Serological survey of *Neospora caninum* (Sarcocystidae) infection in beef cattle from Western Iran

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Abstract. The main purpose of this investigation was to evaluate the presence of *Neospora caninum* infection in beef cattle from Hamedan province, Western Iran. Blood samples were collected from 514 industrial beef cattle and tested using ELISA. IgG antibodies against *N. caninum* were found in 102 (19.8%) sera. Significant differences were observed between seropositive cattle and age group (*p*=0.022). No significant differences were found between seropositive cattle and breeding, dog presence in farm and dog contact with the herd (*p*>0.05). This study is the first report of *N. caninum* infection in beef cattle from western Iran. In conclusion, *N. caninum* was a considerable factor in beef cattle farms in Hamedan province. Therefore, further investigations in other hosts and designing control strategies for improving management in cattle farms is highly recommended.

Keywords: *Neospora caninum*; Beef cattle; ELISA; Hamedan; Iran.

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Introduction

*Neospora caninum* is an Apicomplexan obligate intracellular parasite that was first recognized in dogs in 1984. Since then, neosporosis has emerged as a serious disease of cattle and dogs worldwide (Dubey et al., 2007). Domestic and wild canids are definitive hosts for *N. caninum*. Fecal excretion of oocysts in the environment of definitive hosts is a risk factor for the occurrence of miscarriages and stillbirths associated with *N. caninum* in cattle and other intermediate hosts (Sharifdini et al., 2011).

In cattle, transplacental transmission is the main mechanism by which the parasite persists in a herd (Anderson et al., 2000). Although the vertical transmission is the major mode of infection in cattle, the role of the definitive hosts in horizontal transmission is also important (Haddadzadeh et al., 2007). Neosporosis of cattle has been associated with abortion, neonatal mortality and decrease in the volume of milk production that cause yearly economic loss (Salehi et al., 2010).

The presence of canids has been correlated with high prevalence of infection in cattle and is a risk factor for the disease (Barling et al., 2000).
The prevalence of *N. caninum* infection in its hosts varies largely, depending on the country and region under study (Salehi et al., 2010). Some serological researches in cattle were performed in some parts of Iran. However, there is no published information for *N. caninum* infection in beef cattle from Western Iran. The aim of the current investigation was to determine the prevalence of *N. caninum* infection in beef cattle from Hamedan province, Western Iran using enzyme linked immunosorbent assay (ELISA).

**Materials and methods**

**Study area**

Hamedan province is located in west part of Iran (34.77°N; 48.58°E) with mountainous and mild climate. This province is economically important for crops and animal husbandry, including sheep and cattle breeding. According to statistics of Iranian Veterinary Organization reports, cattle population in this area is approximately 420,000.

**Sample collection**

A cross-sectional study was performed in the first half of year 2012. Blood samples were taken randomly from 514 beef cattle in total industrial farm of Hamedan province. The owners were questioned about age, breeding, dog presence in farm and dog contact with herds.

**Serology and statistical analysis**

All sera were removed after centrifugation at 800×g for 15 minutes and stored at -20°C until laboratory testing. Anti-*Neospora* IgG-antibodies were detected using a commercially available *N. caninum* ELISA kit (HerdCheck®; IDEXX Laboratories; Switzerland) in the serology unit of the Central Laboratory of Hamedan Veterinary Office.

Statistical analysis was performed by using the software package SPSS version 16.0 for windows. The differences among variables were evaluated by Chi-square test. A *p*-value of less than 0.05 was considered statistically significant.

**Results**

IgG-antibodies against *N. caninum* were found in 19.8% (95% CI: 19.78%-19.82%) of cattle serum (table 1). With regard to seropositivity, significant difference were found in age group (*χ²=7.557, p=0.022 and df=2*). There was no significant differences between seroprevalence and dog presence in farm (*χ²=1.002, p=0.316, OR=0.68 and df=1*), dog contact with herd (*χ²=1.791, p=0.181, OR=0.71 and df=1*); as well as breeding (*χ²=0.699, p=0.403 and df=1*).

**Table 1.** Seroprevalence of *N. caninum* in beef cattle in different variables from Hamedan province, Western Iran

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Breeding</th>
<th>Dog presence in farm</th>
<th>Dog contact with herd</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hybrid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1yr* (%)</td>
<td>223 (43.4)</td>
<td>454 (88.3)</td>
<td>117 (25.8)</td>
<td>514</td>
</tr>
<tr>
<td></td>
<td>1-2yr (45.9)</td>
<td>514 (98.3)</td>
<td>102 (21.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-3yr (43.4)</td>
<td>514 (98.3)</td>
<td>102 (21.0)</td>
<td></td>
</tr>
<tr>
<td>NP (%)</td>
<td>47 (19.9)</td>
<td>54 (18.5)</td>
<td>514 (100)</td>
<td></td>
</tr>
<tr>
<td>NP (%)</td>
<td>47 (19.9)</td>
<td>54 (18.5)</td>
<td>514 (100)</td>
<td></td>
</tr>
</tbody>
</table>

*NS = number of sample; NP = number of positive; * = significant difference was seen between this seropositive.

**Discussion**

*Neospora caninum* is a protozoan that causes abortion and economic losses in cattle worldwide (Dubey et al., 2007). Several serologic tests including ELISA, indirect fluorescent antibody (IFAT), and direct agglutination test (DAT) are used to detect *N. caninum* infection (Gharekhani et al., 2012).

This study is the first report of *N. caninum* infection in beef cattle in Western Iran. Reported infection rates of *N. caninum* vary between 1.8% (Hungary) and 79% (Nebraska, United States) (Dubey et al., 2007; Dubey and
Serological surveys in cattle from Iran reported prevalence of 10.5% (Northwest) or 46% (Northeast) (Razmi et al., 2006; Nematollahi et al., 2011). The similar rate of infection was reported in Brazil (Pará and São Paulo) (Dubey et al., 2007; Dubey and Scharres, 2011). Different serological techniques and study design are main causes of varied results (Gharekhani et al., 2012).

Razmi et al. (2006) and Gharekhani et al. (2012) reported statistically significant difference in various age groups. Sadrebazzaz et al. (2004) and Wouda et al. (1998) reported equal levels of seroprevalence in all age groups for most herds. Jensen et al. (1999) suggested seroprevalence increases with age and depends on sample size. Also, the lower and higher seroprevalence in cattle of <2 years age is due to decrease of antibody in congenital infection and vertical transmission of *N. caninum*, respectively. It seems that the relationship between age and seroprevalence rate is speculative.

In the current study, difference in seroprevalence between different breed was not statistically significant, similar to a study in France (Ould-Amrouche et al., 1999). In Spain, the prevalence of *N. caninum* in dairy cattle was reported higher than in beef cattle (Quintanilla et al., 1999; Hemphil and Gottestin, 2000). This may be related to different production systems for dairy and beef cattle rather than to breed differences. There are indications that *N. caninum* seroprevalence differs according to the cattle breed (Dubey and Scharres, 2011). In our study, *N. caninum* infection was reported in 20.5% (93/454) of cattle in farms with dog presence (*p*=0.316, *OR*=0.68). Moreover, 24.8% (29/117) of cattle were in contact with dogs that were seropositive (*p*=0.181, *OR*=0.71). However, studies in Spain and France have found positive associations between the seropositivity of cattle and the presence or the number of farm dogs (Ould-Amrouche et al., 1999). Barling et al. (2001) observed that the presence of dogs in beef farms was a putative protective factor. Our result is similar to those of Kyaw et al. (2004). The presence of dogs in farm has been assumed to provide the greatest chance of horizontal transmission through the ingestion of oocysts, shed by infected dogs (Dubey et al., 2007).

The results of this research can provide a baseline information for future studies. There are both horizontal and vertical transmission ways of *N. caninum* in this region. In conclusion, *N. caninum* is an important factor of economic losses in beef cattle in Hamedan province. Therefore, further investigations and designing control strategies for improving management in cattle farms is highly recommended.

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**References**


