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Study of the risk factors associated with *Neospora caninum* seroprevalence in Algerian cattle populations

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ABSTRACT

Bovine abortions due to *Neospora caninum* infection were reported worldwide. The situation in Algeria was unknown. For the evaluation of the prevalence of *N. caninum* and its associated risk factors, 799 cattle belonging to 87 farms of the north and northeast of Algeria were analyzed. The cattle were divided into imported cattle, local cattle and improved cattle corresponding to breeding between imported and local cattle. Sera were examined for the presence of *N. caninum* antibodies by indirect fluorescence antibody test. The overall seroprevalence for the 87 farms was 52.87% (41.28–62.71%). The overall animal seroprevalence was 19.64% (16.82–22.45%). The seroprevalence of *N. caninum* in local cattle (34.28%) was significantly higher ($p < 0.05$) than in modern (16.04%) and improved (18.64%) cattle. The risk factors analysis indicated that cattle population, geographical location, dog presence, season, global farm hygiene or the presence of abortion were significantly associated with seroprevalence.

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1. Introduction

Neospora caninum is an obligate intracellular protozoan parasite which has emerged as a cause of infectious abortion in cattle worldwide (Dubey et al., 2007). In many countries *N. caninum* is the most frequently diagnosed cause of bovine abortion (Dubey and Lindsay, 1996).

The biological cycle of *N. caninum* is heteroxenous. Dogs, coyotes and gray wolf (*Canis lupus*) are the only species recognized as definitive hosts, in which the sexual phase of *N. caninum* cycle occurs, resulting in the shedding of oocysts in the feces (Mc Allister et al., 1998; Gondim et al., 2004; Dubey et al., 2011). It has been established that bovines are the major intermediate hosts of the parasite. The routes of infection in cattle for *N. caninum* consist of vertical or transplacental transmission, and horizontal or oral transmission (Dubey, 1999). However, vertical transplacental infection from infected dams to their offspring appears to be the major natural route of infection, and congenitally infected calves remain persistently infected and can infect their offspring (Anderson et al., 1997).

The pathogenesis of neosporosis in cows is complex (Dubey et al., 2006) and it is not well understood why some animals abort and others do not. Infected cattle remain carriers of the parasite for life and there are no clear signs of protective immunity (Dubey, 2003).

No fully effective vaccine or treatment is available to prevent or cure the infection (Dubey et al., 2006). The study of risk factors of herd infection by *N. caninum* is important for the development and implementation of measures to control bovine neosporosis (Dubey et al., 2007).

For epidemiological studies, serology is the most used techniques. The Indirect Fluorescence Antibody Test (IFAT) is often used as a reference serological test for the detection of *N. caninum* (Dubey and Lindsay, 1996). Many serologic surveys of *N. caninum* infection in cattle worldwide and the risk factors for *N. caninum* in cattle have been discussed broadly in the literature (Dubey et al., 2007).

In Algeria, the cattle population is estimated to 1.6 million, including 53.55% dairy cattle and representing an important food source (MADR, 2008). Despite the massive imports of dairy cows with high genetic potential, the milk production remains low. It is estimated at 1.38 million tons in 2000 (Ghozlane et al., 2003) either 0.26% of the world production. This production is in total inadequacy with the continued strong growth of the population because it covers only 40% of the needs (MADR, 2008). Although the neosporosis has been diagnosed in the main dairy and beef cattle-producing countries, no previous study has been published in the literature about the disease in Maghreb. In Algeria, there is only one published report available on its occurrence that indicated 20.47% seropositivity in 781 dogs in Algiers (Ghalmi et al., 2009b). This demonstrates the wide diffusion of *N. caninum* in this area. A study of significant factors that influence the distribution of

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N. caninum in this area, could be useful to better know the epidemiology of *N. caninum* infection in Algerian cattle. Therefore, the aim of this study was mainly to identify the risk factors associated with *N. caninum* seroprevalence in different cattle populations in Algeria.

2. Material and methods

2.1. Studied area

A cross-sectional study was designed to study the relationship between the *N. caninum* serological status of dairy cattle and various potential risk factors. The populations of interest were dairy farms in two distinct regions of Algeria. The geographical location of the farms is presented in Fig. 1. These farms were located either in the northern regions (Algiers County) or in the eastern regions (Bejaia and Setif). The sampled region represented around 25, 000 square kilometers.

Region-I was located in North Algeria (36° 49′ N; 3° 0′ E) and contain about 727 cattle farms characterized mainly by imported cattle with high genetic potential and region II was in the west of the country (36° 10′ N; 5° 24′ E). The choice of region-II was justified by the fact that more than half of the local breed cattle are located in the eastern part of the country.

The distance between the two regions is approximately 400 km.

2.2. Sampling procedures

The animals that were studied belonged to 87 dairy farms in above cited regions. In the region of Algiers 72 farms were sampled representing 10% of the farms present (n = 727).

A total of 799 serum samples were assessed. They represented 7% of the cattle population (n = 11,500) in the studied region (INMV, 2009).

The minimum number of cattle to be tested on each farm was established as 10 (Cannon and Roe, 1982), corresponding to the probability of detecting at least one seropositive animal per farm. On farms with less than 10 bovines, all of them were tested.

A stratified sampling was performed each stratum was a cattle population. Three cattle populations were considered: imported cattle (IPC), improved cattle (IMC) and local catte (LC). For each population, the relative precision was similar: 25.5%, 22.2% and 27.2% for IPC, IMC and LC respectively.

2.3. Collection of blood and epidemiological data

Sera from 799 bovines belonging to 87 farms were collected. 324 cattle from 30 farms were IPC, 370 cattle from 43 farms were IMC and 105 cattle from 14 farms were LC.

The study period ranged from September 2006 to January 2009. Blood samples were collected by coccygeal venipuncture, using identified dry tubes. The serum was removed after centrifugation at 2700*g* for 10 min and stored at −20 °C until analysis.

Simultaneously, blood was collected from dogs (n = 107) present in 67 out of the 87 farms. Data for *N. caninum* seroprevalence in those dogs were published previously (Ghalmi et al., 2009b).

An epidemiological questionnaire was fulfilled by farmers who were asked to answer the questionnaire in order to obtain information on the risk factors such as: farm location, herd size, cattle breed, cattle age, presence of abortion in the five last years, presence of pregnant cows, stadium of pregnancy, presence of dogs,

Fig. 1. Map of the analyzed regions. The regions in gray were those where the sampled farms are situated. The Algiers region has been divided into 4 sub-regions, Zeralda, Rouiba, Baraki, Birtouta. The regions of Bejaia and Setif constitute the eastern regions.

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