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# THE ROLE OF WILD BOAR AND CARNIVORES IN THE EPIDEMIOLOGY OF TRICHINELLOSIS IN PORTUGAL

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## ABSTRACT

The aims of this study, initiated in January 2002, are the identification the sylvatic foci of trichinellosis and to assess the risk factors associated with the maintenance and spread of this zoonosis in Portugal. The study involves examining wild hosts, specifically carnivores and wild boars *Sus scrofa* from different regions of Portugal. We examined 189 wild boars and 217 carnivores (206 foxes *Vulpes vulpes*, 3 badgers *Meles meles*, 7 mongooses *Herpestes ichneumon* and one stone marten *Martes foina*) from Alentejo, Beira Interior and Trás-os-Montes and Alto Douro, Portugal. To isolate *Trichinella* L1 larval stages, we applied standard artificial digestions techniques to 25 g samples of muscle tissue from each animal (tongue and diaphragm in wild boar; tongue and forearm muscles in carnivores). *Trichinella* was only found in 10 of 206 (4.9%) foxes, which suggests that wild carnivores, particularly foxes, play a major role in the maintenance of *Trichinella* sp. in Portugal, but wild boar does not.

Key words: Epidemiology, Portugal; *Trichinella*, Wild hosts

## INTRODUCTION

Trichinellosis is one of the most widespread helminthic zoonoses and is endemic in most of the countries in the European Union. In Europe, four *Trichinella* species, each with specific epidemiological properties, are known. They include *T. spiralis* Owen, 1835, an aetiological agent of domestic trichinelosis, which can also occur in sylvatic animals; *T. britovi* Pozio et al. 1992, an aetiological agent of sylvatic trichinelosis in most of the EU; *T. nativa* Britov and Boev, 1972, an aetiological agent of sylvatic trichinelosis in Finland and in some areas of central and northern Sweden; and *T. pseudospiralis* Garkavi, 1972, a species that has the ability to infect birds and mammals and has bee identified in France, Finland, and Italy (Pozio et al. 1992, Pozio 1998, 2001).

The epidemiology of *Trichinella* shows two main cycles, the sylvatic and the domestic (Campbell 1983, 1988). The sylvatic cycle occurs in sylvatic carnivores, mainly in those species that scavenge and cannibalistic, although wild boars *Sus scrofa* Linnaeus, 1758 and horses can be infected (Pozio 1998). In the wild, the sylvatic cycle is maintained by foxes *Vulpes vulpes* Linnaeus, 1758 (principal reservoir), mustelids, and other carnivores. Nevertheless, the cycle is influenced by human interventions (Murrell & Pozio 2000). In the EU, wildlife trichinellosis is widespread in mountainous regions and areas exposed to low human impact, e.g., protected areas, natural parks and sanctuaries (Pozio 1998).

The domestic cycle includes domestic pigs, which can become infected by consuming rodents, tail biting, by ingesting poorly cooked kitchen waste or carcasses left by hunters. This domestic cycle occurs in rural areas of Western Europe where traditional swine-rearing practices are used, but not in industrial pig farms (Pozio et al. 1996).

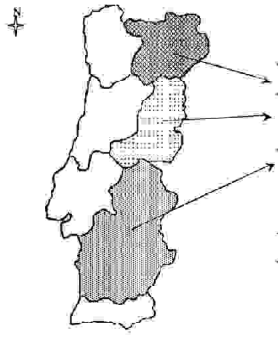
The study of trichinellosis in wild boar is very important because the species is thought to be an important reservoir of *Trichinella* (mainly *T. spiralis* and, to a lesser extent, *T. britovi*) and the main link between wild and human ecosystems. Wild boar plays an important role in the sylvatic trichinellosis ecology when humans fail to properly dispose the carcasses of domestic and game animals and permit uncontrolled garbage dumps (Pozio et al. 1996, Murrell and Pozio 2000).

Potential wild hosts of *Trichinella* spp., namely sylvatic carnivores and wild boars, from two regions of Portugal were subjected to specific methods for the identification of *Trichinella.* The aims of this study, initiated in January 2002, are to identify the sylvatic foci of trichinellosis and to assess the risk factors associated with the maintenance and spread of this zoonosis in Portugal.

## MATERIALS AND METHODS

We tested for the presence of *Trichinella* in 189 wild boars and 217 carnivores (206 foxes, 3 badgers *Meles meles* Linnaeus, 1758, 7 mongooses *Herpestes ichneumon* Linnaeus, 1758 and one stone marten *Martes foina* Erxleben, 1777) from Alentejo, Beira Interior and Trás-os-Montes and Alto Douro, Portugal. To isolate *Trichinella* L1 larval stages, we applied standard artificial digestions techniques to 25-g samples of muscle tissue from each animal (tongue and diaphragm in wild boar; tongue and forearm muscles in carnivores) (Gamble et al. 2000).

The geographic distribution of the animals sampled is presented in Figure 1.



| Provinces | District | Wild boars | Foxes | Other carnivores |
|---|---|---|---|---|
| Trás-os-Montes | Bragança | 26 | 1 | |
| Beira Interior | Guarda | 9 | 48 | |
| | Castelo Branco | 62 | 27 | 1 |
| Alentejo | Beja | 39 | 11 | |
| | Évora | 20 | 59 | 7 |
| | Portalegre | 18 | 60 | 3 |
| unknown source | | 15 | | |
| | Totals | 189 | 206 | 11 |

Figure 1. The distribution within Portugal of the potential hosts tested for the presence of *Trichinella*

## RESULTS AND DISCUSSION

All of the wild boars sampled from Alentejo, Beira Interior and Trás-os-Montes tested negative for *Trichinella.* Ten of 206 foxes tested positive, and all of the samples from other carnivores tested negative for *Trichinella.*

Our results suggest that wild carnivores, but perhaps not wild boar, might play an important role in the transmission of *Trichinella* in Portugal. All of the positive results were from foxes from Beira Interior [10 of 75 (13.3%)]. In contrast, all of the animals from Alentejo and Trás-os-Montes tested negative for *Trichinella.*

Our digestion assay was sensitive enough to detect at least 0.01 larvae per gram of tissue and a minimum intensity of 1 larva per gram of ingested meat is usually required to cause clinical illness in humans (Gamble 1995, Gamble et al. 2000). Thus, in addition to all of the wild boars testing negative, there was no apparent risk of acquiring trichinellosis after the consumption of the meat from the wild boars sampled in this study.

The findings of our study are consistent with recent findings in other Western European countries (Rossi et al. 1992, Pozio et al. 1996 and Pozio 1998), where fox is the main reservoir and wild boars are intermittent hosts of *Trichinella,* and the probability of wild animals becoming infected with *Trichinella* is higher in mountain areas and national parks than in lowland areas. Thus, wild boars in mountain areas might be more susceptible to *Trichinella* infection, given their potential for predation and scavenging of wild carnivores. Accordingly, samples from the mountainous region of Beira Interior with natural parks exhibited a high prevalence of *Trichinella*, and no cases were detected in Alentejo, a plain area of Portugal.

Although the sample size in this study is small, our results suggest that wild boars might play a less important role than do foxes in the maintenance of trichinellosis in Portugal. Nevertheless, the inspection of game meat should continue to be the major method of preventing trichinellosis in humans in Portugal.

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