



ВЕТЕРИНАРНІ НАУКИ

UDC 636.7:616.36:577.1

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ANALYSIS OF FACTORS AFFECTING TICK INFESTATIONS IN DOGS

Abstract

Tick-borne invasions are among the most common diseases for both animals and humans. This study describes the spread of pathogens *Demodex canis*, *Sarcoptes scabiei* var. *canis*, and *Otodectes cynotis* in Ukraine over the past five years, and investigates the age-related characteristics of the diseases, as well as the impact of dog breed and sex on the intensity of the disease.

The study, conducted from 2019 to 2023, covered 1,452 dogs belonging to owners from the Khmelnytskyi and Chernivtsi regions of Ukraine. Clinical examinations were carried out using standard methods, taking into account the localization and area of skin lesions, the presence of itching, and other symptoms. Deep skin scrapings were used to diagnose acaroses (scabies, otodectosis, demodicosis), as well as otoscopy to assess the condition of the ear mite.

The study of acariform mites in dogs from 2019 to 2023 revealed that the main species of parasites affecting the animals were *Otodectes cynotis*, *Sarcoptes scabiei* var. *canis*, and *Demodex canis*. According to the results of the study, the most common diseases among dogs were demodicosis (6.3%), otodectosis (4.3%), and scabies (1.2%). The highest infestation rate was recorded in 2023, specifically for otodectosis (5.5%), demodicosis (7.5%), and scabies (1.4%). Age-related infection features were also studied, with a high infection rate observed in dogs aged 2–6 months, and a peak infection rate at 6–12 months. Breed and sex differences in disease occurrence were also considered: the most cases of otodectosis were found in mixed-breed dogs, while demodicosis was more common in mongrel animals. Female dogs were found to be more susceptible to mite infections compared to males.

The obtained data will help to develop a comprehensive approach to the prevention of these diseases, taking into account the epidemiological situation in specific regions.

Key words: dogs, age categories, breed predisposition, *Demodex canis*, *Otodectes cynotis*, *Sarcoptes scabiei* var. *Canis*.

Introduction. Tick-borne infestations continue to be the most common diseases worldwide, affecting both animals and humans [6]. Parasitic mites are most often members of the *Acariformes* family [9]. Representatives of this series can cause dermatitis, which is complicated by secondary infection. *Demodex canis*, *Sarcoptes scabiei* var. *canis* and *Otodectes cynotis* ticks are most often registered among dogs [7; 11; 15].

Demodicosis is one of the most common skin diseases caused by mites of the *Demodex* genus (*Demodecidae* family). Ticks are localized in the sebaceous glands and hair follicles of animals and humans [7; 9]. The disease is manifested by the phenomena of diffuse or focal inflammation, accompanied by local or generalized alopecia, the formation of papules, pustules, scales, thickenings and folds. When the body's resistance is reduced, demodectic infestation can cause papular and pustular dermatitis, erythema, formation of comedones and contribute to secondary bacterial and/or mycotic infections [8; 13].

Sarcoptosis is a skin disease caused by representatives of the *Sarcoptes* genus, which affects a wide range of hosts, including dogs [6]. The disease begins with tick damage to the scalp, neck, root of the tail, and groin. Later, the parasites spread to other parts of the body. A characteristic sign is inflammation of the edges of the ears, as well as an itch reflex, which is clearly visible a day after infection, when they start stroking the animal's head, neck, and back [11]. The generalized form of sarcoptosis in the absence of treatment leads to the death of the animal from exhaustion, nervous excitement and septic phenomena [10].

Otodectosis is caused by the acariform mite *Otodectes cynotis* [2], which parasitizes on the inner surface of the auricle, in the auditory canal and tympanic membrane of animals [7]. In dogs, as a result of infection with *O. cynotis*, otitis externa develops, which is characterized by erythema and is accompanied by itching, the development of dermatitis and otitis, the release of serous and then purulent exudate from the external auditory canal, which forms dark crusts [5]. In more severe cases, the inflammatory process can spread to the middle and inner ear and membranes of the brain, as a result of which the animals die [4].

Recently, there have been more and more literary reports indicating a significant spread of acarosis of small domestic animals in different parts of Ukraine. In particular, demodicosis of dogs, otodectosis of cats and dogs, notoedrosis of cats and dogs, and sarcoptosis of dogs and cats are mainly diagnosed as skin parasitic diseases. The causative agents of these diseases can also harm human health, because they often cause their invasion with the manifestation of characteristic clinical signs. According to [5; 6] the number of patients with sarcoptosis and otodectosis of animals is increasing annually. Transmission of the disease is possible through direct or indirect contact, as ticks can survive for several days without a host and remain infectious

The given information testifies to the important epizootic and epidemic significance of acarotic zoonotic invasions, the increase in the frequency of relapses of animal and human parasitic diseases, as well as the variability of the epizootic process. Despite the variety of methods of diagnosis and means of treatment of carnivore acarosis, the problem of combating these diseases remains relevant.

A number of factors affect the infestation of dogs with ticks, such as age, sex, breed, general condition of the body, and even climatic conditions. In Ukraine, there are quite limited data on infestation in dogs caused by *Demodex canis*, *Sarcoptes scabiei* var. *sanis* and *Otodectes cynotis*. Most of the studies were independent of each other and there is little systemic or regional data.

Research aim. The aim of this study was to investigate the dynamics of disease occurrence depending on the age, sex and breed of dogs in order to better understand the control and prevention of outbreaks in animals and humans.

The presentation of the main material of the research. The research was conducted during 2019–2023. In total, 1,452 animals belonging to owners living in Khmelnytskyi and Chernivtsi regions, Ukraine, were included in the study. The study included dogs of various breeds, aged from 2 months to 10 years at the start of the study, and of various weights. During the entire study period, the dogs remained with their owners under the usual housing conditions.

Clinical examination of sick animals was carried out according to generally accepted methods. During the examination, the location and area of the lesion, the nature of the changes in the skin, the presence of itching of the affected skin areas, as well as data on the time of onset and nature of the course of the disease, must be taken into account. Deep scrapings of the skin in the most affected areas were taken from each dog during the first visit. The skin was slightly compressed to facilitate the removal of the mite from the lumen of the follicle. Assessment of the state of ear mite infestation was carried out using otoscopy. After the samples were collected, they were placed in Petri dishes and immediately transported to the laboratory [9].

Samples were evaluated microscopically at 100x magnification. Ticks were counted and identified according to morphological description [1]. The final diagnosis of acarosis (sarcoptosis, otodectosis, demodicosis) was established in case of detection of ticks during microscopic examination of scrapings from the affected areas of the skin.

All studies were conducted in accordance with the Council of Europe Convention for the Protection of Vertebrate Animals Used in Experiments and for Other Scientific Purposes of March 18, 1986, Directive 2010/63/EU of the European Parliament and of the Council of the European Union of September 22, 2010 on the protection of animals, which are used for scientific purposes and Law of Ukraine dated February 21, 2006 № 3447-IV (as amended from June 22, 2017 No. 2120-VIII) “On the Protection of Animals from Cruelty”.

Statistical processing of the obtained data was carried out using the Statistica 9.0 program (StatSoft Inc., USA). Arithmetic mean (m), standard error of the mean value ($M \pm m$) were determined. The difference between the values was considered probable by P not lower than 0.05.

The presentation of the main material of the research. The research results showed that the main acariform ticks affecting dogs were *Otodectes cynotis*, *Sarcoptes scabiei* var. *canis* and *Demodex canis*. The results regarding the distribution of these pathogens are shown in Figure 1.

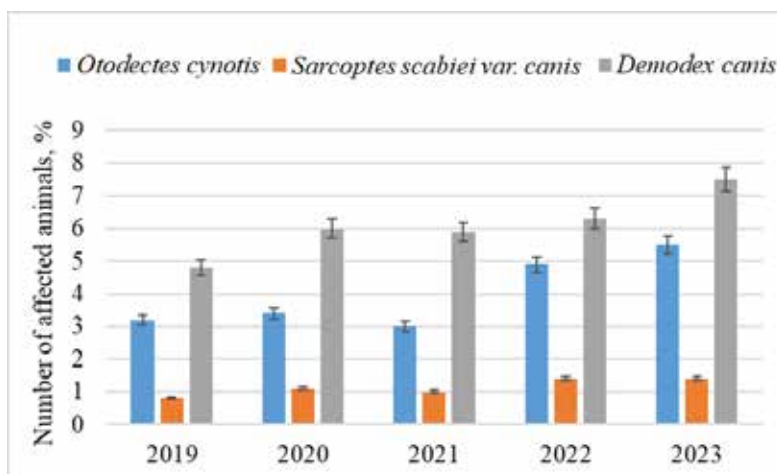


Fig. 1. Affection of dogs with acarosis during 2019–2023, n=1452

The results of the research are shown in Figure 1, indicating that during the research period, demodicosis was most often registered among sick dogs – 92 animals (6.3% of the number of examined animals), otodectosis – 62 (4.3%). Sarcoptosis affected 17 dogs, which was 1.2%. In 2023, the highest extent of infestation was noted for both otodectosis (5.5%) and demodicosis (7.5%), as well as sarcoptosis (1.4%).

We also determined the age-specific features of infection of dogs with acariform ticks (Figure 2).

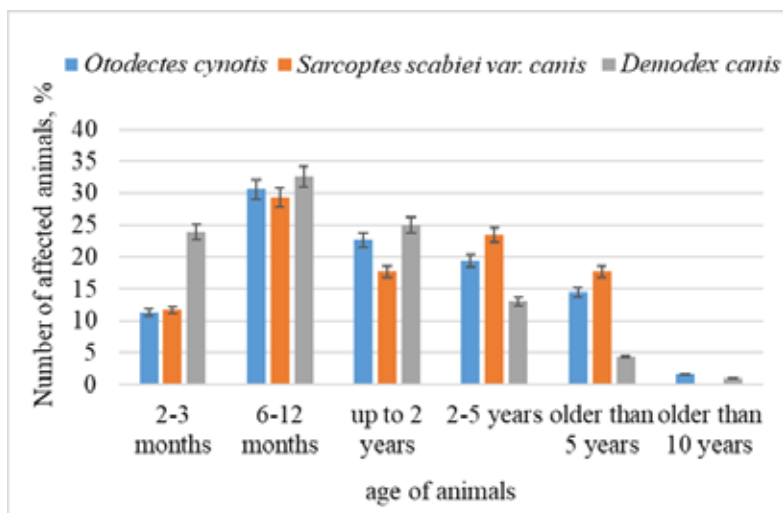


Fig. 2. Age characteristics of the manifestation of acarosis lesions in dogs, n=171

It was found that the age of the animals affected tick infestation. The data shown in Figure 2 show a fairly high extent of dogs already at the age of 2–6 months. Thus, in this age period, 23.9% of the animals affected by acarosis were affected by demodicosis, and 11.3% and 11.7% were affected by otodectosis and sarcoptosis, respectively. Meanwhile, the highest peak of acarosis in dogs was found at the age of 6–12 months – from 29.4 to 32.6%, depending on the type of acarosis infestation. In older dogs, the intensity of acarosis lesions gradually decreases, and only 4.4% of animals affected by demodicosis, 14.5% by otodectosis, and 17.7% by sarcoptosis were found at the age of over 5 years.

Conducted studies on the breed characteristics of the disease (Figure 3) showed that the following are the most frequently affected by otodectosis: Mongrel (16.1%), German shepherds (14.55%) and Rottweilers (11.3%). The following suffered from demodicosis: Mongrel (13.0%), Rottweilers (10.9%) and German Shepherds (10.9%). Sarcoptosis was diagnosed in German Shepherds (17.7%), Bulldogs (11.8%), Rottweilers (11.8%) and Purebreds (11.8%).

Studies have established the sexual susceptibility of dogs to acaroses (Figure 4).

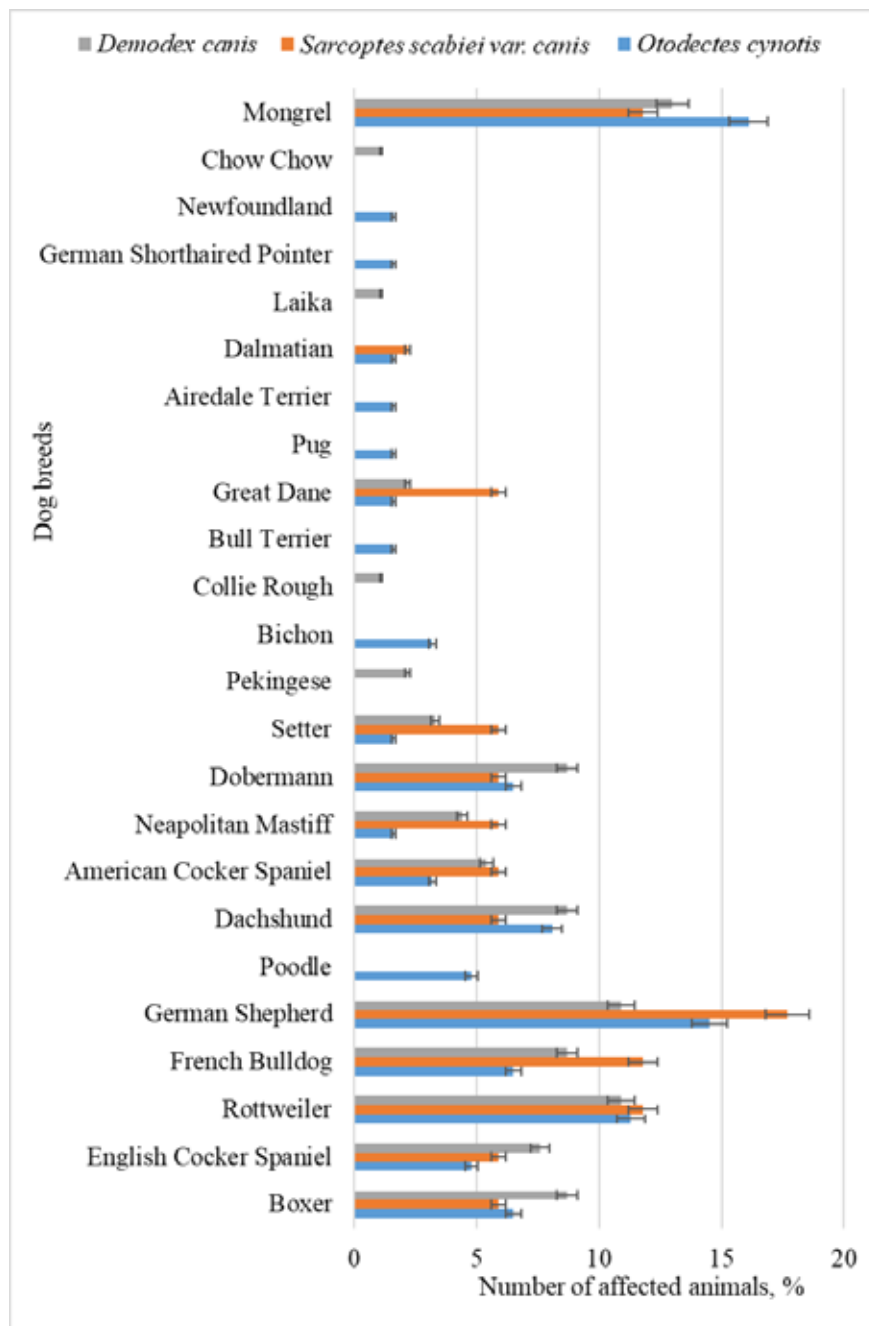


Fig. 3. Affection of dogs with acarosis depending on the breed, n=171

The obtained data indicate that bitches are more often ill with acarosis. Thus, we diagnosed otodectosis in 56.4% of bitches, demodicosis in 51.1%, and sarcoptosis in 52.9%. According to our data, male dogs suffer from otodectosis in 43.6% of cases, demodicosis in 48.9%, and sarcoptosis in 47.1%.

Infestations caused by ticks remain common throughout the world [12]. Our studies confirmed a significant frequency of infection. Thus, during 2019–2023, *Demodex canis* and *Otodectes cynotis* were released from 3% to 7.5%. *Sarcoptes scabiei* var. *canis* was diagnosed almost 2 times less often.

The age of the host as a determinant of these infestations is still controversial [14]. However, the results of our research showed that dogs aged 2-6 months were most affected. With age, the extensiveness of animals gradually decreased, and the manifestations of the disease in dogs older than 10 years were almost not registered. The data of our studies coincide with the information of some researchers who claim that acarosis mainly affects young animals aged from 6 to 18 months. Thus, scientists [10] described that young animals up to 1 year were more susceptible (incidence about 60%), than adults older than 2 years (17%). This feature of the manifestation of the invasion can be explained by not yet fully formed immunity. In addition, some researchers explain this by the greater activity of young individuals, which significantly increases the risk of infection.

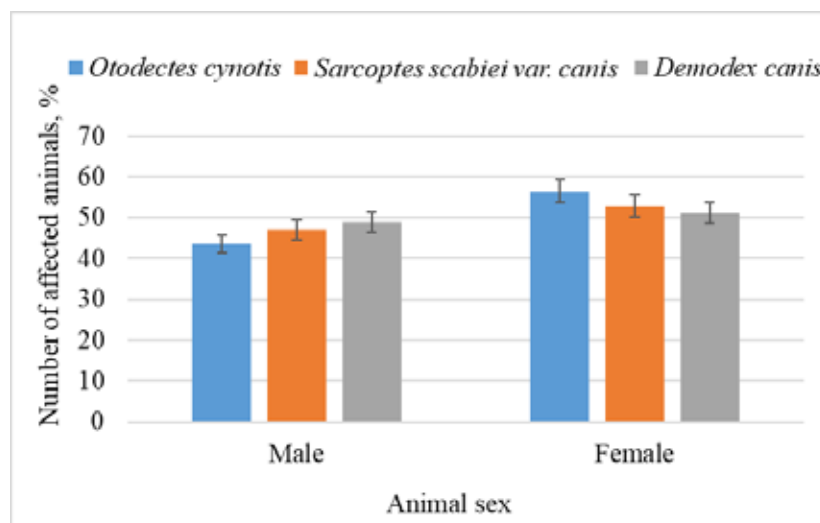


Fig. 4. Affection of dogs with acarosis depending on the sex, n=171

After analyzing the breed characteristics of the manifestation of acarosis in dogs, a high infestation in Mongrel was noted (11.8–16.1%), which may be related to insufficient control of these diseases. There is also a high risk of infection from foxes, as they can serve as reservoirs for infestations such as *S. scabiei*. Our data on breed susceptibility of dogs to acarosis also coincide with the data of some researchers [1; 4]. However, most publications will describe the susceptibility of a particular breed to invasion, while not taking into account the local base population [7].

Animal sex does not appear to play a significant role in the prevalence of tick infestation [4]. However, studies have shown that females were more susceptible to infection with all the tick species studied. This may be due to the difference in their hormonal activity.

So, the most widespread diseases among acarosis of dogs in this region are demodicosis and otodectosis, to a lesser extent, sarcoptosis is diagnosed. The obtained data will make it possible to develop a comprehensive approach to the prevention of these diseases, taking into account the epizootic situation in a specific region.

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АНАЛІЗ ФАКТОРІВ, ЩО ВПЛИВАЮТЬ НА ЗАРАЖЕННЯ СОБАК КЛІЩАМИ

Анотація

Інвазії, спричиненні кліщами, є одними з найпоширеніших захворювань для тварин і людей. У дослідженні описано поширення збудників *Demodex canis*, *Sarcoptes scabiei* var. *canis* і *Otodectes cynotis* на території України впродовж останніх п'яти років, досліджено вікові особливості прояву хвороб, вплив породи і статті собак на інтенсивність захворювання.

Дослідження, проведене протягом 2019–2023 років, охопило 1452 собаки, які належали власникам із Хмельницької та Чернівецької областей України. Клінічне обстеження здійснювалося за стандартними методами, урахувавши локалізацію та площу ураження шкіри, наявність свербіння й інші симптоми. Для діагностики акарозів (саркоптозу, отодектозу, демодекозу) використовувалися глибокі зіскреби шкіри, а також отоскопія для оцінювання стану вушного кліща.

Дослідження акариформних кліщів у собак протягом 2019–2023 років виявило, що основними видами паразитів, які уражали тварин, є *Otodectes cynotis*, *Sarcoptes scabiei* var. *canis* і *Demodex canis*. За результатами дослідження, найбільш поширеним захворюванням серед собак є демодекоз (6,3%), отодектоз (4,3%) і саркоптоз (1,2%). Найвища екстенсивність інвазії була зафіксована у 2023 році, зокрема на отодектоз (5,5%), демодекоз (7,5%) і саркоптоз (1,4%). Досліджено також вікові особливості зараження, де відзначено високу зараженість у віці 2–6 місяців і пік ураження у віці 6–12 місяців. Порідні та статеві особливості захворювання також враховані: найбільше випадків отодектозу зареєстровано в змішаних порід собак, а демодекоз частіше зустрічався в безпородних тварин. Самки виявилися більш схильними до зараження акарозами порівняно із самцями.

Отримані дані дадуть можливість розробити комплексний підхід щодо профілактики цих захворювань з урахуванням епізоотичної ситуації в конкретному регіоні.

Ключові слова: собаки, вікові категорії, породна схильність, *Demodex canis*, *Otodectes cynotis*, *Sarcoptes scabiei* var. *canis*.

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