

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
HIGHER EDUCATIONAL INSTITUTION «PODILLIA STATE  
UNIVERSITY»**

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# **CANINE DISEASES OF INFECTIOUS ETIOLOGY OF THE PODILLIA REGION**

**MONOGRAPH**



**Kamianets-Podilskyi– 2024**

**UDC 619:616.98:578.822:57.083**

Recommended for publication by the academic council of the Higher educational institution «Podillia State University» (protocol No. 3 dated 04/25/2024)

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Canine diseases of infectious etiology of the Podillia region: monograph. Kamianets-Podilskyi: HEI «PSU», 2024. 72 p.

ISBN

With the development of dog breeding over the last period, there is an increase in the frequency of cases of infectious pathology in dogs with various clinical manifestations. The monograph provides an analysis of the epizootic situation on the territory of the Podillia region regarding the manifestation of demodicosis and enteritis of infectious origin among dogs. The influence of various factors that contribute to the development of these diseases in dogs has been determined, various treatment schemes have been tested, and recommendations for their prevention have been provided.

UDC 619:616.98:578.822:57.083

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## ABSTRACT

The number of dogs as pets continues to grow all over the world, including in Ukraine. This led to an increase in the occurrence of various animal pathologies, both infectious and non-infectious. With the development of dog breeding over the last period, there is an increase in the frequency of cases of infectious pathology in dogs with various clinical manifestations. Dog diseases can be caused by such well-known parasites as helminths (toxocara, toxascaris, hookworms, uncinaria, tapeworms), acariform mites (demodex, otodectes, sarcoptes), pathogens of protozoa (babebiasis), dermatomycoses, viruses (reoviruses, caliciviruses, retroviruses, parvoviruses, paramyxoviruses, leukosarcomatous viruses, coronaviruses, herpes viruses, syncytial virus, rhabdoviruses, papovaviruses, adenoviruses), as well as a significant number of bacteria (bordetella, salmonella, escherichia, klebsiella, campylobacter, mycobacteria, leptospira, listeria), etc.

The preliminary analysis of the epizootic situation in the territory of the Podilsk region showed an increase in the frequency of cases of demodicosis and enteritis of infectious origin among dogs.

It is known that skin diseases are one of the most common pathologies in dogs. More than 25% of cases of appeals by dog owners to veterinary specialists are related to skin diseases, and its condition in many cases is an indicator of the general health of the animal. In the etiology of skin diseases of dogs, dermatitis of parasitic origin is registered quite often, which is due to the uncontrolled growth of the number of homeless animals, relatively low efficiency of treatment, the ecology of large cities and a number of other factors. Urban dog populations are intensively affected by negative factors, including a high level of stress, an unsatisfactory environmental situation, feeding dry and other concentrated foods, uncontrolled breeding, etc. The listed factors contribute to the emergence and spread of animal skin diseases, including demodicosis.

Among skin pathologies, demodicosis has become a real problem among dogs at the moment. In large cities, when examining dogs with skin lesions, demodicosis was detected in 21.4-67.4% of cases. Therefore, the study of this problem, in particular, issues of epizootology require analysis and specific reference to a certain territory.

Canine demodectic mange is a skin disease associated with a larger than normal population of demodectic mites. The pathogenesis is poorly understood, but it is believed to be related to immunodeficiency. Demodicosis can be localized or generalized, as well as in youth or adulthood. A wide range of clinical signs is possible. Diagnosis involves the detection of ticks in a dog with appropriate clinical signs. Although generalized demodectic mange is no longer a common reason for euthanasia, it can be a very serious disease. Treatment of many patients, especially with foot damage, is far from simple. Demodectic infestation in dogs has a very diverse clinical manifestation - from localized to complicated generalized dermatitis of various nature with damage to internal organs. The complexity of chemotherapy for demodicosis lies in its tendency to damage not only the skin, but also internal

organs. Therefore, the external application of acaricides is not always effective, especially in the case of a generalized process. Virtually all systemic acaricides, including ivermectins and some pyrethroids, are acaricidal against adult mites, but the dormant pre-imaginal stages do not die because they do not feed. With the onset of favorable conditions (cessation of treatments), larvae and nymphs become active, turn into adults, and the number of ticks quickly recovers. In this regard, the search for long-acting drugs is underway, which would create a concentration of the active substance in the body for a long time, which would allow to achieve an absolute therapeutic effect of demodicosis.

Therefore, taking into account the above, it is important to carry out a timely (early) diagnosis of demodicosis, followed by the use of specific, most effective acaricide preparations and means for mobilizing the protective properties of the animal's body. Meanwhile, the development and introduction into practice of new effective acaricides for the treatment of demodicosis in dogs and the study of their effectiveness in different forms of the course of the invasion remain relevant. In addition, the epizootology of dog demodicosis in the conditions of Ukraine constantly requires monitoring studies in connection with the mass importation of animals from abroad, their often uncontrolled breeding, the presence of a large number of homeless and unattached animals and commensal animals of this parasite.

Taking into account the practical importance of the mentioned problem, epizootological monitoring of dog demodicosis was carried out in the conditions of the Podilsk region and combined therapy schemes using the prolonged acaricide "Simparika®" in combination with means of stimulating and pathogenetic therapy were tested.

In the process of conducting epizootological monitoring of the course of demodicosis infestation in dogs, the dynamics of its distribution for the years 2019-2023, the tendency to manifest demodicosis depending on age, breed, sex, season, and the frequency of occurrence of various clinical forms of demodicosis were studied. If clinical signs of demodicosis were detected during the examination, the diagnosis was confirmed by the microscopic method. In the conditions of the Podilsk Region, the share of demodicosis among all dog skin pathologies was 14.8% in 2020, 15.3% in 2021, and 15.9% in 2022. In addition to demodicosis, otodectosis and sarcoptosis were found in dogs from this region, but with a significantly lower extent of infestation. Thus, for the period from 2019 to 2023, the frequency of detection of sarcoptosis increased from 0.9% to 1.2%; otodectosis - from 3.1% to 5.5% and demodicosis - from 4.9% to 7.5% of all studied dogs. In terms of age, the peak of infestation by acariform mites fell on a 6-12-month period with a gradual decrease in the extent of infestation in older animals. The share of dogs affected by demodicosis in this age period reached 32.6%. The study of breed sensitivity of dogs showed a higher sensitivity of some breeds of dogs to causative agents of acarosis. Thus, 42% of all cases of otodectosis invasion were found in yard dogs, German shepherds and Rottweilers. 53.1% of cases of sarcoptosis occurred in such breeds of dogs as German Shepherds, Bulldogs, Rottweilers and yard dogs (11.8%). Mongrels, Rottweilers and German Shepherds were affected by demodicosis in 34.8% of cases.

A slightly higher susceptibility of females than males to damage by acariform mites was revealed. Various clinical forms of its manifestation have been revealed by the conducted studies of patients with demodicosis in dogs. Most of the clinical forms were related to local demodicosis without a tendency to generalize the process. Severe generalized forms of demodicosis were recorded in about a third of cases. Regardless of the generalization of the process, a scaly form was found in 35.4% of cases, a pustular form in 18.6%, a papular form in 16.8%, and a mixed form in 21.2% of cases.

Bulldogs (17.7%), rottweilers (16.8%), pugs (14.2%), crossbreeds (11.5%) and pit bull terriers (10.6%) had the highest sensitivity among animals diagnosed with demodicosis. 26.5% of detected clinical cases of demodicosis occurred in the age period from 7 to 12 months and 19.5% - registered in dogs aged 1-2 years. Females accounted for 60.2% of all cases of demodicosis detected by us, and short-haired dog breeds accounted for 66.4%. The analysis of the seasonal dynamics of dog demodicosis showed a slight increase in the extent of infestation in March (31.1%), November (34.1%) and October (37.8%). In general, in the conditions of the Podilsk region, during the year, fluctuations in the incidence of demodicosis in dogs were observed in the range of 15.6-37.8%.


Generalized demodicosis in dogs was accompanied by erythrocytopenia, a decrease in the volume of erythrocytes, stable leukocytosis and eosinophilia, hyperproteinemia due to the globulin fraction, an increased level of malondialdehyde (MDA), superoxide dismutase (SOD), C-reactive protein (CRP), an increase in total antioxidant capacity (TAC). In contrast, the levels of creatinine (Creatinine), catalase (CAT) and glutathione peroxidase (GPx) were significantly lower compared to the physiological norm for dogs.

An experiment was also conducted to determine the therapeutic effectiveness of the modern acaricidal agent "Simparika®" for dogs with generalized forms of demodicosis (at least 6 areas on the animal's body are affected - independently and in combination with the drugs "Katozal" and "Tioprotectin"). Prolonged acaricide "Simparika®", both when used independently and in combination with the drugs "Katozal" and "Tioprotectin", showed 100% therapeutic effectiveness only for the scaly form of generalized demodicosis. However, with pustular and mixed clinical forms of generalized demodicosis, its therapeutic efficiency decreased to 66.7 and 57.1%, respectively, and in general, this acaricide showed 78.6% efficiency. The use of the acaricide "Simparika®" in combination with the stimulating agent "Katozal" increased the therapeutic efficiency to 75.0% for the pustular form of demodicosis and 81.8% for the mixed form. The overall effectiveness of this treatment scheme increased to 86.1%. When the hepatoprotector "Tioprotectin" was added to the regimen, the therapeutic effectiveness against demodicosis in dogs increased to 92.9% in the pustular form, 83.3% in the mixed form, and 91.9% in total.

Analysis of the structure of dog pathologies, both in Ukraine and abroad, shows a significant spread of diseases of an infectious nature, in particular with the syndrome of damage to the gastrointestinal tract. Moreover, the degree of spread of certain pathologies has significant regional features, which depends on many factors,

including the level of veterinary care, control over the movement of animals, their passporting and registration, control over stray dogs, etc. In this regard, one of the directions of our research was aimed at studying the distribution of the main pathologies of dogs of infectious and non-infectious etiology in the territory of the Podilsk region, clarifying epizootological characteristics, pathogenetic mechanisms and testing various combined schemes of therapy for infectious enteritis in dogs. The conducted retrospective analysis and the results of our own research revealed a significant prevalence of non-contagious (33.9%) and contagious (29.3%) pathologies in dogs in this region. Surgical and obstetric and gynecological pathologies were registered somewhat less. Among the infectious pathologies of dogs, the highest incidence rate was viral infections (25.0%), mycosis (20.2%), arachnoentomosis (17.7%) and protozoa (16.9%). Approximately half of the cases of manifestation of infectious pathologies are caused by viral, bacterial and fungal etiology. Among them, enteritis of an infectious nature was the most common, the share of which was 32.9%. The majority of cases were found in dogs aged 2 to 8 months (69.0%), with no clear seasonal dynamics. The analysis of the pathogenetic features of the course of infectious enteritis in dogs confirmed the presence of deviations of some hematological and coprogram indicators from the physiological norm. In dogs with a diagnosis of infectious enteritis, erythrocytopenia, anemia, a decrease in blood color index, hematocrit value, hypoproteinemia and an increase in ESR (ESR) were found. Against the background of persistent leukocytopenia, changes in the leukogram were detected in such animals, with the appearance of moderate neutrophilia, monocyto- and lymphocytopenia, which causes an immunosuppressive state and a more severe course of the disease. The diet of dogs with an acute course of infectious enteropathies, compared to healthy animals on the same diet, was characterized by an increased content of protein, stercobilinogen, bilirubin, undigested starch, soaps and neutral fat. Changes in hematological indicators and co-programs for infectious pathologies of the digestive tract of dogs should be objectively taken into account when choosing therapeutic agents for the purpose of their effective treatment.

**Key words:** dogs, demodicosis, forms of demodicosis, treatment, infectious pathologies of the digestive tract, infectious enteritis, hematological studies, coprological studies, biochemical studies.



**Part 1.**  
**Regional features of  
the course of  
demodicosis in dogs  
and its treatment**



**MONOGRAPH**



## INTRODUCTION

Dogs are considered the nearest creatures to humans due to their reliable social behaviors (O'Neill et al., 2019; Bond et al., 2020; Sivel & Yağci, 2022). Distinctive dog breeds serve various manners like draught dogs assist in work, guard dogs protect, assistant dogs help visually impaired and physically disabled individuals, and detective dogs support criminal inquiries. Above all, pet dogs are regarded as trustworthy acquaintances by their masters (Taenzler et al., 2016). Most owners are very close to their pets and like to invest their free moments in cuddling them. However, these dogs are occasionally confronted with numerous dermatological problems that often force them to isolate themselves from their masters.

Tick-borne infestations continue to be the most common diseases worldwide, affecting both animals and humans (Klink et al., 2023). Parasitic mites are most often members of the Acariformes family (Bond et al., 2020). 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 (O'Neill et al., 2019; Nwufoh et al., 2020; Lefkaditis et al., 2021).

Demodecosis 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 (O'Neill et al., 2019; Bond et al., 2020; Sivel & Yağci, 2022). 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 (Sivajothi et al., 2013; Malik et al., 2020; Prosyanyi et al., 2022).

Sarcoptosis is a skin disease caused by representatives of the *Sarcoptes* genus, which affects a wide range of hosts, including dogs (Terada et al., 2010; Klink et al., 2023). 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 (Taenzler et al., 2016). The generalized form of sarcoptosis in the absence of treatment leads to the death of the animal from exhaustion, nervous excitement and septic phenomena (Nwufoh et al., 2020).

Otodectosis is caused by the acariform mite *Otodectes cynotis* (Baraka, 2011), which parasitizes on the inner surface of the auricle, in the auditory canal and tympanic membrane of animals (Silva et al., 2020; Lefkaditis et al., 2021). 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 (Fanelli et al., 2020). 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 (Carithers et al., 2016; Taenzler et al., 2017).

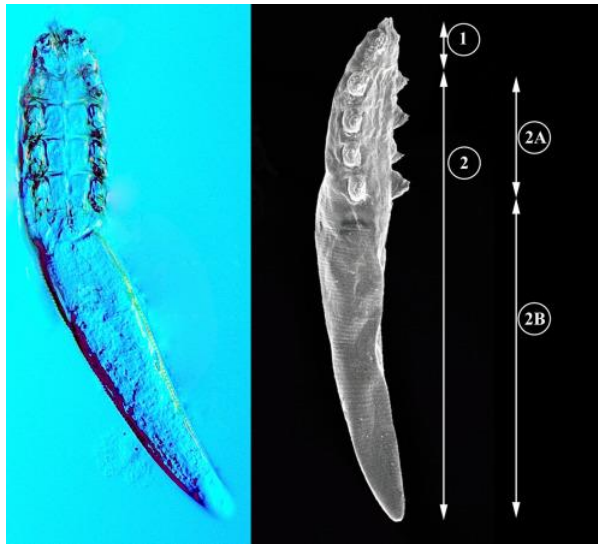
Recently, there have been more and more literary reports indicating a significant spread of acarosis of small domestic animals in different parts of Ukraine. In particular, demodicosis of dogs, otodectosis of cats and dogs, notoedrosis of cats and dogs, and sarcoptosis of dogs and cats are mainly diagnosed 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 (Fanelli et al., 2020; Klink et al., 2023) 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.

In large cities, when examining dogs with skin lesions, demodicosis is detected in 21.4 – 67.4% of cases (Becskei et al., 2018; Horne, 2019). The disease is caused by Demodex mites, mainly *Demodex canis* and to a lesser extent *Demodex injai* (Taylor et al., 2015; Taenzler et al., 2016). Demodex mites are normal flora localized in the skin of most apparently healthy dogs, and the disease arises when these mites overly multiply in the skin and hair follicles (Malik et al., 2020).





Demodex canis in light and scanning electron microscopy. The length of mites varies between 150 and 285  $\mu\text{m}$ . Similarly to other mites, the general structure of Demodex consists of the head, or gnathosoma, with its mouthparts (1), the trunk or idiosoma (2), and the extremities. The idiosoma includes the podosoma (2A), into which the legs are attached, and opisthosoma (2B), distal to the legs. The elongated, cigar-like idiosoma, ring-like segmentation of opisthosoma, and very short legs are characteristic Demodex features.



Demodex injai is clearly the longest of canine Demodex mites (330–370  $\mu\text{m}$ ). This species has an exceptionally long opisthosoma.

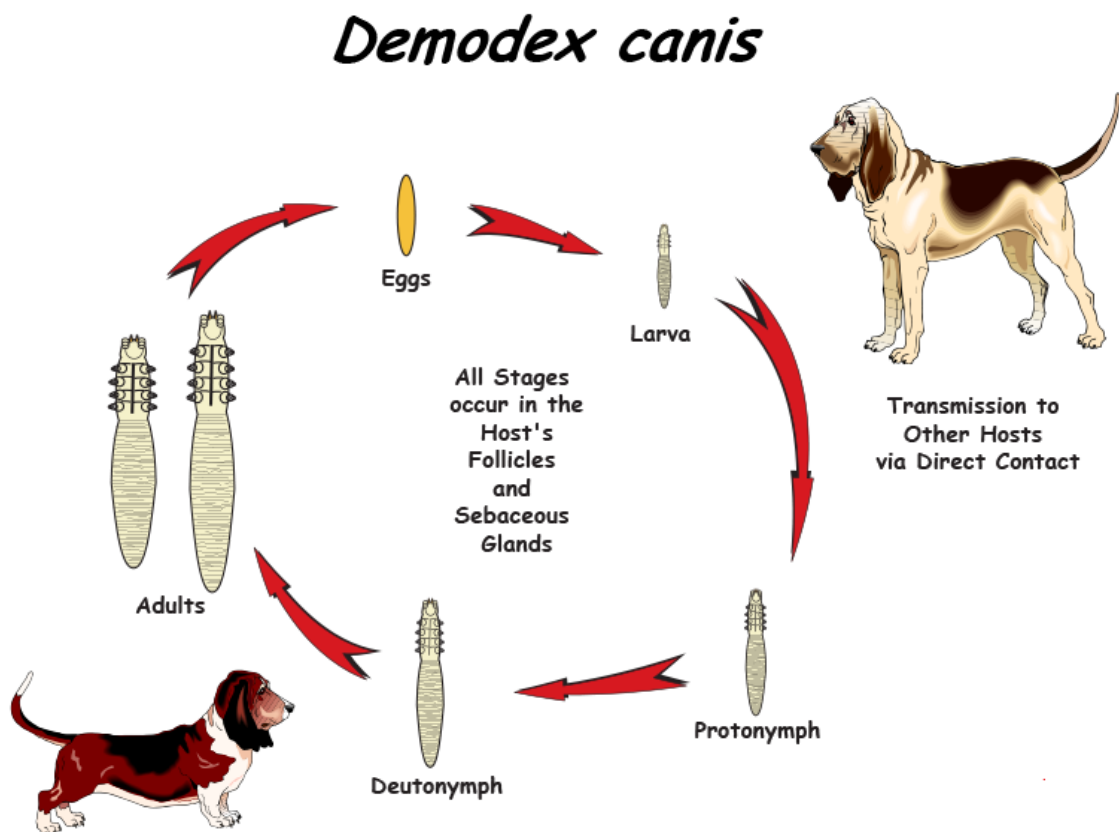
**Figure 1.** *Demodex canis* in dog (Taylor et al., 2015)



**Figure 2.** Demodex Canis Eggs (Taylor et al., 2015)

Morphology of Demodex spp. found in Dogs. Similarly to other mites, the general structure of Demodex consists of the head, or gnathosoma, with its mouthparts, the trunk (idiosoma) and the extremities. The idiosoma includes the podosoma, into which the legs are attached, and opisthosoma, distal to the legs. The elongated, cigar-like idiosoma, the ring-like segmentation of opisthosoma and very short legs with claw-like hooks at the tips are characteristic Demodex features (Fig. 9.41). The gnathosoma is trapezoid and wider than its length. The slit-like genital

pore of the female is located ventrally at the level of the fourth pair of legs, extending slightly caudal past it. The male genital, or aedeagus, is located dorsally in the genital pore that is at the level of the second pair of legs. The width of female *D. canis* is about 40  $\mu\text{m}$  and the length varies between 165  $\mu\text{m}$  and 285  $\mu\text{m}$ . Males are shorter (150–210  $\mu\text{m}$ ) with a shorter and sharper opisthosoma than that of females. *D. injai* is longer than *D. canis* (330–370  $\mu\text{m}$ ) and *D. cornei* is shorter (90–140  $\mu\text{m}$ ). Molecular biological studies have indicated that *D. cornei* may not be an independent species, but rather a morphological variant of *D. canis*. The egg is spindle-shaped and sized 80–105  $\mu\text{m} \times 32$ –54  $\mu\text{m}$ .



**Figure 3.** Life Cycle: *Demodex canis* (Taylor et al., 2015)

At present, it has been established that demodicosis invasion in dogs has a very diverse clinical manifestation – from localized to complicated generalized dermatitis of various kinds with damage to internal organs [Dengler B., Mendoza-Kuznetsova E., Nikolaeva L., Rieger A., Mueller R. S., 2021).

Canine demodicosis is an intricate infection, postulated to involve several immunologic and genetic components playing an integral role in its pathogenesis (O'Neill et al., 2019; Bond et al., 2020; Sivel & Yağci, 2022). The level of C-reactive protein (CRP), one of the acute-phase proteins (APPs) associated with non-specific inflammatory reaction in consequence to tissue injury, is believed to increase in canine demodicosis; however, there are limited data available about this. Albumin

is classified as a negative APP as it is expected to decrease during the course of an infection. Oxidative stress is a state, in which the production of free radicals surpasses the neutralizing ability of the antioxidant system with consequent tissue damage and possible disruption of molecular structures. Oxidative stress is believed to play a role in numerous human allergic and inflammatory cutaneous infections and canine allergic dermatitis (Sivajothi et al., 2013; Malik et al., 2020; Prosyanyi et al., 2022).

Canine demodicosis is differentiated into a localized versus a generalized form. Localized demodicosis has a good prognosis, with the overwhelming majority of cases spontaneously resolving without miticidal treatment (Scott et al., 2001). Generalized demodicosis may be a severe and potentially life-threatening disease (Mueller et al., 2012). Generalized demodicosis is commonly complicated with a secondary bacterial folliculitis and/or furunculosis (Kuznetsova et al., 2012). The dogs with generalized demodicosis showing spontaneous cure is unknown presently, albeit evidence for spontaneous remission in a subset of cases was recently presented (Bruzinska-Schmidhalter & Nett-Mettler, 2011). The number of mites is kept low by a dog's immune system. Despite various studies demonstrating numerous aspects of canine demodicosis; immuno-pathological conversions are still matter of discussion to manage the ailment contentedly.

In young animals, endoparasiticism, malnutrition and debilitation may lead to an immunocompromized state that favours mite proliferation and development of skin disease. In adult animals, chemotherapy, neoplasms, hypothyroidism or hyperadrenocorticism, for example, may suppress the immune system sufficiently to trigger proliferation of the mites (Mueller et al., 2012). However, studies proving a cause–effect relationship between these factors and demodicosis are lacking. Many immunosuppressed dogs never develop demodicosis, and in many cases an underlying cause may not be found. In many publications, a juvenile-onset and an adult-onset form of the disease are differentiated (Becskei et al., 2018; Horne, 2019). However, this differentiation may be difficult in individual cases. It is more important to identify and correct predisposing factors (such as endoparasitism or underlying diseases) independent of age to achieve the best possible outcome (COE IV).

Therefore, given the abovementioned, it is important to carry out timely (early) diagnosis of demodicosis, followed by the use of specific most effective acaricides-drugs and means to mobilize the protective properties of the animal. Meanwhile, the development and implementation of new effective acaricides for the treatment of demodicosis of the dog and the study of their effectiveness in various forms of the invasion remain relevant.

The definition of localised versus generalised demodicosis has been a matter of debate (Becskei et al., 2018; Horne, 2019). A recent Committee of Experts considered demodicosis as localised if there are no more than four lesions with a diameter of up to 2.5 cm (Mueller et al., 2012). Nevertheless, this needs to be adapted to breed and each clinical situation by the practitioner, i.e. three lesions of 2 cm in diameter in a young Chihuahua may be considered generalised demodicosis,

while five lesions of 3 cm could be diagnosed as localised demodicosis in an English Mastiff. Canine generalised demodicosis is frequently seen in practice and is characterised by five or more affected areas or by lesions covering an entire region of the body, and/or pododemodicosis involving two or more paws. The affected areas are erythematous, with comedones, hair loss, follicular papules to pustules and scales. Lymphadenopathy is commonly associated with the disease and secondary bacterial infections are frequent. Although some young dogs with an early generalised form can self-cure, it is impossible to clinically ascertain which animals will progress to the more severe state (Becskei et al., 2018; Horne, 2019). Generalised demodicosis in young adult dogs is considered to be related to immune deficiency with a genetic base. To decrease the prevalence in pure breed dogs, it has been recommended to avoid breeding dogs with generalised demodicosis. In recent international treatment guidelines, it is recommended that each dog requiring acaricidal therapy should be neutered (Mueller et al., 2012).

It is known that the complexity of chemotherapy for demodicosis is its tendency to damage not only the skin but also internal organs. Therefore, external application of acaricides is not always effective, especially in the generalized process (Kuznetsova et al., 2018). Virtually all acaricides of systemic action, including ivermectins and some pyrethroids, have an acaricidal effect on adult mite, but preimaginal stages, which are in a passive state, do not die because they do not feed. With the onset of favourable conditions (cessation of treatments) larvae and nymphs become active, turn into adults and the number of mites quickly recovers (Sivajothi et al., 2013). In this regard, there is a search for long-acting drugs that would create a concentration of the active substance in the body for a long time, which would allow to achieve the absolute therapeutic effect of demodicosis (Kumar et al., 2018).

Usually, the drugs ivermectin, selamectin, milbemycin oxime, doramectin and moxidectin are used for the treatment of animals, as well as amitraz, which in appropriate concentrations is also used in large animals in the form of compresses. In cats, an ointment containing calcium sulfate is used with different efficiency (Kuznetsova et al., 2018). It should be noted that many of these drugs are not registered in individual countries for use in the treatment of pets. Because many dog breeds are sensitive to ivermectin, they should be pre-screened for multidrug resistance to prevent lethal side effects after taking ivermectin or its derivatives.

Treatment of canine generalized demodicosis is multimodal. In addition to effective acaricidal therapy, treatment of concurrent bacterial skin infection, internal parasitism and underlying systemic disease must be undertaken to maximize the potential for successful treatment (Sivajothi et al., 2013).

Generalised demodicosis is a very challenging disease to treat effectively. Only a few drugs and formulations are registered, with variable efficacy (Sivajothi et al., 2013).

Amitraz (Ectodex®, Mitaban®), applied topically as a rinse or sponge on, has been approved for the treatment of canine generalised demodicosis in many countries for decades (Taenzler et al., 2016). Several amitraz-based protocols have been described in which amitraz is applied at various concentrations and frequencies.

Efficacy data are variable, treatment protocols are time-consuming and there may be safety issues. Recently, topical formulations containing amitraz combined either with the insecticide metaflumizone (ProMeris duo®), or with the insecticide-acaricide fipronil and the insect growth regulator S-methoprene (Certifact®), have shown efficacy (Zeibig, 2012; Nuttall & Bensignor, 2014). Their easier administration helps improve owner compliance and therefore increases the rate of success. Nevertheless, safety issues have limited the use of both ProMeris Duo® and Certifact®, especially the risk of triggering pemphigus foliaceus reactions (Klink et al., 2023).

Protocols based on daily to weekly oral or subcutaneous injections of macrocyclic lactones including ivermectin, doramectin and moxidectin at high doses are reported to provide variable efficacy, but may also have potential for toxicity, especially in dogs carrying MDR-1 gene mutations (P-glycoprotein deficiency), especially including Collie breeds (Zeibig, 2012; Nuttall & Bensignor, 2014). Daily oral milbemycin oxime at a minimum dose of 0.5 mg/kg (Interceptor®) is registered in some countries for the treatment of canine demodicosis (Klink et al., 2023). It provides good results but its cost, especially for treating large-breed dogs, appears to be a limiting factor for its use. Moxidectin, combined with the insecticide imidacloprid (Advocate®, Bayer), in a topical formulation that has shown efficacy in several studies (Zeibig, 2012; Klink et al., 2023) and has been approved in several European countries has therefore been used as a positive control in studies assessing the efficacy of new drugs, following registration agency guidelines. However, efficacy rates seem to be more variable under field conditions, and it appears to be more efficacious in juvenile dogs with milder forms of the disease (Zeibig, 2012). Bi-weekly or weekly treatments showed better results than monthly administration (Kuznetsova et al., 2018). Whatever the choice of the antiparasitic drug by the veterinarian, the duration of treatment for demodicosis is usually 3 months or more.

The reviewed literature sources emphasize the need for further in-depth study of this disease.

Taking into account the practical significance of this problem, one of the areas of our research was to conduct epizootological monitoring of canine demodicosis and study the features of its course on the territory of Ukraine, 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, to test the therapeutic efficacy of the acaricide «Simparica®» in combination with the biostimulator «Catosal» and the hepatoprotector «Tioprotectin» for demodicosis in dogs in the conditions of veterinary clinics in the Kamianets-Podilskyi, Ukraine.

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