

EPIDEMIOLOGICAL STUDIES ON ANIMAL AND HUMAN TRICHINELLOSIS IN ESTONIA

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Summary :

From 1992 to 1999, muscle samples from 814 sylvatic animals and 1,173 domestic and synanthropic animals were collected in 15 districts of Estonia; the prevalence of trichinellosis ranged from 1.0 % to 79.4 % for sylvatic animals and from 0.6 % to 24.5 % for domestic or synanthropic animals and for animals from fur-bearing farms. The most important reservoirs of *Trichinella* in nature were the raccoon dog, the red fox, the lynx and the wolf. Three species of *Trichinella* (*T. spiralis*, *T. nativa*, and *T. britovi*) were identified by several types of PCR-based analyses. Meat from sylvatic animals was the main source of *Trichinella* infection for humans.

KEY WORDS : trichinellosis, epidemiology, *Trichinella* species, Estonia.

In the past 10 years, an annual average of 7 *Trichinella* infections has been reported in Estonia, though in 1993, 43 persons acquired the infection. The source of infection has almost always been meat of sylvatic animals; the only other reported source has been pork from a domestic pig, which was associated with infection in three individuals in 1999. Approximately half of the cases of trichinellosis infection has been reported in the Järvamaa province (central Estonia). According to the State Veterinary Laboratory, in 1998, *Trichinella* infection was detected in lynxes, bears and minks and in 1999 in lynxes, wild boars, badgers and domestic pigs. The aim of the present study was to evaluate the prevalence of *Trichinella* infection in sylvatic, domestic, and synanthropic animals and to identify the etiological agents.

MATERIALS AND METHODS

In 1992, a *Trichinella* project was established at the Estonian Agricultural University. To date, muscle samples from 814 sylvatic animals and 1,173 synanthropic and domestic animals have been collected. The

prevalence of infection and the worm burden (i.e., number of larvae per gram) were evaluated by artificial digestion. Muscle larvae were identified at the species level by several analyses based on polymerase chain reaction (PCR) (i.e., RAPD, PCR-RFLP, and multiplex PCR) (Bandi *et al.*, 1995; Wu *et al.*, 1999; Zarlenga *et al.*, 1999).

RESULTS AND DISCUSSION

Trichinella infection was detected in all of the species examined (Table I). The prevalence of infection was highest in wolves (79.4 %), raccoon dogs (50.0 %), lynxes (47.4 %) and red foxes (42.1 %). The high prevalence and the worm burden (up to 200 larvae per gram) detected in the raccoon dog suggest that this carnivore is one of the most important reservoirs of *Trichinella* in Estonia (Miller *et al.*, 1997). Furthermore, this host is resistant to diseases, has large litters, and feeds on small rodents and carrion. The high prevalence detected in lynxes (47.4 %) suggests that this carnivore plays a role in the sylvatic cycle of *Trichinella*. The low number of bears in Estonia and the low worm burden detected suggest that this animal is a less important reservoir of *Trichinella*. The high prevalence among wolves (79.4 %) is likely due to infections imported from Russia; in fact, in the winter, a large population of wolves migrates from Russia to Estonia. The highest worm burden in muscles was observed in a red fox (213 larvae per gram). The fox is the main reservoir of trichinellosis in wild animals in many regions of Europe. In southern Finland, the prevalence of trichinellosis has been reported to be 50 % in the red fox and 35 % in the raccoon dog (Oivanen *et al.*, 1999). Both *T. nativa* and *T. britovi* were detected in wildlife in Estonia: *T. nativa* was detected in eastern regions and *T. britovi* in western regions; in central Estonia, animals with both infections were detected. Sylvatic *Trichinella* species are frequently transmitted to man and domestic pig, when wildlife is in close contact with farms (Gamble *et al.*, 1999). In Latvia, trichinellosis seems to be the most dan-

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Host	No. of animals infected/examined (%)	Larvae/g	Species of <i>Trichinella</i>
Wolf (<i>Canis lupus</i>)	27/34 (79.4)	0.01-44.9	<i>T. nativa</i> , <i>T. britovi</i>
Raccoon dog (<i>Nyctereutes procyonoides</i>)	11/22 (50)	0.3-200	<i>T. nativa</i> , <i>T. britovi</i>
Lynx (<i>Felis lynx</i>)	9/19 (47.4)	0.1-1.4	<i>T. nativa</i> , <i>T. britovi</i>
Red fox (<i>Vulpes vulpes</i>)	8/19 (42.1)	0.1-213	<i>T. nativa</i> , <i>T. britovi</i>
Brown bear (<i>Ursus arctos</i>)	5/17 (29.4)	0.05-2.0	<i>T. nativa</i>
Pine marten (<i>Martes martes</i>)	1/6	n.d.	n.d.
Badger (<i>Meles meles</i>)	1/2	66.7	<i>T. nativa</i>
Brown rat (<i>Rattus norvegicus</i>)	2/18 (11.1)	33 - 90	<i>T. spiralis</i>
Wild boar (<i>Sus scrofa</i>)	7/695 (1.0)	0.5-52	<i>T. nativa</i> , <i>T. britovi</i>
Domestic pig (<i>Sus scrofa</i>)	6/1002 (0.6)	12.0	<i>T. britovi</i> , <i>T. spiralis</i>
Silver fox* (<i>Vulpes vulpes</i>)	1/70 (1.4)	0.7	<i>T. nativa</i>
Blue fox* (<i>Alopex lagopus</i>)	13/53 (24.5)	0.1-19.0	<i>T. nativa</i> , <i>T. spiralis</i>
Mink* (<i>Mustela lutreola</i>)	5/28 (17.9)	n.d.	n.d.
Domestic cat (<i>Felis felis</i>)	1/2	n.d.	n.d.
Total	97/1987 (4.9)		

* From fur-bearing animal farms; n.d. = not determined.

Table I. – *Trichinella* infection in animals examined from 1992 to 1999.

gerous and widely spread helminthozoonosis in pigs; in the period from 1976 to 1998, the prevalence of infection in wild boar populations of Latvia ranged between 1.3 % to 3.2 % (Keidans, 1999). In Estonia, about 1 % of the examined wild boars were infected.

To date, only two foci of trichinellosis in domestic pigs have been documented in Estonia: one on the Island of Hiiumaa, where five pigs were reported to be infected with *T. britovi*, and the other in the Järvamaa province, where pork from domestic pigs (infected with *T. spiralis*) was the source of infection for three individuals in 1999. The presence of the sylvatic species *T. britovi* in domestic pigs has been frequently reported in Italy, France, Spain, Croatia, and Macedonia (Pozio, 2000). *Trichinella spiralis* and *T. nativa* have also been identified in minks and blue foxes from fur-bearing animal farms.

Most human infections in the world are due to *T. spiralis*, which is highly pathogenic but whose larvae are not freezing resistant in host muscles. *Trichinella nativa* from sylvatic animals is also highly pathogenic and larvae in carnivore muscles are freezing resistant (e.g., infective larvae were collected from muscles of a racoon frozen for five years at -15°C , Pozio, in press). Compared to *T. nativa*, larvae of *T. britovi* are somewhat less resistant to freezing in muscles of carnivores; in swine muscles they have been reported to resist for only three weeks at -20°C (Pozio, 2000).

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