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Research Article

TICKS-PARASITES OF DOGS IN NORTHERN TRANS-URALS

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Abstract:

The prevalence and structure of parasitic diseases of dogs was studied for the first time in the conditions of Northern Trans-Urals. The dynamics of their parasitism was analyzed. The survey of dogs of different gender, age and breed was conducted in the period from 2002 till 2017. As a result of the research, it was found, that diseases with parasitic etiology were registered in dogs in 42.5±1.78% of cases. Significant role in the parasitocenosis of dogs is played by mites; among them there is the class Arachnida, divided in 2 orders: Acariformes (*Otodectes cynotis*, *Sarcoptes canis*, *Demodex canis*, *Cheyletiella jurgovi*) and Parasitiformes (*Ixodes persulcatus*, *Dermacentor marginatus*, *Dermacentor reticulatus*). As a result of the study, we obtained information about the seasonality of otodectosis in dogs; during the study period, this disease was diagnosed in 26.1 ± 1.25% of cases. The peak of otodectosis falls on the summer period - 58.33%, and the decline - for the winter period - 0.78%. The analysis showed, that the greatest peak of invasion in dogs was observed in July - 19.44%, in August - 27.78%, and in September - 19.13%. Sarcoptic mange was diagnosed in 16.4 ± 0.97% of cases. The peak of sarcoptic mange falls on the spring-summer period - 21.15%, and the decline - for the winter period - 0.57%. Demodicosis of dogs was diagnosed in 38.68 ± 1.32% of cases. The highest peak of invasion was observed in May - 10.7%, and in August - 17.2%. Among the short-haired dogs, demodectic invasion occurred in 51.1% of cases, and in long-haired dogs - in 48.9% of cases. In addition, scaly and mixed forms of demodicosis were diagnosed more often in short-haired animals; pustular and mixed forms - in long-haired animals. The analysis of parasitizing of ixodid ticks showed, that *Ixodes persulcatus* was revealed in 30.7 ± 1.02% of cases, *Dermacentor marginatus* - in 12.7 ± 0.22% of cases, and *Dermacentor reticulatus* - in 56.6 ± 1.36% of cases. Seasonal activity of ixodid ticks is very high: in spring - *Ixodes persulcatus* (from April to the first ten days of June), *Dermacentor marginatus* and *Dermacentor reticulatus* (from May to mid-June) and in autumn (from August to the end of September). The amount of ixodids in the biotope is directly dependent on fluctuations in the ambient temperature; the most comfortable range is from +10°C to +22°C.

Keywords: dogs, parasites, mites (ticks), biology, modern urban environment, ecological epidemiology, otodectosis, demodicosis, sarcoptic mange, cheyletiellosis, ixodid ticks, acaricides.

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1. INTRODUCTION:

Domestic animals in urbanized areas are often the sources of causative agents of infectious and invasive diseases, dangerous to humans, the control of which can't be organized and effectively carried out without timely and error-free diagnosis. Due to the absence in Russia of a statistical database on the number of dogs and cats, their socio-biological categories, it is not possible to make an objective assessment of the spread of specific animal diseases of these species. Anecdotal publications on the number of dogs are generalized, characterizing only the number of registered animals [4-13].

The fragmentary data, available in the literature sources, describe diseases of parasitic etiology, among which acaroses (ixodidiasis, demodecosis, sarcoptic mange, otodectosis) are widespread; and the tendency of growth of blood-parasitic diseases among small unproductive animals (babesiosis, pyroplasmosis, anaplasmosis) is also noted. There is the expansion of the vector range (ixodid ticks) of intermediate hosts (mouse-like rodents, foxes, hares, wild boars, etc.) and the causative agents of parasitic diseases themselves (*Babesia*, *Anaplasma*, *Piroplasma*) [6,8].

As a result of close contact of dogs in places, where animals are crowded (nurseries, walking grounds, exhibitions, animal protection centers, veterinary clinics, etc.), re-infection with dangerous invasive diseases occurs, which subsequently leads to an increase in parasitic etiology.

THE PURPOSE OF THE STUDY

The purpose of our investigation was to study the prevalence and the structure of parasitic diseases of dogs in Northern Trans-Urals, and to analyze their dynamics.

MATERIALS AND METHODS OF THE RESEARCH:

The studies were conducted in the period from 2002 till 2017, at the Departments of the Institute of Biotechnology and Veterinary Medicine of Federal State Budget Educational Institution of Higher Education "Northern Trans-Ural State Agricultural University", and in the laboratories of the Federal State Budgetary Scientific Institution "All-Russian Scientific Research Institute of Veterinary Entomology and Arachnology", as well as in the veterinary clinics of the Tyumen Region. We examined dogs of different gender, age and breed.

8,441 dogs were examined in total. It was defined 3,589 dogs with parasitic diseases (otodectosis, sarcoptic mange, demodecosis, cheyletiellosis) and

affected by ixodids. The material for the retrospective analysis was the records and reporting documentation of clinics. Epizootic data, clinical picture of diseases, standard parasitological methods of animal studies were used to identify parasites on animals. History taking, which consisted of information on the breed, sex, age, weight, animal environment and previous diseases, was held with this purpose. External examination included assessment of the general appearance, skin and hair condition, measurement of body temperature, pulse and respiratory rate, examination of eyes, mouth and ear cavities, palpation of the skin and peripheral lymph nodes [11,13,15]. The following special tests were used in the work: wet paper test (for the detection of flea feces); combing the wool, using a hand-glass (to detect surface parasites); imprint of wool with application of acetate strips (for collection of eggs, feces and surface parasites); microcopy of the ear contents, surface and deep scrapings of skin (for the detection of acariformes) [11,12,16]. In order to study the viability of ectoparasites, scrapings were examined using the microscope "IBA-10". The results were processed statistically, using the program Microsoft Excel.

RESULTS OF THE RESEARCH:

Parasitic diseases of dogs in the conditions of Northern Trans-Urals are widespread. It was found, that ectoparasites, represented by mites (EI - 42.5±1.78%), which caused inconveniences for dogs, were predominant. The following representatives of this class (*Arachnida*) parasitize in dogs in the conditions of Northern Trans-Urals: *Acariformes* and *Parasitiformes*.

The most common mites of the order *Acariformes* are *Otodectes cynotis* and *Sarcoptes canis*.

The *Otodectes mites* are found on the inner surface of the auricles, in the external auditory canal and on the eardrum. As a result of inflammation of the skin, in places of their location, a fluid is released, which, drying up, forms scabs and crusts. When nourishing and moving of the mites, sharp extremities and trunks irritate the nerve endings of the skin of the auricle inner surface and the external auditory canal, resulting in severe itching and inflammatory reaction in the affected areas. All this is accompanied by inflammatory reactions of the skin, as well as the absence of skin lubrication, that provides for the reproduction of mites. Further, secondary purulent-putrefactive microflora is added to the primary inflammation of skin, complicating the disease. Sometimes there is a perforation of the tympanic membrane and the transition of inflammation to the

middle and inner ear. Mites leave the outer ear canal when it becomes wet and suppurating, then they settle on the body. One of the complications is otitis, developing as a secondary phenomenon, due to the constant itching, as well as dirt, accumulating as a result of life's activity of mites (Figure 1). As a result of the study, we obtained information on the seasonality of otodectosis in dogs. During the period of study, the otodectosis was diagnosed in 936 animals, and the prevalence was $26.1 \pm 1.25\%$. The peak of otodectosis falls on the summer period - 58.33%, and the decrease in the number of cases - for the winter period - 0.78%.

When analyzing the indices it was found, that the greatest peak of invasion in dogs was observed in July - 19.44%, in August - 27.78% and in September - 19.13%. In other periods, the incidence rate declined or remained stably low.

The causative agent *Sarcoptescanis* causes inflammation in the thickness of epidermis, due to a well developed proboscis. Often, the areas with a small amount of wool (head, around the eyes, auricles, elbows, inner surface of thighs) were noted as its habitats. Inflammatory process is manifested by hyperemia, papules, vesicles and the release of serous exudate. Carnivores have intense itching, effusion of blood and bleeding scrapes appear in the areas of scratching. The most often infection occurs in case of direct contact with affected animals or in case of contact with care items. Sarcoptic mange was diagnosed in 587 dogs and the prevalence was $16.4 \pm 0.97\%$. The peak of sarcoptic mange falls on the spring-summer period - 21.15%, and the decline in the number of cases - for the winter period - 0.57%.



Fig.1: Otodectes cynotis mites



Fig.2: Demodex canis mites

Thrombidiformes mites, parasitizing in dogs, include: *Demodex canis* (Figure 2) and *Cheyletiellajascuri*. Demodicosis of dogs is widespread in urbanized areas and accounts for up to $38.68 \pm 1.32\%$ of cases. The highest peaks of invasion were observed in May 10.7% and in August 17.2%. Vulnerability of dogs depends on age and is registered in the following amounts of cases: up to 1 year in 28.2% of cases, up to 2 years - 13.2%, up to 3 years - 10.5%, up to 4 years - 6.7%, up to 5 years - 6.6%, up to 6 years - 5.9%, up to 7 years - 6.2%, up to 8 years - 9.2%, up to 9 years and over - 13.5%. Females were in 52.1% of cases, males - in 47.9% of cases. Among short-haired dogs, demodectic invasion occurred in 51.1% of cases, and among long-haired animals - in 48.9% of cases. In addition, scaly and mixed forms of demodicosis were diagnosed more often in short-haired animals; pustular and mixed forms - in long-haired animals. We have established that all affected dogs were high-breed, and due to this, they had a reduced immunity to *Demodex canis* mites, due to the hereditary deficiency of T- and B-lymphocytes.

The second disease of Thrombidiformesmites' representatives is cheyletiellosis [4]. *Cheyletiellajascuri* - are the mites, light yellow in color, having a small size, the development cycle

proceeds in the following stages: egg, larva, protonymph, deuteronymph and imaginal stage. The mite lives on the surface of the skin, unlike another *thrombidiformes mite* - *demodex*. Infection occurs when affected and healthy animals come into contact, as well as through litter, items of care. The most vulnerable are the dogs during the first year of life, as well as weakened animals. Animals of various breeds are affected. The spread of invasion is promoted by poor housing conditions, huddling of animals. The mites of this species cause severe itching in the animal, the main localization sites are the areas of the head, neck, back, tailhead. The signs of inflammation in the form of hyperemia, papules, vesicles, were found on the affected areas of the skin

Cheyletiellosis manifested by discomfort and itching in the area of dorsal part of the neck and trunk along the back. Other parts of the body are not involved in the pathological process. In the affected areas, the skin is hyperemic; thin scales, pustules and papules of moderate size, covered in most cases with a black crust, as a result of scratches, appear on its surface. Cheyletiellosis was diagnosed among dogs in $1.09 \pm 0.06\%$ of cases. It was the most pronounced in spring period, when the prevalence was 40.8%.

In recent years, the number of cases of dogs' invasion with ixodid ticks has increased. As it is known, they are the carriers of highly dangerous diseases, both human and animal (tick-borne encephalitis, ixodictick-borne borreliosis, tularemia, hemosporidial infections of carnivores and other diseases of infectious and parasitic etiology) [3,5-8,17].

As a result of the research we have found the parasitism of three ixodid ticks species: *Ixodespersulcatus* – $30.7 \pm 1.02\%$, *Dermacenter reticulatus*– $56.6 \pm 1.36\%$, and *Dermacentermarginatus*– $12.7 \pm 0.22\%$.

Among the *Parasitiformesticks*, there are three types of ixodid ticks: *Ixodespersulcatus*, *Dermacentermarginatus* and *Dermacenterreticulatus*. Ticks feed on blood, and therefore mass affect by ixodid ticks causes a great damage to the health of animals: fatness and immunity decrease, allergic reactions are observed (figure 3,4). It is known, that a large number of simultaneously feeding ixoded ticks are capable of provoking even the death of the host-feeder [8].



Figures 3,4: Feeding of ixodid ticks on the dog

Ixodids are the carriers of serious diseases and this is of great importance. Due to their long life and reservoirs, they convey a great number of pathogens of animal and human natural focal diseases, such as tick-borne encephalitis, ixodic tick-borne borreliosis, tularemia, pyroplasmosis, anaplasmosis, babesiosis and other diseases of infectious and parasitic nature. The range of diseases, passed by ixodid ticks, is constantly expanding [1-3,5,8]. Seasonal activity of

ixodid ticks is very high: in spring - *Ixodes persulcatus* (from April to the first ten days of June), *Dermacenter marginatus* and *Dermacenter reticulatus* (from May to mid-June) and in autumn (from August to the end of September). The amount of ixodids in the biotope is directly dependent on fluctuations in the ambient temperature; the most comfortable range is from + 10°C to + 22°C (Figure 5).



Fig.5: Collection of ixodid ticks in the biotopes of Tyumen region

The maximum number of parasites was recorded from the third decade of April to the first decade of June, then their number decreased, and in July in nature one can find only single specimens of arthropods. The second peak of ticks' activity is observed from mid-August to the end of October.

To control and protect dogs from parasitic diseases, one can use a variety of acaricidal compounds. At present, preparations, based on synthetic pyrethroids, macrocyclic lactones, isoxaline groups, phenylpyrazole groups, are used for this purpose [1,2,20-25]. Acaricides are used, both by spraying of animals with aqueous emulsions, wearing of acaricidal collars, and by applying locally to separate parts of the body, as well as giving them inside.

Multiplicity of animal treatments with antifungal drugs is from several days to a month. As a result of the use of such treatments, animals are protected against external pathogens [20-25].

In order to prophylaxis of hemosporidial infections in dogs, various methods and means are used to prevent an invasion with ixodid ticks. To determine the most convenient, effective and safe method of prevention, external preparations (drops, sprays, collars) and tablets for oral administration Bravecto® were chosen. The results of these investigations allowed to determine the effectiveness of methods and means of prevention. For external treatments, the most effective was the use of "Advantix®" and "Frontline Spot On®", in the form of droplets on the shoulders, as well as the collar

"Scalibor®". When using the preparation Bravecto® in the form of tablets, all tested animals received maximum protection from pyroplasmiasis during the summer, despite the fact, that ticks were found on dogs. Various drugs and methods of their administration were used in cases of sarcoptic mange, demodicosis and cheyletiellosis: "Aversect K&C®" (injection), ointment "Aversectin®", "Ivermek®" gel, "Advocat®" (externally), "Milbemycin®", tablets "Bravecto®" and "Ivermectin®" (orally). All the tested preparations have a pronounced acaricidal effect; however, the most effective are Bravecto® preparations, especially in cases of extensive skin lesions. "Aversect K&C®", ointment "Aversectin®", "Ivermek®" gel, "Advocat®", "Milbemycin®" and "Ivermectin®" are used in cases of low and medium degrees of skin lesions. In addition to the use of acaricides in case of demodicosis, symptomatic therapy and other agents, for example, phyto-shampoos, lotions, antiseptics, should be used. For the treatment of otodectosis in dogs, preparations in the form of drops on the shoulders were used, according to the instructions for their use: "Fiprist spot on®", "Oricin®", "Amit forte®", "Advocate®", Ivermek® spray, Ivermek® gel, ointment "Aversectin®".

CONCLUSION:

All the above allows us to conclude, that each of the nosological entity has individual features, expressed by clear indicators of population, time and territorial boundaries, determining the nature of their epizootic manifestations. To reduce their number in the modern world, there is a diverse assortment of insecto-acaricide means, allowing to protect and prevent the tick invasion of animals.

CONFLICT OF INTEREST

The authors confirm that the presented data do not contain the conflict of interest.

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