Incidence and seasonal variation of pet dermatophytosis in Moscow region

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Abstract. In the current one-year study 2477 samples from pets clinically suspected for dermatophytosis (1010 from dogs and 1467 from cats) were examined by direct microscopy, conventional mycological culture and DTM culture. Direct microscopy revealed 1.28% positive samples, conventional culture – 8.0% and DTM culture – 27.7% positive samples. The average incidence of dermatophytosis in Moscow region was 14% (9.5% in cats and 4.5% in dogs), most of cases were diagnosed in autumn. DTM culture proved to be the most effective method for diagnosing dermatophytosis in pets.

1. Introduction
Dermatophytosis of animals is a specific disease of fungal etiology, which is highly contagious and widespread among various animal species. In addition to animals, humans are susceptible to infection. The disease is characterized by superficial damage to keratinized skin structures - the epidermis, hair, including claws.

The causative agents of the disease are dermatophytes - a group of microscopic fungi that includes more than 30 species [1]. Dermatophytes are usually divided into 3 groups depending on their natural habitat: geophilic - live in soil, bestial - parasitize on animals, and anthropophilic - species of this group are able to infect only humans [2,3].

A number of studies indicate the leading role of Microsporum canis, Trichophyton mentagrophytes and Microsporum gypseum in the occurrence of infection and the spread of the disease among small domestic animals [4-7]. The frequency of excretion of each type of fungus varies in different countries, depending on the geographical location, season of the year and climatic conditions.

In a study in New Zealand, where a humid and warm climate is observed, of the 200 cats examined, 78 (39%) were positive for dermatophytes, and out of 120 dogs, 10 (8.3%) were positive [8]. In Colombia, with a similar climate, out of 251 animals, 34 (13.5%) managed to isolate dermatophytes, mainly M. gypseum [9]. In India and northern Brazil, where a hot humid climate prevails, the prevalence of dermatophytosis among cats was 37%, in dogs - 14-20%, with the prevalence of the pathogen M. canis, M. gypseum and Tr. mentagrophytes [6,10].

In countries with hotter and drier climates, such as Iran, Turkey, the incidence of dermatophytosis in cats ranges from 20-50%, in dogs 9-18%. The most frequently detected dermatophyte was also M. canis [11, 12, 13].
In Europe, there are significantly more reports of dermatophyte prevalence. Studies conducted by various authors from Italy, Portugal, England, Romania, show that the incidence of cats is 7-41%, dogs - 11-28%, while from 50% to 90% of cases of dermatophytosis causes M. canis [14,15,16,17,18,19,20].

There is very little data on the prevalence of dermatophytosis in Russia, and in Moscow, in particular. According to Nikitushkina (2008), when examining 2997 dogs and 2240 cats with signs of dermatophytosis, the disease was confirmed in 771 (34%) cats and 1088 (36.3%) dogs [21]. However, the climate of Omsk (Siberia), in which the study was conducted, is characterized by rather cold conditions, therefore, the incidence can differ significantly from other regions of Russia.

The incidence of dermatophytosis can depend on many factors, in particular on the epizootic situation in the region, the conditions of detention, the degree of damage to the animal (from asymptomatic carriage to serious dermatitis), and finally on the diagnostic method.

A study of the prevalence of dermatophytosis in animals is necessary for two reasons: firstly, sick companion animals can be a source of human dermatophytosis [12]. In this case, the danger is not only sick, but also animals with asymptomatic myocarriage, which is widespread, especially in cats. Often people do not know that their pet is infected until they have clinical symptoms [22]. In humans, dermatophytosis most often causes M. canis, which is the most common pathogen in animals, which indicates the potential threat of sick animals to humans [23, 24]. The second reason to study the prevalence of dermatophytosis is the timely detection and prevention of the spread of infection in crowded areas such as shelters and nurseries. An outbreak of dermatophytosis, for example, in a shelter, in addition to harm to the health of animals and personnel, also leads to significant economic damage, which consists of the cost of treatment, sanitation, and quarantine [25,26].

Given the above facts, it is important to conduct periodic studies to identify dermatophytosis among domestic and wild animals. This is necessary to understand the epidemiology of the disease and the timely adoption of preventive measures. In a metropolis, it is first necessary to study the prevalence of dermatophytosis among small domestic animals, so the goal of our study was to study the incidence of dermatophytosis in cats and dogs in Moscow and the Moscow region.

2. Material and methods

The study was conducted in the capital of Russia - Moscow, a city with a high population density. The climate is temperate continental, with a pronounced seasonality.

The study was conducted in the laboratory "NEOVET" - one of the largest veterinary laboratories in Moscow, together with the Laboratory of Mycology and Antibiotics named after A Kh Sarkisov of Federal State Budget Scientific Institution “Federal Scientific Centre VIEV” (FSC VIEV). Samples from animals for the study came from more than 450 veterinary clinics located throughout the city and region.

For the twelve months of 2019, 2477 samples of material from 1467 from cats and 1010 from dogs with skin lesions suspected of dermatophytosis were examined. 1792 samples (690 from dogs and 1102 from cats) were examined only by direct microscopy, 476 samples (272 from cats and 204 from dogs) were tested by mycological culture, 209 samples (37 from dogs and 93 from cats) were examined with by seeding on a DTM medium (Dermatophyte Test Medium).

To assess the seasonality of the disease, the year was divided into periods: winter (December, January, February), spring (March, April, May), summer (June, July, August) and autumn (September, October, November).

Direct microscopic examination was carried out using a light microscope, with a 40-fold increase. Microscopic preparations were prepared in a 10% KOH solution [27, 28].

Mycological inoculation was carried out on a Saburo culture medium containing 0.5 mg/ml chloramphenicol. Crops were incubated for 21 days at a temperature of 26-28 °C. To confirm the belonging of the isolated fungus to the group of dermatophytes, macroscopic and microscopic identification was used [29].

The presence of dermatophytes in the material during the study on DTM medium was determined in accordance with the manufacturer’s instructions (color change from yellow to red with simultaneous
growth of characteristic colonies) [30, 31]. The exact species identification of the isolated dermatophyte cultures was not carried out.

3. Results

3.1 Direct microscopy.
In 2019, using this method, 1792 samples of material obtained from 690 dogs and 1102 from cats were examined (figure 1).

![Figure 1. Occurrence and seasonal variation of dermatophytosis diagnosed by direct microscopy.](image)

Among cats, 15 (1.36%) positive samples were revealed, of which 9 were confirmed in the autumn, 4 in the summer. The largest number of studies was conducted in the autumn - 496 (45%), a little less in the summer - 329 (30%). Samples from dogs were most often taken in the summer - 286 (41%) samples of the material were examined, less often in the fall - 208 (30%) samples were examined. There were 8 positive results (1.15%). Thus, 23 (1.28%) positive samples were detected among animals by direct microscopy. In the autumn, a little more research was carried out - 704 (39%) than in the summer - 615 (34%), and the largest number of positive results was recorded in the autumn period - 9 (39%).

3.2 Mycological culture.
Using classical seeding, 476 samples were examined, of which 272 were from cats and 204 were from dogs (figure 2).

![Figure 2. Occurrence and seasonal variation of dermatophytosis diagnosed by conventional culture.](image)
It was possible to identify 38 (8%) cases of dermatophytosis, of which 28 (5.8%) in cats and 10 (2.1%) in dogs. The peak of studies was recorded in the fall - 206 (43%), the same number of cases accounted for the largest number of cases - 16 (42%). Slightly fewer cases of dermatophytosis were detected in the summer - 9 (23.7%) and in the winter - 10 (26%) positive studies.

3.3 The use of DTM tools.
Using DTM media, 58 (27.7%) cases of dermatophytosis from 209 examinations were diagnosed. Moreover, infection in cats was recorded in 37 cases out of 93 (17.7%), in dogs - 21 out of 116 (10%) positive results (figure 3).

The peak incidence is the fall season, which accounts for 22 (38%) positive cases, less incidence is noted in the winter - 17 cases (29%).

4. Discussion and conclusion
The aim of the study was to study the prevalence of dermatophytosis in Moscow and the Moscow region in 2019. From the data obtained, conclusions can be drawn about the incidence of dermatophytosis among companion animals in the Moscow region, as well as about diagnostic methods chosen by veterinarians.

As can be seen from the data obtained, direct microscopy of wool is the most popular among doctors and owners, the share of which is 72.3% of all studies. The reason for the popularity of this method lies in its speed and availability. A large number of negative tests can be explained by the fact that practitioners often use this study to exclude dermatophytosis in doubtful cases [32]. However, according to foreign authors, the effectiveness of the method can be either very low - only 12% [33], or reach 80% [34]. To increase the effectiveness of this diagnostic method, it is necessary to train specialists who can accurately determine mycelial fragments, hyphae, and arthrospores in the preparation, which can be difficult to do due to the presence of a large number of artifacts in the samples. It can be assumed that direct microscopy was not always performed correctly, so we cannot fully rely on the results of this diagnosis to assess the prevalence of dermatophytosis. Despite obvious shortcomings, in practice this type of research can be very useful if it is correctly applied, reducing the time required to start treatment [12].

In total, 1.2% of dermatophytosis-positive specimens were detected by microscopy, 8.0% by classical culture and 27.7% by DTM.
The incidence data obtained are similar to those of other authors. G. Alpun et al. in 2009, a study was conducted according to which it was possible to isolate 33 (20.4%) dermatophytes from 162 animals with suspected dermatophytosis [13]. A study by Mederle, N. et al. 2007 in Romania, shows a higher incidence of dermatophytosis among animals with dermatological problems. Of 324 animals examined in 2001-2004, 97 (29.9%) dermatophytes were isolated [15].

When summarizing the data obtained during mycological seeding (classical and DTM medium), the number of animals infected with dermatophytosis was 96 (14%) of 685 examined. At the same time, there are twice as many sick cats as dogs: out of 355 cats, 65 (9.5%) were infected, and out of 320 dogs, 31 (4.5%) (figure 4).

![Figure 4. Overall occurrence of dermatophytosis in dogs and cats revealed by mycological culture.](image)

Of the three methods used, the largest number of dermatophytes (27.7%) was confirmed by plating on DTM. From the data obtained, it can be assumed that the diagnostic efficiency of using the DTM medium is higher than conventional seeding. This type of medium is characterized by selective properties, inhibiting the growth of contaminating concomitant microflora, which provides simple and clear detection of dermatophyte growth.

The Saburo medium does not possess such properties and can germinate with fast-growing molds that inhibit the growth of dermatophytes, which leads to a false-negative result of the study [31].

In all three diagnostic methods, a clear seasonal incidence is observed - the highest peak in the detection of dermatophytosis occurs in the autumn - 38 animals, slightly lower incidence in winter and summer - 27 and 21 animals, respectively, which is consistent with the opinions of foreign authors [10, 16,19,20]. In addition to morbidity, in the same periods there are more studies to identify dermatophytosis.

The data obtained allow us to judge the prevalence of dermatophytosis in Moscow and the Moscow region, which is important for understanding the epidemiology of the disease. Such studies are necessary for planning preventive measures and controlling the spread of dermatophytosis among animals and humans.

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