

## Parasites in dogs – prevention and control according to the questionnaire analysis

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**Abstract:** *Parasites in dogs – prevention and control according to the questionnaire analysis.* The aim of the study was to determine the extent of knowledge of dog owners on the incidence of parasitic diseases, their negative consequences and preventive measures. The research material was based on data from 162 anonymous questionnaires. The study was conducted in the period between July and October 2015, among owners of dogs living in different regions of Poland. Analysis of the results showed that most respondents were aware of the dangers posed by the development of parasitic diseases in their animals, however the extent of their knowledge was insufficient and required further deepening. Unfortunately, 6% of owners do not use any form of antiparasitic prophylaxis. Less than half of the respondents declared that they regularly pick up their dog's waste. More than half of the surveyed owners were not aware of the type and programme of antiparasitic prevention used by the vets, or the necessary changes in the dog's pharmacological treatment. The largest group of owners (32% of respondents) used the prevention of ectoparasites twice a year. Nearly half of the respondents used antiparasitic drops as a precaution against ectoparasitic diseases, while 33% used antiparasitic collars. 40% of respondents seeking to increase the effectiveness of protection against parasitic infestations applied two different forms of treatment simultaneously. The results of the questionnaire surveys indicated, according to specialists recommendations, that there was insufficient frequency of using antiparasitic treatment against

endoparasites. Single deworming was performed by 41% of respondents while the smallest group of respondents (12%) did it three times.

*Key words:* parasites, dogs, prevention, combating parasites

### INTRODUCTION

Interaction with animals has a positive effect on the human health and well-being. The role of dogs in human-animal relationships is quite special. They give psychological and physiological support working as “therapists”, guides for the blind, rescue and police dogs. They have a positive effect on human physiological functions by normalizing blood pressure, cholesterol levels (Beck and Meyers 1996), and psychological and psychosocial wellbeing (Robertson and Thompson 2002).

Unfortunately, the presence of a dog also poses a potential threat to the health of the owners and causes many diseases. Viral, bacterial, fungal or parasitic infections can be transmitted to humans (Robertson and Thompson 2002). Animals become carriers of parasites no matter which environment they live in

– whether they are kept at home or outdoors (Uspensky and Loffe-Uspensky 2002). It has been proven that reducing the risk of exposure to pathogens in domestic dogs does not reduce the incidence of infections (Kowalska 2012). Appropriate prophylaxis, monitoring of any behavioural changes in dogs and testing for faecal parasites contributes to reducing the risk of developing parasitic diseases and ensuring effective protection of animals and thereby their owners.

It is important to be aware of the importance of picking up dog waste, due to the fact that they represent a potential epidemiological risk. Microorganisms found in the faeces carry the risk of infectious and parasitic diseases such as toxocariasis, toxoplasmosis, plateletosis, typhus, campylobacteriosis, salmonellosis and yersiniosis.

Eggs of nematodes and tapeworms are extremely resistant to adverse environmental conditions and can survive in the soil for up to several years. Removing faeces from places frequented by dogs is equivalent to reducing probability of parasite infection (Kowalska 2011).

In the case of parasitic infection the symptoms manifest themselves shortly after the dog's contact with the parasite or after longer incubation periods. The illness can disappear after some time, go into chronic form, sometimes asymptomatic, or even lead to the host's death (Buczek 2010). The intensification of the symptoms shortly after the parasite's invasion is characteristic for the so-called primary parasitic diseases. In the case of secondary parasitic diseases the symptoms begin when the balance between the parasite and the host is destroyed.

The disease progresses gradually, which is why it is difficult to diagnose a parasitic infection shortly after it occurred.

The aim of the study was to determine the dog owner's knowledge concerning the incidence of parasitic diseases, their negative consequences and prevention.

## MATERIAL AND METHODS

The research material was based on the respondents' statements taken from the questionnaires, which were carried out to determine the scope and level of knowledge of dog owners on the subject of parasitic diseases, prophylaxis and parasite control. The study was conducted from July to October 2015. The anonymous questionnaire consisted of 32 questions – 4 open and 28 closed. Responses were given by 162 people from different parts of Poland, 114 of them were sent *via* an Internet portal. Among the 162 respondents 118 were women. The majority of the respondents were 25–45 years old (34%) and over 45 (35%), with the smallest group being under 18 (5%). Over half of the respondents (53%) had higher education, 43% had graduated from secondary school, and 5% had a primary education. Most of the respondents were owners of crossbreds (52%), with males predominating (57%). Young dogs up to the age of five dominated within both purebreds and crossbreds. The least numerous was a group of dogs over 15 years old. Medium sized animals, weighing between 10 and 25 kg, constituted 41% of the analysed population, small dogs weighing less than 10 kg – 34%, big weighing from 25 to 40 kg – 22% and giant dogs weighing over 40 kg – 3%.

## RESULTS AND DISCUSSION

Almost all respondents (94%) were aware of the fact that parasitic diseases can transmit easily between animals of both the same and different species, and that they can pose a risk to humans. This fact should be considered extremely optimistic when compared to Steinka's research (2016). The author's assessment of animal owners' knowledge in the field of hygiene and the health effects of interactions with domestic animals has shown that 91% of respondents did not believe that it was possible for humans to be infected by domestic animals, and less than 4% of respondents have considered it possible. According to their opinion animals can be a source of bacteria transmission (78% of respondents), fungi (15%) or both of these micro-organisms (27%). A small percentage of respondents defined animals as a potential source of worms yet no one perceived them as a source of viruses and protozoa. According to the author, owners probably considered the deworming procedure as a method of releasing their animals from the presence of these organisms.

As Grajek and Woźniak-Holecka (2014) reported, 9% of the 300 surveyed dog owners in urban areas were aware of the occurrence of zoonotic diseases. However, in response to that fact 65% of the respondents included the information that contact with dogs causes fungal infections.

In the present study the majority of the respondents (62%) owned more than one dog. In this group 69% had two, 21% three, 5% four, 2% five, 2% seven, and 1% ten dogs. As reported by Roliński (2008) and Niemand (2011), the increas-

ing number of animals was equivalent to a higher risk of parasitic infestation, especially in the case of a common place of residence. Survey and serological research carried out by Zielicka-Hardy et al. (2012) on the presence of specific anti-Toxocara IgG antibodies within members of the Polish Hunting Association showed that infection was detected in 33% of hunters. The incidence of antibodies was higher in samples from hunters living in rural areas (95%), and the probability of infection increased with the number of dogs. The number of infected persons was higher among people who had more than two dogs and those who dewormed their dogs less than once a year.

According to Gliński and Kostro (2013), keeping animals at home increases the possibility of people being infected with parasitic diseases carried by animals and it is exactly how over 68% of the people surveyed is keeping their dogs. Raś-Noryńska et al. (2011) have studied faecal samples of children up to 17 years old that have been treated in the Provincial Children's Hospital in Olsztyn. The survey attached to each trial specified the issue of the presence of animals in the household. The obtained result has indicated the lack of correlation between permanent contact with animals in the house and the frequency of parasitic invasion.

The fact that 95% of the surveyed dog owners possessed the knowledge concerning the effects of neglecting the anti-parasitic prophylaxis in animals and 96% took preventive measures to protect themselves against parasites should be considered very important and optimistic. According to the studies of Grajek

and Woźniak-Holecka (2014), only 61% of respondents who were dog owners in urban areas have performed a deworming treatment at least twice a year, and less than 80% of the surveyed population protected dogs from ectoparasites.

In order to protect and eradicate ectoparasites in dogs, the owners can use external preparations applied directly on the skin, such as collars, spot-ons (drops), aerosols or *per os* (Roliński 2008, Zawiślak et al. 2011, Bowman 2012). Studies showed (Fig. 1) that the most used products were spot-ons (47%) and collars (33%). The aerosol formulations were the least popular (7%). In an effort to increase the effectiveness of the antiparasitic protection of their animals, almost 40% of the respondents used two formulations in different forms.

In turn, the results of a survey carried out by Lonc et al. (2016) in order to assess the knowledge of cat and dog owners from the Wrocław agglomeration in the field of tick prevention pointed out that 61.3% of respondents protected their animals against ticks and the drops were the most frequently used form of application (60.1% of respondents). The

collars were used by 32.9% of respondents, and 2.2% used preparations in the form of aerosols. In spite of undertaking safety measures, infestations were still being observed. Owners who did not use any form of treatment observed tick infestation more often (82.7%) than those who protected their animals from external parasites (69.4%). The probable reason, according to the authors, could have been not complying with the recommendations regarding the application of the preparations (incorrect frequency, loss of the collar's protective properties due to contact with water).

The choice of a particular formulation is usually dictated by its simplicity of use and effectiveness. In the case of drops and spray agents the duration of the protection period is determined by the type of active substance used, its release rate and absorption. Most of these preparations protect dogs for one month, however, the increased contact with water shortens the protection to about three weeks. The active substance released into the animal's body from the antiparasitic collar protects against infestation for up to 7–8 months.

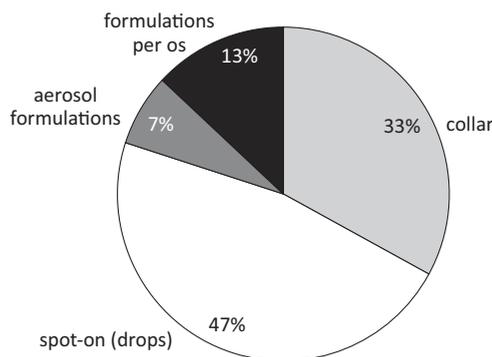


FIGURE 1. Types of prevention against ectoparasites

The effectiveness of antiparasitic prophylaxis depends on the systematic use and the frequency of use, determined by the period of protection a given method guarantees. The most representative group among the respondents (32%) was the owners who used prophylaxis against ectoparasites twice a year (Fig. 2).

In the studies of Grajek and Woźniak-Holecka (2014), 65% of respondents were protecting dogs against fleas and ticks seasonally – from spring to autumn, 14% continued securing also after the season, and 21% did not secure at all.

In the case of ticks, lice, fleas or other external parasite infestations, despite the use of therapeutic agents to eliminate the source of infection, there is a risk of recurrence. The residual effect of the drug, which accompanies the use of the latest therapeutic formulations, ensures the prolonged duration of the active substance in the body. This explains the use of such measures for preventive purposes (Niemand 2011).

The increased tick activity in recent years should encourage the rigorous use of prophylaxis against babesiosis which is caused by *Babesia canis*, a protist of Babesiidae family that can be found in

tick salivary glands (Niemand 2011, Solano-Gallego and Baneth 2011). Infections with this parasite can cause haemolytic anaemia, drowsiness, fever, vomiting, haematuria, apathy, decreased appetite, stomach problems, enlarged spleen and liver, and pallor or redness of mucous membranes. The disease can take the form of a mild infection or cause haemolytic complications that can lead to paralysis and even death following kidney damage and uraemia. Constant proliferation of protozoa presented in red blood cells causes the tearing of the walls of the dog's erythrocytes, decreasing the number of red blood cells, leading to anaemia and dangerous haemolytic diseases (Buczek 2010, Dziubek 2014).

Dogs may be the final hosts of a large number of internal parasites, including not only aschelminthes and flatworms but also protozoa. From among the intestinal protozoa, the most common cause of parasitoses in dogs are *Babesia* spp., *Giardia intestinalis* (*G. duodenalis*, *G. lamblia*), *Toxoplasma gondii*, *Cystoisospora canis*, *Cryptosporidium* spp., *Leishmania infantum* and *Hammondia* spp. (Bajer and Bednarska 2007).

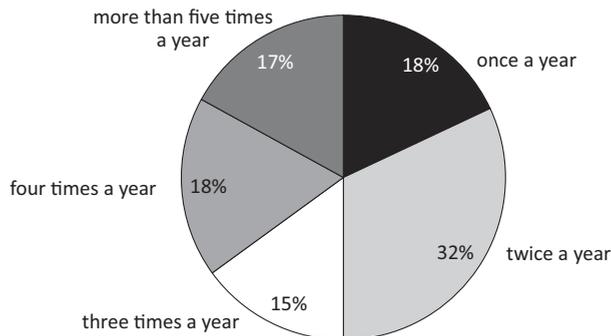


FIGURE 2. Frequency of prevention against ectoparasites

It is estimated that the percentage of domestic dogs in Poland that are infected with *Giardia* is 57% and with *Cryptosporidium* – 27%. The scale of the problem is illustrated by the fact that approximately 80% of the *Cryptosporidium* oocysts and *Giardia* cysts, which develop in the organisms of infected animals and are excreted into the environment with faeces, where they remain invasive for many months (Rozej et al. 2008).

Protozoa of *Giardia* and *Cryptosporidium* cause debilitating, watery diarrhoea, have influence on weight loss and lack of appetite (Hadaś and Derda 2014). The course of giardiasis, both in humans and animals, may be asymptomatic. Chronically infected and asymptomatic hosts may be reservoirs of invasion for several years (Gundlach and Sadzikowski 2004).

In the light of the threats described above, the results of the survey indicate that the frequency of treatments against endoparasites is insufficient. The most numerous group of respondents (41%) of respondents dewormed their animals once a year (Fig. 3). Only 12% of respondents administered three doses of the preparations.

In the studies of Grajek and Woźniak-Holecka (2014) more than half of the respondents coming from urban areas (61%) dewormed their dogs twice a year. Only 8% declared a complete lack of deworming activities, 10% did them once a year, and 21% more often than twice a year. According to Grajek and Woźniak-Holecka's (2014) own research, 92% of dog owners of Silesia region have dewormed dogs at least once a year. The similar regularity has been shown by the results of surveys conducted by Gawor and Marczyńska (2015) on farms in the Mazovian and Lublin Voivodeships. Exactly 94.1% of respondents have performed the deworming of dogs at least once a year.

According to Klockiewicz (2004a), when it is not possible to regularly conduct analyses of the faeces, which reflect the current level of parasitic infection, it is advisable to perform the deworming four times a year. Basing on the knowledge of the developing cycle of the most common parasites it can be concluded that a one or two-time deworming does not ensure complete protection of the animal.

The basic principle is to give appropriate, dose-compatible medicine. Active

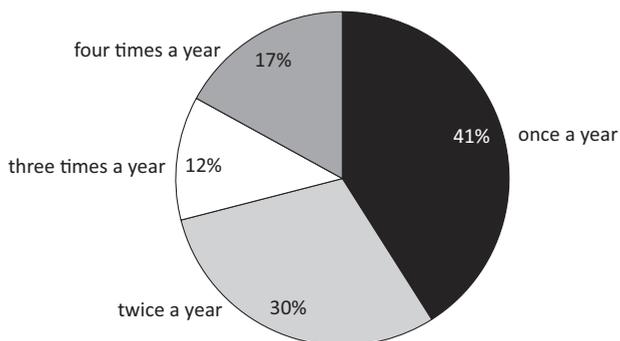


FIGURE 3. The frequency of dog deworming

substances that are part of market available medicines are: benzimidazoles, imidazothiazoles, tetrahydropyrimidines, macrocyclic lactones, organophosphorus compounds, piperazine and its derivatives, synthetic organic compounds, and diamidine derivatives. As Niemand (2011) has shown, most of these substances cause paralysis of the nervous-muscle system of the parasite, acting on receptors, inhibiting enzyme activity, and limiting access to essential nutrients. It is very difficult to create an effective, universal formulation, taking into account the huge variety of parasites. In the assessment of veterinary parasitologists, regardless of the availability of effectiveness of anthelmintics, animals still play an important role in the spreading of parasites, especially the *Toxocara* nematodes (Deplazes et al. 2011).

The larvae of the parasites can be found in the faeces of sick dogs, which poses a threat to healthy organisms. For this reason, clearing-up of canine faeces, as well as testing it for the presence of parasites is extremely important for antiparasitic prophylaxis (Hadaś and Derda 2014).

According to Gawor and Marczyńska (2015), not all preparations have an ovicidal effect. The dead or paralysed female nematodes excreted after administering the medicine have eggs that are capable to develop. For this reason, it is advisable to utilise the faeces for at least two days after deworming. Man infected with *Toxocara* plays a role of a paratenic (reservoir) host, where the parasite remains in the form of larvae in the internal organs.

Roundworms found in carnivorous animals (Gawor and Marczyńska 2015)

pose another zoonotic threat. An intrauterine and lactogenic invasion causes that 16-day-old puppies already excrete worm eggs in the faeces (the infection rate of several-week-old puppies reaches 70–100%). As Schnieder et al. (2011) have shown, the survival time of roundworms may last up to several years, leading to their accumulation in the external environment. Investigation of the degree of soil and sand pollution by invasive geohelminth forms in urban and rural areas in Poland have shown a significant level of soil contamination by eggs of intestinal parasites among which the *Toxocara* spp. was most frequently observed. The analysis of the soil from courtyards, playgrounds and squares has shown the presence of *Toxocara* spp. in 7.2–28.6% of samples from different regions of Poland (Mizgajska and Luty 1998, Petryszak and Nosal 2003, Rokicki et al. 2007, Ronkiewicz et al. 2007, Gawor et al. 2008, Borecka et al. 2010, Błaszowska et al. 2013, Bartosik et al. 2017). Studzińska et al. (2015) have shown that 54.3% of soil samples from urban areas were contaminated by parasitic eggs. Contamination was reported in 40% of sandpits and as much as 70% of residential alleys. According to Borecka and Kłapeć (2015), the incidence of toxocarosis in people, which is caused by a nematode from the *Toxocara* group, is a result of the severity of dog's infection and the contamination of soil with their faeces. As a component of the toxocarosis prevention the author suggests the need to introduce a legislation prohibiting the introduction of dogs into parks and playgrounds and to force owners to clean animal waste in public areas. The results

have shown that backyards and public playgrounds are places with the highest levels of *Toxocara* spp. (Gundlach et al. 1996, Borecka 2001, Gawor i Borecka 2004, Rokicki et al. 2007, Kłapeć and Stoczyńska-Sikorska 2009). In this study, only 40% of respondents reported clearing-up the dogs' waste, and only a quarter of the dogs have had their faeces tested for the presence of parasites.

Gawor and Marczyńska (2015) conducted surveys in agricultural holdings in the Masovian and Lublin Voivodeships to assess the level of parents' knowledge about the risk of zoonotic parasites to the children's health and the range of activities undertaken to ensure proper hygiene conditions (deworming, clearing-up of faeces, securing the sandboxes). For most of the respondents, the clearing-up of animal faeces had only aesthetic aspect. Only 9.8% treated such activities as a form of removal of the potential source of eggs of *Toxocara* spp. from the environment.

The season in which the owners of animals performed the deworming most often was spring – 40% of respondents, autumn – 27%, summer – 22% and winter – 11%. Bartosik et al. (2017) showed an increase in parasitic invasion during autumn and winter. The authors point out the need to increase the intensity of dog deworming during that period.

Many owners have chosen the anti-parasitic preparation themselves. The lack of knowledge and experience in this area could have negative consequences for this procedure. According to Klockiewicz (2004b), an inadequately chosen formulation or an insufficient dose can aggravate the symptoms and worsen the

condition of the animal. In addition to the ineffectiveness of deworming, such action can promote the development of parasitic resistance. The alternate use of therapeutic agents prevents the parasites from becoming resistant to the active substance of the preparation. Ensuring the effectiveness of the procedure is important due to the fact that even though the toxic effect of chemotherapeutics is stronger on the parasite's organism than on the animal, each use can have dangerous effects also for the host (Roliński 2008, Bowman 2012).

Information obtained from the survey indicated that 89% of the owners used the services of the same vet, who gave advice of dates and method of deworming to almost 86% of owners mentioned above. Similar results were obtained by Grajek and Woźniak-Holecka (2014). The authors stated that 80.5% of respondents had declared that they had received comprehensive answers from their vets. They had also obtained advice how to avoid zoonosis.

On average 11% of the respondents changed their vet every few months, once or twice a year, and sometimes consulted various specialists as a result of moving house or a variety of emerging problems.

The owner and the veterinarian should decide on the method of deworming. The owner informs of his or her financial possibilities and the frequency of performing the treatment. The doctor chooses the medicine, dose and frequency of use. However, as many as 56% of respondents were unable to answer why the veterinarian chose a certain type of deworming treatments and 58% had no knowledge of how adequate

deworming programme was. Only 41% of the respondents were aware of the changes made by the veterinarian in their preparations, although they claimed that it happened less than once a year. The remaining 59% of owners were not interested in what formulations were applied to their dogs, and 34% of people in this group could not tell whether the dog was weighed prior to application.

Advanced molecular and bioinformatic technologies can enrich knowledge of parasite pathways. Studies on the genetic diversity of protozoa occurring in wild and domestic canines characterize the dynamics of the development of parasitic infections in the animal population. Determination of the protozoal parasite population structure is an important component of the study defining the transmission of the pathogen, immunogenicity and pathogenesis of the disease (Sibley et al. 2009). It also becomes the basis for the development of effective control strategies that underpin veterinary protection and public health (Aroch et al. 2015). The radical transformations of the climate, landscape and ecosystem in recent years have contributed to changes in the transmission of parasitic diseases and the zoonotic pathogens can “return” to human populations. Pathogens adapt to new places and hosts, and thus remain a new form of danger. This causes the need to identify particular species of parasites, their life forms and ways of parasitism in order to plan and develop control strategies against pathogen (Otranto et al. 2015a, Otranto et al. 2015b, Bartosik et al. 2017). It seems that every animal owner should possess at least a part of the combined knowledge of microbiologists, physicians,

veterinarians, parasitologists, biologists and epidemiologists since it is crucial for a better understanding of the aetiology of parasitic diseases.

## CONCLUSIONS

Based on the analysis of the results of the survey, it was concluded that:

1. The vast majority of respondents were aware of the dangers posed by the development of parasites in dogs, although this knowledge turned out to be incomplete and needed to be deepened. On average 6% of owners did not use any form of antiparasitic prophylaxis.

2. Less than half of the respondents who found it reasonable to pick up dog faeces admitted doing it regularly.

3. More than half of the surveyed owners did not show any interest in the type of preventive medicine used by the vets, the programme and the necessary changes in the pharmacological agents applied.

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**Streszczenie:** *Pasożyty u psów – profilaktyka i zwalczanie w świetle badań ankietowych.* Celem przeprowadzonych badań była próba określenia zakresu wiedzy właścicieli psów na temat występowania chorób pasożytniczych, ich negatywnych następstw oraz działań prewencyjnych. Materiał badawczy stanowiły dane pochodzące ze 162 anonimowych ankiet. Badania przeprowadzono w okresie od lipca do października 2015 roku wśród właścicieli psów zamieszkujących różne rejony Polski. Analiza wyników wykazała, że większość respondentów wiedziała na temat zagrożeń wynikających z rozwoju chorób pasożytniczych u posiadanych zwierząt, zakres tej wiedzy był jednak niewystarczający i wymagał pogłębienia. Niestety 6% właścicieli nie stosowało żadnej formy profilaktyki przeciw pasożytniczej. Mniej niż połowa respondentów zadeklarowała, że regularnie sprząta odchody swoich podopiecznych. Ponad połowa ankietowanych właścicieli nie miała informacji na temat rodzaju i programu profilaktyki przeciw pasożytniczej stosowanej przez lekarza weterynarii oraz o wprowadzaniu

koniecznych zmian w aplikowanych psom środkach farmakologicznych. Najlicniejsza grupa właścicieli (32% ankietowanych) stosowała profilaktykę przeciw ektopasożytom dwukrotnie w ciągu roku. Prawie połowa respondentów jako prewencję chorób wywołanych przez ektopasożyty stosowała preparaty w formie kropli, 33% używała obroży przeciwpasożytniczych. Dążąc do zwiększenia skuteczności ochrony przed infekcją pasożytami, 40% respondentów stosowało jednocześnie dwa preparaty w różnych formach. Wyniki przeprowadzonych badań ankietowych wskazują na niedostateczną częstotliwość stosowania zabiegów zwalczających endopasożyty. Jednokrotne odrobaczanie psów było wykonywane przez 41% ankietowanych, a t rzykrotne przez najmniej liczną grupę respondentów (12%).

*Słowa kluczowe:* pasożyty, psy, profilaktyka, zwalczanie

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