WIADOMOŚCI PARAZYTOLOGICZNE
T. 48 (1) 2002: 65–68

RACCOON DOG (*NYCTEREUTES PROCYONOIDES*) – THE NEW HOST OF *ECHINOCOCCUS MULTILOCULARIS* IN POLAND

BARBARA MACHNICKA-ROWIŃSKA, BOGUSŁAW ROCKI, EWA DZIEMIAN AND MARTA KOŁODZIEJ-SOBOCIŃSKA

W. Stefański Institute of Parasitology, Polish Academy of Sciences,
Twarda str. 51/55, 00-818 Warszawa, Poland

ABSTRACT. The alimentary canals of 9 species of domesticated or wild animals were examined for the presence of *E. multilocularis*. The tapeworm was found in 9 red foxes (*Vulpes vulpes*) out of 155 examined (5.8%) and in 2 raccoon dogs (*Nyctereutes procyonoides*) of 25 examined (8.0%). Our studies proved that in Poland the raccoon dog can also be infected with *E. multilocularis*.

Key words: *Echinococcus multilocularis*, raccoon dog (*Nyctereutes procyonoides*), red fox (*Vulpes vulpes*), Poland.

INTRODUCTION

Alveolar echinococcosis (AE) is a chronic disease caused by the metacestode (larval) stage of the tapeworm *Echinococcus multilocularis*. It is one of the most lethal helminthic infections of humans (Gottstein and Hemphill 1997).

Our knowledge on the geographical distribution of *E. multilocularis* in Europe enlarged during the last decade. Also in Poland, cases of *E. multilocularis* in humans have been reported. Studies carried out in Switzerland, Austria, Germany and France revealed that the main source of the infection was the red fox (*Vulpes vulpes*). To determine the epidemiological threat of AE, examinations of red foxes were carried out. These studies showed that, on the average, *E. multilocularis* was present in 2.6% of the red fox population. In the northern part of Poland, this parasite infected as much as 36% of the red fox population (Malczewski et al. 1999).

The present study revealed that in Poland a wild reservoire of *E. multilocularis* are both: the red fox and the raccoon dog.

MATERIALS AND METHODS

In our study carried out in 2000, we examined 9 animal species for the presence of *E. multilocularis*: the dog (*Canis familiaris*), the cat (*Felis catus*), the red fox (*Vulpes vulpes*), the polecat (*Mustela putorius*), the raccoon dog (*Nyctereutes procyonoides*), the badger (*Meles meles*), the marten (*Martes* sp.), the weasel (*Mustela nivalis*) and the rat (*Rattus* sp.).

Among 338 animals belonging to 9 species, 216 specimens came from the northern part of Poland (Pomorskie Province: 215 animals; Warmińsko-Mazurskie Province: 1 animal) and 122 animals from the southern part of Poland (Podkarpackie Province: 78 animals; Małopolskie Province: 44 animals) (Table 1).

Table 1. Number and province of origin of animals examined

Species	Pomorskie	Warmińsko-Mazurskie	Podkarpackie	Małopolskie
Red fox (*Vulpes vulpes*)	90	0	63	2
Dog (*Canis familiaris*)	57	0	11	42
Cat (*Felis catus*)	37	0	3	0
Raccoon dog (*Nyctereutes procyonoides*)	24	1	0	0
Badger (*Meles meles*)	2	0	0	0
Polecat (*Mustela putorius*)	2	0	0	0
Marten (*Martes* sp.)	2	0	0	0
Weasel (*Mustela nivalis*)	1	0	0	0
Rat (*Rattus* sp.)	0	0	1	0

Alimentary canals of the animals were isolated and studied for the presence of *E. multilocularis* as well as other parasites. The small intestines after keeping for at least 10 days at −80°C were thawed and each of them was cut into 5 equal parts. Each part was cut longitudinally and after removing the contents, three mucosal scrapings for microscope slide examination were taken. Worm burdens were determined as: low − < 100 *E. multilocularis* parasites, medium − 100−1000 parasites and high − > 1000 parasites.

RESULTS

Out of 338 examined animals, 11 (3.3%) were infected with *E. multilocularis* (9 red foxes and 2 raccoon dogs). Among 155 red foxes *E. multilocularis* was present in 5.8% of animals and among 25 examined raccoon dogs in 8.0%. Only 2 of 9 species examined occurred to be a reservoire of *E. multilocularis*. Dogs and cats, although originated from the region of the highest prevalence of *E. multilocularis* in red foxes, were free of infection with this parasite.

In the Podkarpackie Province, in the southern part of Poland, 4 red foxes (6.3%) were infected with *E. multilocularis* and in the Pomorskie Province in the northern part of Poland, 5 red foxes (5.6%) and 2 raccoon dogs (8.0%) with *E. multilocularis* were found. Four of red foxes were females (f.), 3 were males (m.); the sex of 2 red foxes and 2 raccoon dogs was not defined (Table 2).

Table 2. Place of the occurrence of the animals with *Echinococcus multilocularis*

Species (sex)	Locality	Commune	Administrative district	Province	Worm burden
Red fox (?)	Sadlinki	–	Kwidzyn	Pomorskie	low
Red fox (m.)	Prabuty	–	Kwidzyn	Pomorskie	high
Red fox (m.)	Dzieżgoń	–	Malbork	Pomorskie	low
Red fox (f.)	Miastko	Miastko	Bytów	Pomorskie	low
Red fox (f.)	Dretyń	Miastko	Bytów	Pomorskie	low
Raccoon dog (?)	Puck	–	Puck	Pomorskie	medium
Raccoon dog (?)	Starogard Gd.	–	Starogard Gd.	Pomorskie	low
Red fox (f.)	Machowa	Czarna Grn.	Bieszczadzki	Podkarpackie	medium
Red fox (m.)	Wisłok Wlk.	Komańcza	Sanok	Podkarpackie	high
Red fox (f.)	Berezka	Solina	Bieszczadzki	Podkarpackie	high
Red fox (f.)	Pustków	Żyraków	Dębica	Podkarpackie	low

DISCUSSION

The percentage of red foxes infected with *E. multilocularis* differs considerably in various places of Europe in which this parasite occurs. The results of examinations in Zurich obtained by Deplazes et al. (1999) can be an example. Another example can be the results of research done in Poland (Malczewski et al. 1999), which demonstrate a substantial dissimilarity in the percentage of infected red foxes in different regions. Our results also confirm that *E. multilocularis* infections in wild animals show a focal appearance.

The important final hosts of *E. multilocularis*, by their proximity to humans, are dogs and cats. A contact with them could be a risk factor for people, mainly for veterinarians. Craig et al. (1992) stated that in a large focus of AE in central China the infection was caused by domestic dogs, as the tapeworm was identified in 10% of these animals in local population. Similarly, examinations performed by Petavy et al. (2000) in France, in Haute Savoie endemic area of alveolar hydatid disease, pointed out that domestic cats infected with adult *E. multilocularis* were the most probable source of infection. Similar observations were made in Japan (Kamiya 1997). The infection of cats with *E. multilocularis* was registered in France (Petavy et al. 1988, Petavy et al. 2000), Germany (Meyer and Svilenov 1985, Zeyhle et al. 1990, Worbes 1992), Czech Republic (Cada et al. 1999) and Switzerland (Deplazes et al. 1998, Deplazes et al. 1999). Our examinations did not reveal the presence of *E. multilocularis* in dogs and cats, although several of the necropsied animals derived from an area of the high prevalence of this parasite in red foxes. Possibly, a higher number of examined animals could give positive results.

It is worth noticing that the infection with *E. multilocularis* was stated in raccoon dogs living in the same habitat and having similar feeding demands as the red fox. Infection of the raccoon dog was signalized earlier in some countries of the former USSR (Bessonov 1998) and in Japan (Obayashi 1996).

In Poland, nearly 40 years of observation shows that the raccoon dog similarly as the red fox constitutes the wild reservoire of rabies and has to be tested also for *E. multilocularis* presence. The bait vaccination against rabies of red foxes causes the fulminant growth of their populations and the same is probably true for the raccoon dog populations.

ACKNOWLEDGEMENTS

This study was supported by the Committee for Scientific Research (Komitet Badań Naukowych), Poland, grant No. 5 P06K 025 17 (1999–2001).

REFERENCES

Bessonov A.S. 1998. *Echinococcus multilocularis* infection in Russia and neighbouring countries. *Helminthologia* 35: 73–78.

Cada F., Martinek K., Kolarova L. 1999. Domestic cat (*Felis catus* f. *dom*) as the final host of *Echinococcus multilocularis* tapeworms. *Veterinarstvi* 49: 2–3.

Craig P.S., Deshan L., MacPherson C.N., Dazhong S., Reynolds D., Barnish G., Gottstein B., Zhirong W. 1992. A large focus of alveolar echinococcosis in central China. *Lancet* 340: 826–831.

Deplazes P., Hofer S., Gloor S., Gottstein B., Eckert J. 1998. Urbaner Zyklus von *Echinococcus multilocularis* und Untersuchungen zur epidemiologischen Rolle on Hunden und Katzen als Enwirte. *Abstracts, 18 Tagung der DGP*, Dresden.

Deplazes P., Alther P., Tanner I., Thompson R.C.A., Eckert J. 1999. *Echinococcus multilocularis* coproantigen detection by enzyme-linked immunosorbent assay in fox, dog and cat population. *Journal of Parasitology* 85: 115–121.

Gottstein B., Hemphill A. 1997. Immunopathology of echinococcosis. In: *Immunopathogenetic aspects of disease induced by helminth parasites* (Ed. D.O. Freeman). Basel, Switzerland; S. Karger, *Chemical Immunology* 66: 177–208.

Kamiya M. 1997. Update of Alveolar Echinococcosis in Hokkaido, Japan. *Archivos Internacionales de la Hidatidosis*. In: *Eighteenth International Congress of Hydatidology*, Lisboa, Portugal, 154.

Malczewski A., Ramisz A., Rocki B., Bieńko R., Balicka-Ramisz A., Eckert J. 1999. *Echinococcus multilocularis* in red foxes (*Vulpes vulpes*) in Poland: an update of the epidemiological situation. *Acta Parasitologica* 44: 68–72.

Meyer H., Svilenov D. 1985. Funde von *Echinococcus multilocularis* bei streunenden Hauskatzen in Suddeutschland. *Zentralblatt für Veterinarmedizin B.* 32: 785–786.

Obayashi M. 1996. Host animals of *Echinococcus multilocularis* in Hokkaido. In: *Alveolar echinococcosis. Strategy for eradication of alveolar echinococcosis of the liver* (Eds. J. Uchino and N. Sato). Fuji Shoin, Sapporo, 59–64.

Petavy A.F., Prost C., Gevrey J., Gilot B., Deblock S. 1988. Natural infestation of domestic cats (*Felis catus* L.) by *Echinococcus multilocularis* Leuckart, 1863 (*Cestoda*): first case in France detected in peri-urban area. *Compte rendu de l'Académie des Sciences* 307: 553–556.

Petavy A.F., Tenora F., Deblock S., Sergent V. 2000. *Echinococcus multilocularis* in domestic cats in France. A potential risk factor for alveolar hydatid disease contamination in humans. *Veterinary Parasitology* 87: 151–156.

Worbes H. 1992. Zum Workommen von *Echinococcus granulosus* und *Echinococcus multilocularis* in Thuringen. *Angewandte Parasitologie* 33: 193–204.

Zeyhle E., Abel M., Frank W. 1990. Epidemiological studies on the occurence of *Echinococcus multilocularis* in definitive and intermediate hosts in Germany. *Mitteilungen der Österreichischen Gesellschaft für Tropenmedizin und Parasitologie* 12: 221–232.