

THE ROLE OF FOXES (*VULPES VULPES* L.) IN THE EPIZOOTIOLOGY AND EPIDEMIOLOGY OF NEMATODE PARASITIC ZOONoses

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*A large number of foxes, known to carry various parasites, live in the vicinity of Belgrade. Therefore we conducted a postmortem parasitological (pathoanatomic) examination of a total of 357 adult and 102 juveniles hunted in the Belgrade area. Nine species of nematodes were found, namely: *Toxocara canis*, *Toxocara mystax*, *Toxascaris leonina*, *Ancylostoma caninum*, *Uncinaria stenocephala*, *Spirocerca lupi*, *Capillaria plica*, *Trichinella spiralis* and *Trichuris vulpis*. Comparing these results with those found in stray dogs, we concluded that many nematode species were found in both populations. This is of great epizootiological and epidemiological significance in terms of expansion of helminthoses, because of possible urban environmental contamination and subsequent human infection, particularly with *Ascaridae* and *Ancylostomidae* species.*

Key words: fox, nematodes, dog, epizootiology, epidemiology

INTRODUCTION

Numerous papers have reported on nematoda of red foxes (*Vulpes vulpes* L.) from many countries throughout the world. Petrov (1950) stated that this class of helminths was found in foxes in Central and Far East Russia. Irgašov et al. (1968) reported the occurrence of several nematode species in foxes in Uzbekistan. Williams (1978) have also reported the recovery of adult nematodes from wild foxes in Great Britain. The occurrence of nematodes in red foxes in Europe has been reported by Petavy et al. (1980) in France, Fumaga et al. (1955) in Poland, Atanasov (1958) in Bulgaria, Ross et al. (1969) in North Ireland, Nickell et al. (1980) and Sarr (1957) in Germany. Baron (1971) and Killgore (1969) have also reported the recovery of several nematode species in foxes in the U.S.A. and Canada. Foxes have also been examined in order to assess their role in the epidemiology of hydatidosis and other zoonanthropohelminthoses in Belgrade area by Ložanić (1963), Bošković (1983) and Pavlović (1994). Foxes in the extended area of Belgrade were found to be carriers of many species of nematode, including some species of importance for human health. In habiting the nearest surroundings of the urban part of Belgrade foxes have permanent contact with the large popula-

tion of urban animals such as stray and pet dogs. Both populations of animals (foxes and dogs) belong to Canidae family and have similar parasitic fauna. With these tendencies in mind and the way foxes and especially stray dogs breed in the same places, and with the possible role that stray dogs might play in the epizootiology of parasitic infections of pet dogs and their role in the epidemiology of human parasitic infection, we decided to embark on a systematic examination of endoparasites, especially nematodes in red foxes (*Vulpes vulpes* L.) inhabiting the region round Belgrade (South Banat, South Srem and Šumadija).

MATERIALS AND METHODS

A total of 357 adult foxes and 102 pups of red foxes (*Vulpes vulpes* L.) were examined in the laboratory of the Veterinary Institute in Belgrade.

Out of this total, 263 foxes, originated from South Banat (Pančevački Rit, Krnjača, Ovča, Borča, Kovilovo, Padinska Skela, Dunavac, Lepušnica, Jabučki Rit, Glogonjski Rit, Crvenka, Vrbosko, Besni Fok, Sefkerin and Sebeš Ritovi). From South Srem (Zemun, Batajnica, Banovci, Dobanovci, Sopot, Surčin, Ugrinovci and Surduk) originated 57 of the examined foxes. A total of 37 foxes came from Šumadija (Begaljica, Ripanj, Kotež, Boleč, Višnjica and Parcanska forest). All of the examined juveniles originated from South Banat (Pančevački Rit).

After necropsy, we examined the trachea, lung, heart, complete gastrointestinal tract, liver, kidney and urinary bladder. The intestine and the other organs were slit open and visible helminths removed. After that the contents especially of the intestine were washed out. The contents and washings were screened over a gauze sieve, mesh aperture 150 μ m, under jet of water and the retained material examined, small quantities at a time, in a large white enamel tray. Any parasites found were fixed in 10% formalin, and either mounted in lactophenol for identification, or mounted in Canada balsam. They were identified using keys given by Watson (1963) and Soulsby (1977).

RESULTS AND DISCUSSION

In our examination infection with nematodes was found in 296 (82.31%) of the adult foxes and in 73 (71.57%) of the foxpups.

Juveniles were infected with two species i. e. *Toxocara canis* and *Uncinaria stenocephala* (Table 1).

The results obtained in our examination showed that a considerable number of foxes were carriers of a number of nematode species (Table 2). The most prevalent among the species was *Toxocara canis* which was found in 44.26% of the adults and 71.57% of the juveniles, followed by *Uncinaria stenocephala* in 23.25% of the adults and 8.82% of the fox pups. *Trichuris vulpis* (20.17%), *Ancylostomum caninum* (19.33%), *Toxocara mystax* (9.24%), *Capillaria plica* (5.88%), *Toxascaris leonina* (3.92%), *Trichinella spiralis* (2.24%) and *Spirocerca lupi* (0.56%).

Table 1. Species of nematode, number of infected fox pups and intensity of infection

Nematode species	Number of examined fox pups			Intensity of infection	
	Total	Infected		min	max
		No	%		
<i>Toxocara canis</i>	102	73	71.57	1	9
<i>Uncinaria stenocephala</i>	102	9	8.82	3	7

Table 2. Species of nematode, number of infected adult foxes and intensity of infection

Nematode species	Number of examiner adult foxes		Intensity of infection		
	Total	Infected	min	max	
		No.	%		
Toxocara canis	357	158	44.26	2	27
Uncinaria stenocephala	357	83	23.25	4	112
Trichuris vulpis	357	72	20.17	2	23
Ancylostoma caninum	357	69	19.33	2	19
Toxocara mystax	357	33	9.24	3	8
Capillaria plica	357	21	5.88	2	76
Toxascaris leonina	357	14	3.92	3	15
Trichinella spiralis	357	8	2.24	—	—
Spirocerca lupi	357	2	0.56	2	3

Table 3. Species of nematode and intensity of infection of foxes, stray dogs and pet dogs

Species of nematode	Extent of infection (%)		
	Foxes	Stray dogs	Pet dogs
<i>Toxocara canis</i>	44.26	53.16	23.86
<i>Uncinaria stenocephala</i>	23.25	29.61	14.76
<i>Trichuris vulpis</i>	20.17	27.60	16.66
<i>Ancylostoma caninum</i>	19.33	26.67	14.76
<i>Toxascaris leonina</i>	3.92	18.32	—

Polyparasitismus were recorded in 286 (80.11%) adult foxes and 8.82% of the pups.

When the results obtained by other authors (Lozanić, 1963; Bošković, 1983) are compared with our findings we can claim that we are the first to isolated *Toxocara mystax* from foxes inhabiting Yugoslavia.

At the same time intestinal nematode fauna of stray and pet dogs have been examined in the same area of Belgrade (Nešić et al., 1990; Kulišić et al., 1992, 1994 a, 1994 b, 1995 a, 1995 b). Since foxes and dogs belong to the same family - Canidae, and during the last 30 years many natural habits of foxes in South Banat and Srem have become connected with Belgrade, suburbs we compared the results obtained for foxes with those for both groups of dogs (Table 3). Both animal populations (foxes and dogs) presented a similar nematode fauna a high

level and rate of infection with round worm species, important to human health. This is especially the case regarding Ancylostomida and Ascarida species which cause the human larval syndrome (Gibson, 1960; Galliard, 1974; Woodruff, 1988; Virgala and Cesnak, 1975; Knaus et al., 1988; Gemund et al., 1989).

In Serbia, Joković et al. (1988) found in 6% of a human population a positive titer of antibody to larva migrans without clinical symptoms. Lalošević (1990) concluded that *Toxocara canis* plays an important role in the epidemiology of human parasitic zoonoses and introduced a new immunofluorescence test for diagnosis of larval granulomatosis in man. In a population of children with high eosinophilia, a positive titer of antibody to larva migrans was found in 50% (Lalošević, 1993). Moreover, Lalošević et al., (1994) pointed to the involvement of *Toxocara canis* in larval granulomatosis oculi.

These results imply a role for foxes in the spread of infection of those nematode species to stray and pet dogs and also a role for dogs in contamination of urbanized environments (Laborde, 1980; Valkunova, 1982). Contamination of playgrounds, children's sand boxes and grassy areas in Belgrade is continuous and examination of those places was discussed by Pavlović et al., (1995).

The results shown above indicate that the fox population located in the Belgrade area is only one of the natural carriers of nematodes but constant contact with stray dogs allows continuous circulation of those parasitic species confirms the involvement of foxes in the epizootiology and epidemiology of parasitic zoonoses.

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ULOGA LISICA (*VULPES VULPES* L.) U EPIZOOTIOLOGIJI I EPIDEMIOLOGIJI NEMATODNIH PARAZITSKIH ZOONOZA

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SADRŽAJ

Imajući u vidu veliki broj lisica (*Vulpes vulpes* L.) koje žive na širem području Beograda, ispitali smo patoanatomskom sekcijom 357 odraslih i 102 mladih lisica ulovljenih na ovom području (južni Banat, južni Srem i Šumadija).

Ustanovili smo devet vrsta nematoda i to: *Toxocara canis*, *Toxocara mystax*, *Toxascaris leonina*, *Uncinaria stenocephala*, *Ancylostoma caninum*, *Spirocerca lupi*, *Capillaria plica*, *Trichinella spiralis* i *Trichuris vulpis*.

Upoređujući nalaze nematoda lisica sa ustanovljenim vrstama ovih parazita kod pasa sa područja Beograd, ispitivanih u istom periodu na istim lokacijama (s obzirom da obe populacije pripadaju porodici Canida) ustanovili smo da postoji velika sličnost po broju vrsta i intenzitetu infekcija. *Toxocara canis*, *Ancylostoma caninum*, *Uncinaria stenocephala* i *Trichuris vulpis* su pri tome u visokom procentu naročito kod pasa litalica. Ove vrste su u humanoj patologiji poznate kao uzročnici larvalne granulomatoze.

Lisice sa područja Beograda su jedan od prirodnih nosilaca navedenih vrsta parazita, koji u kontaktu sa psima (primarnim kontaminatorima urbane sredine) omogućavaju cirkulaciju ovih vrsta nematoda. Ovo ukazuje na ulogu lisica u epizootologiji i epidemiologiji parazitskih zoonoza.