

SEROPREVALENCE OF *TOXOPLASMA GONDII* IN WILD BOARS (*SUS SCROFA*) IN THE SLOVAK REPUBLIC

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Abstract: *Toxoplasma gondii* is a protozoan parasite of great medical and veterinary importance. The aim of this study was to determine the seroprevalence of toxoplasmosis in wild boars hunted in the Slovak Republic in 2003. Examination of 320 wild boars revealed a seroprevalence of 8.1%. The majority of seropositive wild boars came from the north-western and southern regions of Slovakia. This study indicates that *T. gondii* infection is common in wild boars in the Slovak Republic, underlines its zoonotic potential and the importance of high standards of hygiene during the handling of game.

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INTRODUCTION

Toxoplasma gondii is an important tissue cyst-forming coccidia of great medical and veterinary importance, with a worldwide distribution. The definitive hosts of *T. gondii* are carnivores of the family Felidae, and the intermediate hosts are probably all warm-blooded animals (mammals, birds) and humans. *T. gondii* causes toxoplasmosis, a mild infection in the immunocompetent host, but severe leading even to death in the immunocompromised host, in the foetus and neonate [6]. There are three infectious stages in the life cycle of *T. gondii* (tachyzoites and bradyzoites in tissue cysts and sporozoites in sporulated oocysts). All the mentioned stages are infectious for both intermediate and definitive hosts, respectively, which may acquire infection in the following ways: horizontally – by oral ingestion of infectious oocyst from the environment or by ingestion of tissue cysts of raw or undercooked meat or viscera of intermediate hosts, and vertically – by transplacental transmission of tachyzoites [8].

Wild boars (*Sus scrofa*) are important large game species in the Slovak Republic. Their population has significantly increased during the last decade. According to data of the Slovak Hunting Association [14] the number of animals in

the spring 1995 was 17,738, while in 2002 it was 26,135. Several authors confirmed that toxoplasmosis is common in wild boars. In Japan, positive antibody titres were detected in 1.1% out of 90 animals examined [13]; in Austria, investigation of 269 wild boars revealed 19% seropositivity [4], and in the Czech Republic Hejliček *et al.* [7] observed 2% prevalence of *T. gondii* in 136 animals investigated. Wild boar meat containing tissue cysts is a potential source of infection for humans, especially hunters and their families who may become infected during evisceration and handling of the game [15].

The aim of this study was to determine the seroprevalence of toxoplasmosis in wild boars hunted in the Slovak Republic in 2003.

MATERIAL AND METHODS

Wild boar sera. Sera of 320 wild boars hunted within the monitoring of classical swine fever in the period of May – July 2003 in the different regions of the Slovak Republic were included in this study. Immediately after the death, the animals were bled, and the blood collected and transported to the State Veterinary and Food Institute, Zvolen. Sera were then sent for serological examination

to the Parasitological Institute SAS, Košice. Serum samples were stored at -20°C until tested. The capture site and age of every animal was recorded. According to age, wild boars were divided into 2 groups: under 1 year and adult animals.

Detection of anti-*Toxoplasma* antibodies. Serum samples were tested for antibodies to *Toxoplasma gondii* by commercial ELISA test kit (ELISA *Toxoplasma gondii* serum screening, Institut Pourquier, Montpellier, France). For each sample, S/P% was calculated according to the scheme provided by the manufacturer:

$$\text{S/P\%} = (\text{OD value of the sample} - \text{OD value of negative control}) / (\text{OD value of positive control} - \text{OD value of negative control}) \times 100$$

Samples with S/P % $\leq 50\%$ were considered to be negative and samples with S/P % $\geq 50\%$ were considered to be positive.

Data analysis. The significance of the differences in prevalence of toxoplasmosis according to the age of animals was evaluated by the Fisher Exact Test. Confidence limits for the proportions were established by Exact Binomial Test with 95% CI.

RESULTS

The examination of 320 wild boars revealed 26 seropositive individuals, representing a prevalence of 8.1% (Tab. 1). Antibodies to *T. gondii* were recorded only in adult wild boars (8.8%), none of the animals younger than 1 year was found to be positive. This difference was not statistically significant ($p = 0.143$) (Tab. 1).

The examined wild boars came from 44 districts of Slovakia. *T. gondii* positive animals were recorded in 16 districts: 4 western districts bordering with the Czech Republic, 4 southern districts bordering with Hungary, and 6 districts between these 2 areas. Occasionally, positive individuals originated from a district in the north of Slovakia that borders with Poland, and from a district in the central part of Western Slovakia (Fig. 1).



Figure 1. Occurrence of *T. gondii* seropositive wild boars in the Slovak Republic.

Table 1. Occurrence of anti-*T. gondii* antibodies in wild boars according to the age.

Age category	N/n	Seroprevalence (%)	95% CI
<1 year	0/24	0.0	0-0
adult	26/296	8.8	6-12
Total	26/320	8.1	5-11

N – number of positive samples, n – number of examined samples.

DISCUSSION

In recent years, despite intensive hunting of wild boars, their population has markedly increased in many European countries. Tissue cysts of *T. gondii* in meat of different game species are potential source of human infection. In this study, 8.1% prevalence of anti-*T. gondii* antibodies in wild boars was observed, with its higher occurrence in adult animals as opposed to younger ones. This corresponds with the observation of some authors who surveyed the presence of toxoplasmosis in domestic animals. Jittapalapong *et al.* [9] found that older goats were more likely to be seropositive than those under 1-year old; Gorman *et al.* [5] detected significantly higher seroprevalence in adult sheep than in young ones and Wang *et al.* [16] observed 15% positivity of sows, while only 3.2% of market hogs tested were positive. These results confirmed the report of Dubey *et al.* [3] that indicates a higher risk of exposure as age increases in animals.

According to this study, the majority of seropositive wild boars originate from the north-western regions of Western Slovakia and the southern regions of Central Slovakia, creating a line in the direction of south-west. These areas are characteristic for their uplands with altitudes ranging from 500 m to approximately 1,200 m above sea level (a.s.l.). In Slovakia, regions with 400-800 m a.s.l. are defined as moderately warm areas where mainly barley, potatoes, rye and oat are raised. Areas with altitudes above 800 m a.s.l. are cold, with a high amount of rainfall, characteristic by meadows and veldts. Such conditions are favourable for wild boars and also for the survival of *T. gondii* oocysts, which can lead to a higher prevalence of toxoplasmosis in these areas. Many outbreaks of acute toxoplasmosis in different regions of the world demonstrate that the sources of infection vary greatly in different human populations with differences in culture and eating habits [15]. Choi *et al.* [1] described 2 outbreaks of toxoplasmosis in humans after the consumption of raw spleen or liver of wild boar and domestic pig. Therefore, preventive measures that can reduce the risk of food-borne infection are very important. Tissue cysts of *T. gondii* in meat are killed by heating to 67°C [2] and can survive freezing at temperatures between -1 and -8°C for longer than a week [11]. In order to prevent food-borne transmission of toxoplasmosis, meat, viscera and their products should be cooked properly, the meat should not be tasted during cooking, and a high level of hygiene is

very important. Kapperud *et al.* [10] found that infrequent washing of kitchen knives was associated with increased risk of infection. As an association was observed between the skinning of animals for fur by women and congenital toxoplasmosis [12], a high standard of hygiene during the manipulation of game is also important.

In conclusion, our study confirmed that *T. gondii* infection is common in wild boars in the Slovak Republic. Presented results indicate the zoonotic potential of wild boars, especially in hunters and in people who manipulate or consume wild boar meat-products.

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