

Helminths of hedgehogs, *Erinaceus europaeus* and *E. roumanicus* from Poznań region, Poland – coprological study

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ABSTRACT. Fecal samples from the hedgehogs, *Erinaceus europaeus* (15 samples) and *E. roumanicus* (44 samples) collected in the Poznań region of Poland were examined. Endoparasites were isolated using Sheather's flotation technique. The prevalence of parasitic infections in all hedgehogs examined was 74.6% (*E. europaeus* – 73.3%; *E. roumanicus* – 75.0%). Two species of parasites occurred in both species of hosts: *Aonchotheca erinacei* (60% and 80%) and *Eucoleus aerophilus* (6.7% and 15.9%). *Brachylaima erinacei* was found only in *E. europaeus* (33.3%) while *Physaloptera* sp. (13.6%) and *Crenosoma striatum* (4.6%) only in *E. roumanicus.* The intensity of infection varied from 1 to 371 eggs/1g of feces in *E. europaeus* and from 1 to 194 eggs/1g of feces in *E. roumanicus*. In both sexes the majority of infections were of low intensity, high intensity infections occurring only sporadically. No zoonotic species of endoparasites were recorded in these samples.

Key words: helminths, hedgehogs, *Erinaceus*, coprological examination, Poznań, Poland

Introduction

Two species of hedgehogs, *Erinaceus europaeus* and *E. roumanicus* occur in Poland and Poznań is situated within the geographical range of these two species. These mammals are quite common in synanthropic environments (for example in gardens, cemetries, city parks and city backyards) and some are even kept as pets. Usually, they forage within a radius of 200–300 m around their nests, and this is their home range, but sometimes they cover distance of several kilometers. Many of them are killed by vehicles or perish in other unnatural way [1–3]. Being high in the food chain, hedgehogs play an important role in natural ecosystems and this is one of the reason why they are on the protected species list.

Global information about the parasitofauna of hedgehogs is scarce [4–6] and moreover in Poland, the most recent data on the subject originates from as long ago as the 1960s [7]. So, when a comprehensive ecological study of hedgehogs was initiated in the Poznań agglomeration, we took the opportunity to carry out parasitological examination of their feces. Our purpose was to identify the endoparasites found in these two species of hedgehogs in the region and to determine whether they disseminate zoonotic helminths in examined synanthropic environments in Poland.

Material and methods

Between May 2009 and July 2010, 59 samples of feces were collected from 17 stands in different parts of the region. Samples, each about 2–5 g, were taken from hedgehogs caught and kept temporarily for sampling. Fifteen individuals of *E. europaeus* and 44 individuals of *E. roumanicus* were exami-

Table 1. The prevalence of helminth eggs in hedgehog feces

Genus/species	*E. europaeus* n=15	*E. roumanicus* n=44	*E. europaeus* *E. roumanicus* n=59	Stands with infected hedgehogs
Aonchotheca erinacei	9 60.0%	36 81.8%	45 76.3%	13/17 76.5%
Eucoleus aerophilus	1 6.7%	7 15.9%	8 13.6%	4/17 23.5%
Physaloptera sp.	–	6 13.6%	6 12.2%	2/17 11.8%
Brachylaima erinacei	5 33.3%	–	5 8.5%	4/17 23.5%
Crenosoma striatum	–	2 4.6%	2 3.4%	2/17 11.8%
Total	11 73.3%	33 75.0%	44 74.6%	13/17 76.5%

ned. Thirty-two of the specimens were males and 27 were females. From each sample collected a 1 g portion was analyzed by Sheather's flotation (in saturated sugar dilution). The eggs of parasites were identified on the basis of their size and shape under a light microscope using 10×40 magnification. The measurements were taken with the aid of a microscope with a computer software (Motic Images Plus).

The intensity of infection of each hedgehog examined was evaluated by counting the eggs. One to nine eggs in 1 g of feces sample were regarded as a low intensity (+), 10–99 eggs/1g as a medium intensity (++) and more than 100 eggs/1g as a high intensity (+++).

Results and discussion

The parasitological study of hedgehogs in the Poznań area where two species, *E. europaeus* and *E. roumanicus* coexist, was undertaken to obtain basic information that might be useful in a more detailed study of the subject. Out of 59 feces samples examined collected from 17 stands, 44 (74.6%) samples from 13 (76.5%) stands were positive for parasite eggs and in 15 samples (25.4%) more than one species of parasite were present (Table 1). Only minor differences were observed in the overall prevalence of the helminth parasites in both species of hedgehogs (*E. europaeus* – 73.3% and *E. roumanicus* – 75.0%). A similar prevalence of helminth infection under the coprological test has been reported earlier for *E. europaeus* in Great Britain (69% positive samples) [5] and in Germany (74% positive samples) [8]. Our coprological tests of *E. roumanicus* revealed the same parasites to those reported from post-mortem examination of hedgehogs in Turkey [6] but the prevalence of the

Table 2. The prevalence of helminths in hedgehogs as recorded by different authors based on fecal and post-mortem (*) examinations

Species of hedgehogs	*Aonchotheca* (=*Capillaria*) *erinacei*	*Eucoleus* (=*Capillaria*) *aerophilus*	*Brachylaima erinacei*	*Physalo-pthera* sp.	*Crenosoma striatum*	Other helminths	Country	References
***E. roumanicus* (n=44)**	**82%**	**16%**	**–**	**14%**	**5%**	**–**	**Poland**	**Our study**
**E. concolor* (n=18)	56%	22%	–	72%	56%	*Nephridiorynchus major*	Turkey	[6]
***E. europaeus* (n=15)**	**60%**	**7%**	**33%**	**–**	**–**	**–**	**Poland**	**Our study**
	Capillaria sp. 62%		55%	–	71%	*Oligantho-rhynchus erinacei*	UK	[5]
	Capillaria sp. 49%		2%	–	36%	–	Germany	[11]
	Capillaria sp. 33%		–	–	27%	–	Germany	[12]
E. europaeus (n=754)	72–74%	15–40%	1%	–	21-23%	–	Germany	[8]

Table 3. Intensity of helminth infections in hedgehogs as assessed by the number of eggs in fecal samples

Intensity	*E. europaeus*	*E. roumanicus*	*E. europaeus* and *E. roumanicus*		
	n=15	n=44	male n=32	female n=27	total n=59
+	6 40.0%	21 47.7%	14 43.8%	13 48.2%	27 45.8%
++	4 26.7%	7 15.9%	8 25.0%	3 11.1%	11 1.7%
+++	3 20.0%	1 2.3%	3 9.4%	1 37.0%	4 6.8%
Total	13 86.7%	29 65.9%	25 78.1%	17 63.0%	42 71.2%

+ low (>10 eggs/1g); ++ medium (10–99 eggs/1g); +++ high (>99 eggs/1g)

individual species of helminths in these two studies differ (Table 2). In our study and those reported earlier, the intensity of helminth infections in hedgehogs was high and this indicates that they are rather tolerant for parasite infection.

In both species, *E. europaeus* and *E. roumanicus*, the eggs of *Capillaria* sp. were found most often (71.2%) and were recorded in each of the positive samples. In agreement with other authors we found that *Aonchotheca* (=*Capillaria*) *erinacei* is much more prevalent (60% and 82%) then the lung worm *Eucoleus aerophilus* (7% and 16%) [6,8]. The eggs of 2 species of parasites, *A. erinacei* and *E. aerophilus*, occurred in both species of hosts; *Brachylaima erinacei* was found only in *E. europaeus* (33.3%) while *Physaloptera* sp. and *Crenosoma striatum* only in *E. roumanicus* (13.6% and 4.6% respectively). The species distribution and proportion of endoparasites found in the hedgehogs examined were comparable to those reported earlier (Table 2).

No significant differences were found in the prevalence of infection among *E. roumanicus* and *E. europaeus* ($p>0.05$) and similar frequencies of infected individuals were noticed among both male and female hedgehogs (Table 1). Helminth infections seemed to have little influence on competition between these two species of hedgehogs living sympatrically in Poland.

The intensity of infection, evaluated as the number of eggs recovered in 1 g feces, in *E. europaeus* varied from 1 to 371 and for *E. roumanicus* from 1 to 194. In both species of hedgehogs the number of eggs recovered was low (<10 eggs/1g) in most individuals (46%) and high (>99 eggs/1g) in only 7% (Table 3). But it should be underlined that there is low or no correlation between adult worm burden and the density of the corresponding immature parasite stages in feces [5].

Although some authors [9,10] have demonstrated that hedgehogs can be passive carriers or reservoir host for specified zoonotic helminths or protozoa the present coprological study does not confirm the phenomenon.

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