматофите значајан изворник кожних обољења кућних љубимаца. Исто тако, с обзиром да се ради о зоонози, њихов налаз указује на могућност експонирања људи гљивичним инфекцијама, а пре свега власника, што је посебно потенцирано у условима гајења животиња у урбаној средини.