

Impact of lifestyle on the formation of helminth fauna of domestic carnivores in Azerbaijan

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The lifestyle of domestic carnivores (nutrition, behaviors, and individual characteristics) has direct impact on the formation of infective helminthological fauna. The lifestyle of domesticated animals is characterized by features that contrast with other animals: they always preen themselves, dig the ground (soil), domestic cats dig the soil and cover their excretion, they always shake their body, they adhere to the place where they feed, their kindness with humans, especially to children. Each of these characteristics is important in the infection of stray dogs and cats with different helminths and in the formation of helminthological fauna. Irrespective of the environmental conditions, they maintain their habitual behaviors in all seasons, spreading helminthic eggs, ecologically polluting the environment. In all climatic conditions, they are a source of infection for humans and ruminants thus assigning their epizootic and epidemiological importance in the ecosystem. The aim of this study is to draw attention to the importance of helminthic fauna in domestic carnivores in Azerbaijan.

Keywords: Azerbaijan, biohelminths, carnivores, cats, geohelminths, humans, stray dogs.

Received: 10 February, 2022; **Accepted:** 6 May, 2022.

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Print ISSN: 1687-7942, **Online ISSN:** 2090-2646, **Vol. 15, No. 1, April, 2022.**

Domestic carnivores (stray dog, domestic cat), act as intermediate and definitive hosts, and emitters of dangerous helminths, spreading infection in Azerbaijan. The lifestyle of animals has an impact on the formation of helminth fauna. The helminth fauna was established and acquired a current helminthological condition in accordance with the animals' manner of life. The identification of the conditions that influence its spread is significant and of practical importance.

For this reason, defining the impact of lifestyle of animals on the formation of helminthological fauna, and its reasons are advisable. For this purpose, 695 stray dogs and 971 domestic cats from different areas of Azerbaijan were studied by using full helminthological autopsy method^[1]. Among the observed helminths cestodes were fixed in 70% alcohol; nematodes were fixed in 4% formalin.

As a result of the study, a total of 62 species of helminths were found infecting stray dogs [55 (88.7%)] and domestic cats [41 (66.1%)]. Of the total helminths recorded, 33 (53.2%) species were found in both animals. Overall, the recorded helminths constituted 7 (11.3%) species of trematodes, 26 (42.0%) species of cestodes, 1 (1.6%) species was an acanthocephalan, and 28 (45.2%) species were nematodes (Table 1). According to the development cycle, 51 (82.2%) species were biohelminths, 11 (17.7%) species were geohelminths.

DISCUSSION

The characteristics of domestic carnivores differ from other animals; they always preen themselves and shake their body; dig the ground (soil); domestic cats dig a hole up to 3-5 cm of depth and cover their excreta by backward sweeping of the soil with their paws^[2]; they tend to adhere to the place where they feed; they are kind to humans, especially children. Each one of these individual characteristics has decisive importance in infection of stray dogs and cats with various species of helminths and in the formation of helminth fauna^[3].

The present study investigated the infection of stray dogs and domestic cats with various species of helminths and observed the following:

- The recorded helminths proved to be both biohelminths^[4] (adults worms infest man or animal as primary host, and their larval stages infest various animals as intermediate host; mostly are trematodes and cestodes) and geohelminths^[5] (soil transmitted helminths dependent on soil for development of their life cycle; mostly are nematodes). Generally, both are responsible for human diseases and zoonotic infections.
- Domestic carnivores are infected repeatedly by same species of helminths because they always preen their bodies. When they preen their anus, they swallow the contaminating eggs of helminths passed in their

Table 1. Helminths observed in domestic carnivores in Azerbaijan.

Types of helminthes (No/%)	Animals infected	
	Stray dogs	Domestic cats
Trematodes (7/11.3%)		
<i>Alaria alata</i> Goeze	+	+
<i>Plagiorchis elegans</i> Rudolphi	+	+
<i>Euparyphium melis</i> Schrank	+	-
<i>Echinochasmus perfoliatus</i> Ratz	+	+
<i>Cryptocotyle lingua</i> Creplin	+	+
<i>Pharhyngostomum cordatum</i> Diesing	+	+
<i>Ph. fausti</i> Skrjabin et Popov	-	+
Cestodes (26/42.0%)		
<i>Diphyllobothrium latum</i> Lühe	-	+
<i>Spirometra erinacei-europei</i> Rudolphi	+	+
<i>Dipylidium caninum</i> Lühe	+	+
<i>Diplopylidium nolleri</i> Skrjabin	+	+
<i>D. skrjabini</i> Popov	-	+
<i>Joyeuxiella echinorhynchoides</i> Sonsino	+	+
<i>J. rossicum</i> Skrjabin	-	+
<i>J. pasgualaei</i> Diamare	+	+
<i>Taenia hydatigena</i> Pallas	+	+
<i>T. solium</i> (larvae) Linnaeus	-	+
<i>T. crassiceps</i> Zeder	+	+
<i>T. laticollis</i> Rudolphi	+	+
<i>T. parenchimatosa</i> Pushmenkov	+	-
<i>T. ovis</i> Cobbold	+	-
<i>T. cervi</i> Christiansen	+	-
<i>T. krabbei</i> Moniez	+	-
<i>T. pisiformis</i> Bloch	+	+
<i>Hydatigera taeniaeformis</i> Batsch	+	+
<i>H. krepkogorski</i> Schulz et Landa	+	+
<i>Multiceps multiceps</i> Leske	+	-
<i>Alveococcus multilocularis</i> Leuckart	+	-
<i>Echinococcus granulosus</i> Batsch	+	-
<i>Tetratirotaenia polyacantha</i> Leuckart	+	-
<i>Mesocestoides lineatus</i> Goeze	+	+
<i>M. corti</i> Hoeppli	+	-
<i>M. petrowi</i> Sadychov	+	-
Acanthocephala (1/1.6%)		
<i>Macracanthorhynchus catulinus</i> Kostylew	+	-
Nematodes (28/45.2%)		
<i>Capillaria plica</i> Rudolphi	+	+
<i>C. felis-cati</i> Bellingham	-	+
<i>C. putorii</i> Rudolphi	+	+
<i>Thominx aerophilus</i> Creplin	+	+
<i>Trichocephalus georgicus</i> Rodonaya	+	-
<i>Tr. vulpis</i> Froelich	+	-
<i>Trichinella spiralis</i> Owen	+	+
<i>Strongyloides vulpis</i> Petrow	+	-
<i>Ancylostoma caninum</i> Ercolani	+	+
<i>A. tubaeforme</i> Zeder	-	+
<i>Uncinaria stenocephala</i> Railliet	+	+
<i>Gongylonema pulchrum</i> Molin	+	-
<i>Grenosoma vulpis</i> Rudolphi	+	-
<i>Troglostrongylus brevior</i> Gerichter	+	+
<i>Angiostrongylus vasorum</i> Railliet	+	-
<i>Molineus patens</i> Dujardin	+	+
<i>Toxascaris leonina</i> Linstow	+	+
<i>Toxocara canis</i> Werner	+	+
<i>T. mystax</i> Zeder	-	+
<i>Spirura rytiplerites</i> Deslongchamps	+	+
<i>Spirocerca arctica</i> Petrow	+	-
<i>Sp. lupi</i> Rudolphi	+	-
<i>Physaloptera praeputiale</i> Linstow	+	+
<i>Ph. sibirica</i> Petrow et Gorbunow	+	+
<i>Rictularia affinis</i> Jagerskiold	+	+
<i>R. cahirensis</i> Jagerskiold	+	+
<i>Ascarops strongylina</i> Rudolphi	+	-
<i>Dirofilaria repens</i> Railliet et Henry	+	+
Total: 62 spp.	55/88.7% spp.	41/66.1% spp.

+: Present, -: Absent

stools. At the same time, when they preen their body, they transfer these eggs to other parts polluting the hairs in their fur. For this reason, stray dogs and cats are repeatedly infected with eggs of different species of helminths. Consequently, they become a source of infection to humans, especially children who touch them. Exposure to infections with *E. granulosus* is very dangerous for humans. Nematodes such as *Toxocara canis*, *Toxocara mystax*, as well as *Toxoascaris leonina*, are transferred by the swallowing of eggs, to individuals who care for stray dogs and cats.

- They always shake their body and scatter the helminth eggs stuck to their hairs creating a state of “parasitic pollution” in the eco-system.
- Because of digging the soil ground, stray dogs and cats are infected with nodes of some cestodes full of eggs of *Spirometra erinacei/europei*, *T. crassiceps*, *T. pisiformis*, and *H. taeniaeformis* spp., in addition to eggs of the invading nematodes *A. caninum*, *U. stenocephala*, *T. leonina*, *T. canis*, *T. mystax*, and *M. patens*^[3].
- Nematode eggs contained in excretions buried in soil and eggs in the nodes of some cestodes develop into invasive mode and can survive for up to 17 months. So, the humidity and temperature for the development of nematode eggs are suitable in soil^[6]. For this reason, individuals engaged in farming are more frequently infected^[7]. Additionally, eggs scattered from the nodes of cestodes are digested by tetrapod animals (rodents and reptiles). When dogs and cats eat such infected animals, the relevant helminthological infection develops in them. At the same time, dogs and cats are infected with these invasive eggs repeatedly, while digging the ground^[3].
- The adherence of stray dogs and cats to the area where they feed, as well as their nutrition tendencies predisposes them to the harmful helminths. This has an impact on helminths dissemination between animals and the formation of helminthic fauna according to biotope. Hence, they remain continually predisposed to infection with helminth eggs, resulting in continuation of natural infections by local and basic helminth parasites in that area^[8].
- In comparison to other animals, stray dogs and cats do not depend on ecological conditions of the environment and seasonal change. These animals are found in all seasons of the year, and as they are always free in nature, they pollute the environment with helminth eggs in their excreta and infect humans and domestic ruminant animals. Therefore, the infection with different species of helminths by stray dogs and cats occurs in all seasons^[6].
- Due to close association with humans, various species of helminth eggs stuck to the hairs of stray dogs and cats may be ingested, resulting in infections such as echinococcosis, ancylostomiasis, toxocariasis caused by *E. granulosus*, *A. caninum*, *T. canis*, *T. mystax*, respectively, as well as *U. stenocephala*.
- Because these animals affect humans and ruminants, they are of epizootological and epidemiological

importance in the ecosystem, under all climatic conditions.

Thus, the lifestyle of domestic carnivores has direct impact on the formation of helminthological fauna of the animals. In order to prevent infection with dangerous helminthological species spread by domestic carnivores, it is advisable to treat them carefully and follow the sanitary rules strictly.

Acknowledgment: The author expresses appreciation to the Institute of Zoology of the National Academy of Sciences for its support of this research.

Conflict of interest: No competing interests.

Funding: Self-funding.

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