A study of Neospora caninum and Toxoplasma gondii antibody seroprevalence in healthy cattle in the Czech Republic

Eva Bártová1, Kamil Sedlák2, Marie Budíková3

1 Department of Biology and Wildlife Diseases, Faculty of Veterinary Hygiene and Ecology, University of Veterinary and Pharmaceutical Sciences, Brno, Czech Republic
2 Department of Virology and Serology, State Veterinary Institute, Prague, Czech Republic
3 Department of Mathematics and Statistics, Faculty of Science, Masaryk University, Brno, Czech Republic


INTRODUCTION AND OBJECTIVES

Neospora caninum, a cyst-forming coccidian species, has a broad range of intermediate hosts; however, neosporosis is a serious disease of cattle and dogs worldwide. In cattle, neosporosis is a major cause of abortion, foetal malformations, pre-term deliveries, stillbirths and possible loss of milk yield, thus generating severe economic losses.

Serological prevalences of N. caninum in cattle worldwide have been summarized by Dubey and Schares [1]. In Europe, N. caninum antibodies were detected in Germany, Greece, Norway, Romania, Spain, Slovakia, Sweden, Turkey and the United Kingdom. There were considerable differences among countries, within countries, between regions and between beef and dairy cattle.

Toxoplasmosis is a common parasitic zoonosis that affects a wide range of warm-blooded animals and humans. In cattle, clinical cases of the infection have not been reported, but the real problem of toxoplasmosis in cattle lies in the fact that the tissues of infected animals may contain T. gondii tissue cysts. Insufficiently cooked meat and poor personal hygiene principles during cooking may cause latent or even clinical infections in humans. Antibodies against T. gondii were found in cattle from several countries in Europe: France, Italy, the Netherlands, Portugal, Spain, Switzerland and Turkey.

During the 10 year period 2000–2010, several studies focusing on the detection of both N. caninum and T. gondii antibodies in different groups of animals – sheep, horses, pigs, goats, wild boars, hares, wild ruminants and zoo animals – were conducted in the Czech Republic. In the case of cattle, there is only limited data. There are only two studies detecting N. caninum antibodies in cattle [2, 3]; and two studies detecting T. gondii antibodies by the Sabin Feldman Test (SFT), a method that is no longer used [4, 5].

For this reason, the presented study aimed to test sera of healthy dairy cows from the Czech Republic by the same methods used in other groups of animals, and thereby obtain actual data about N. caninum and T. gondii seroprevalence in cattle with the possibility to compare the data with other groups of animals in the Czech Republic, and with seroprevalence in other countries in Europe.

MATERIALS AND METHOD

Blood samples were collected from 546 clinically healthy adult dairy cows (Bos primigenius f. taurus), aged > 2 years, without any cases of abortions recorded. The cows came from 49 farms...
Antibodies against \textit{N. caninum} were detected in 3 (0.5%) of 546 cows with inhibitions of 47, 78 and 85. Positive animals came from 3 different farms in 2 districts. Statistical analysis (Chi-Square test) could not be performed, because of the very low frequency of \textit{N. caninum} prevalence.

Antibodies against \textit{T. gondii} were detected in 53 (9.7%) cows, with S/P ranging from 50–100, 100–150, 150–200 and ≥ 200 in 34, 10, 7 and 2 cows, respectively. Positive animals were found in 4 of 7 districts, with prevalence ranging from 8% – 14% (Tab. 1). Indication of mixed infections (concurrent presence of both \textit{N. caninum} and \textit{T. gondii} antibodies) was not proved. We found statistically different \textit{T. gondii} prevalence in cows from the district of Ústí nad Labem with respect to all other examined districts (p=0.046; OR 1.841; 95% CI 1.003, 3.380); however \textit{T. gondii} seroprevalence does not depend on the origin (district) of cows (p = 0.200). The statistical results must be interpreted carefully because of the small numbers of cows in the districts of Hradec Králové, Prague and Karlovy Vary.

**DISCUSSION**

In Europe, antibodies against \textit{N. caninum} have been detected in 2.8–60% cattle. There are considerable differences among countries, within countries, and between regions, with the highest in Turkey – 60% [7] and the lowest in Sweden – 2.8% [8]. The differences in prevalence could be influenced by many factors, such as the method and cut-off used, the number of cows examined, their health status, age, gender and breed. There are some studies documenting different \textit{N. caninum} seroprevalence in cattle breeds, whereas on the whole year are not provided. Blood samples were collected by veterinarians from the caudal vein of cows during 2009. Blood was centrifuged and serum stored at −20°C.
contrary [9] found similar *N. caninum* seroprevalence 25.6% and 22.5% in 20,206 beef and 37,090 dairy cattle, respectively. In Slovakia, *N. caninum* antibodies were found in 20.1% cows post-abortion, while only 2.3% in cows without any reproductive problems [10]. In the Czech Republic, 3.9% *N. caninum* seroprevalence was found in cows post-abortion [3]. Bulk milk samples collected from 495 dairy herds were analysed for the presence of specific antibodies by a commercial *N. caninum* iscom ELISA, and only 5 (1%) herds were considered positive [2]. In the present study, similarly very low *N. caninum* seroprevalence (0.5%) was found in dairy cows without any cases of abortion. The risk of natural infection with *N. caninum* seems to be relatively low for cows in the Czech Republic.

In Europe, antibodies against *T. gondii* were found in 2–76% of cows by using different serological methods, e.g. SFT, Modified Agglutination Test, Direct Agglutination Test and ELISA. From previous studies in the Czech Republic, 2–24% seroprevalence was in cattle by SFT [4,5]. In the current study, *T. gondii* antibodies were found in 9.7% of cows by ELISA. A similar seroprevalence of 11% was found in cows from Switzerland using the same method [11], while a higher seroprevalence of 22% was found in cows from the Netherlands, also by ELISA [12].

In cattle, a usually higher *N. caninum* seroprevalence was found compared to *T. gondii* infection, e.g. 24.1% and 7.3% seroprevalence in cows from Spain [13], in Turkey, however, a higher *T. gondii* seroprevalence was found compared to *N. caninum* infection: 6.8% and 13.6% for cows with abortions, and 15.8% and 31.3% for cows without abortions, respectively [14]. Similarly, the presented study also found higher *T. gondii* seroprevalence compared to *N. caninum* (9.7% vs. 0.5%).

Simultaneous detection of both *N. caninum* and *T. gondii* antibodies were found in 4.8% of cows in Brazil [15] and in 1.1% of cows in Switzerland [11]. In the presented study, only three cows were found to be positive for *N. caninum*, but negative for *T. gondii* antibodies.

The results of this study indicate that the risk of natural infection with *N. caninum* and *T. gondii* seems to be relatively low for dairy cattle in the Czech Republic. The cows positive for *N. caninum* antibodies in this study came from small farms in different districts. There was no case of abortion or other reproduction problems in these cows, which is why transplacental transfer of infection can be ruled out, and the possible source of infection could be pastures contaminated with *N. caninum* oocyst.

**CONCLUSION**

In the Czech Republic, several seroprevalence studies have been conducted in recent years among domestic and wildlife animals without clinical symptoms. In the group of domestic animals, *N. caninum* and *T. gondii* were found in 24% and 23% of horses, 12% and 59% of sheep, 6% and 66% of goats and in 3% and 36% of pigs, respectively [16, 17, 18, 19]. *N. caninum* and *T. gondii* antibodies were also found in 6% and 32% of wildlife ruminants, respectively [20].

Compared to different groups of domestic animals and wildlife ruminants, the herds of healthy dairy cattle in the Czech Republic are not so much exposed to *T. gondii* infection and represent low risk for human consumption. However, further studies with regard to risk factors are needed.

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