VETERINARY MEDICINE SCIENCES

RELATIONSHIP OF NEOSPOROSIS INFECTED ANIMALS IN HERDS AND THEIR BLOOD BIOCHEMICAL DATA

Evija Eihvalde, Vita Antāne, Pēteris Keidāns
Latvia University of Agriculture
E-mail: eveihvalde@inbox.lv

Abstract

Neosporosis is an infection disease caused by a single celled parasite *Neospora caninum* that produces cysts in the host organism. The dogs are a definitive host of parasite; cows and other ruminants are intermediate hosts. It causes neuromuscular disorders in dogs and abortions, birth of weak calves and neonatal mortality in cattle. Disease occurs worldwide (Sweden, Germany, Spain, Australia, Canada, USA et al.). Our aim of this study was to clear up how many seropositive animals in two seropositive dairy herds (after bulk milk investigation) in Latvia there are, their relationship and possible changes of their biochemical data. The studies in 2006 between September and November were carried out. In two farms there were 14 seropositive animals (from 67). There was evidence of inheritance of neosporosis infection. No differences were recognized in cows' blood biochemical data between positive and negative animals.

Keywords: cows, neosporosis, serology, blood biochemical data.

Introduction

Neosporosis is an infection disease caused by a single celled, cyst- forming, and coccidian parasite *Neospora caninum*. *N.caninum* was first identified in dogs with neurological disorders in 1984 (Dubey et al., 2002). *N.caninum* has a two-host life cycle. Dogs are the definitive hosts. Cattle and other animals' species such as sheep, deer, monkeys, pigs and foxes are intermediate hosts (Bjorkman, 2003). Seropositive cows frequently have abortion, stillbirth or birth of weak calves. Three infective stages of *N.caninum* – tachyzoites, bradyzoites and oocysts have been identified. Tachyzoites and bradizoites are found intracellular. They can be found in different cell types and organs, but most often they are found in the brain and spinal cord. If the cattle is pregnant, tachyzoites have been found in the placenta. They can rapidly multiply in the host cell, causing cell death and necrotic lesions. Bradyzoites are primarily found in the central nervous system and other neural tissues. They are situated in tissue cysts. Inflammation can be around the cysts. Cysts are found in skeletal muscle in cattle and dogs after natural infection with *N.caninum* (Dubey et al., 2002). Dogs become infectious and shed unsporulated oocysts with their feces two weeks after ingesting infected tissues of intermediate hosts or infected placenta. The intermediate hosts become infected in two ways: horizontal transmission – after intake of oocysts-contamined feed and water, or by eating tissues of infected animals; vertical transmission – during gestation from the cow to its fetus. The presence of dogs on the farm, especially, the coming-in of new dogs, is the risk for horizontal transmission of the cattle. Vertical transplacental transmission of the infection is an important route of infection in many herds (Anderson et al., 2000).

N.caninum infection in cattle has been reported from several countries over the world. However the prevalence of infection in cattle differs between countries and regions. In Europe, between 16% and 83% of dairy herds were confirmed to have *N.caninum* infected animals (Anderson et al., 2000; Bjorkman, 2003). Neosporosis in Latvia was first diagnosed in 2001 in State Veterinary Diagnostic Centre (starting from 1st January 2006. – National Diagnostic Centre). In period until 2005 from investigated aborted cows blood serum samples 16% were seropositive to neosporosis (Eihvalde et al., 2006).

Abortion and death of neonatal calves appear to be the main cause of economic impact. *N.caninum* infection may also affect milk production and reproductive performance in dairy cows. No investigation as to how neosporosis can affect blood biochemical data of cows after infection has been carried out.

Our aim of this study was to detect the number of the seropositive animals in seropositive herds, estimate relationship of seropositive animals and compare blood biochemical data between seropositive and seronegative animal groups.

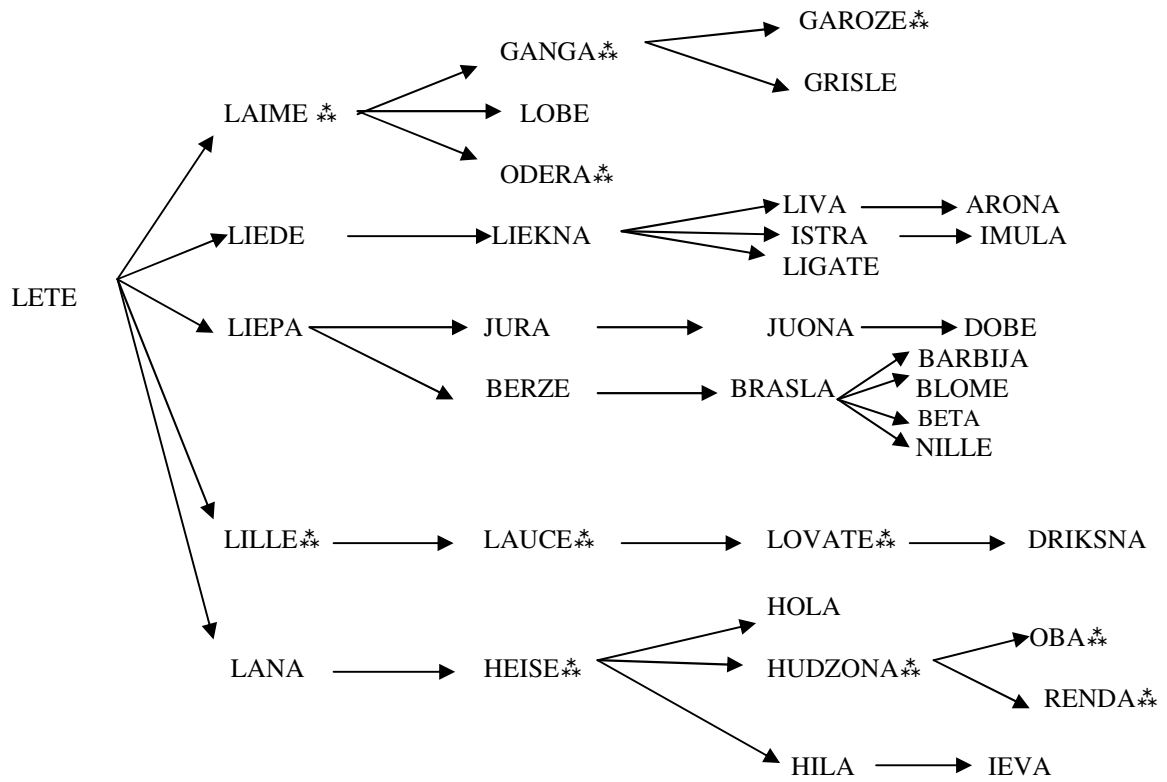

Figure 1. Herd 'A' cows' relationship in the herd and their serological status.
⁂ - seropositive cows

Materials and Methods

The studies in 2006 between September and November, in two seropositive dairy herds in Riga and Jelgava district were carried out. The herds were choosen after serological examination of bulk milk samples to neosporosis in 2005. All female animals (> 3 months) in herds (67 cows and heifers) were serologically investigated to neosporosis with ELISA (SVANOVIR® Neospora-Ab iscom ELISA, Svanova Biotech AB, Uppsala, Sweden). The animal groups were ordered after serological investigation – seropositive and seronegative cows. The blood serum samples were taken from 20 dairy cows and 8 heifers (14 – seropositive, 14 – seronegative animals) for biochemical investigation. Data management and descriptive statistics were performed by SPSS programme (Arhipova, Bāliņa, 2003).

Results and Discussion

In herd 'A' (Jelgavas district) serologically positive to neosporosis were 24.1% (7 from 29) animals. In this herd cows to neosporosis were investigated until 2003. In 2003 there were 54.5% seropositive animals. They were not eliminated from the herd, but continued using in breed. In length of time some seropositive cows were culling for various reproductive disorders. The herd relationship among cows and their serological status are shown in Figure 1.

While analyzing the cow family beginning from the cow Lete, it is seen that in the second generation there were 5 daughters. When the herd was under neosporosis investigation in 2003, 2 daughters (Laime, Lille) were found to be positive. As concerns the third generation, their daughters (Ganga, Odera, Lauce) turned out to be positive. Admittedly, Lete's daughter Lana, had been eliminated till investigation was carried out, and her serological status was not known, but in the third generation the cow Heise was seropositive. In next two generations Hudzona, Oba, Renda were seropositive cows. Infection of neosporosis in this herd is retaining and continuing in next generation. Other studies show similar results regarding spread of infection (Anderson et al., 2000; Bjorkman, 2003; Chanlun et al., 2002, Gottstein, 2005).

From 38 investigated animals in Riga district in the herd 'B' seropositive were seven cows,

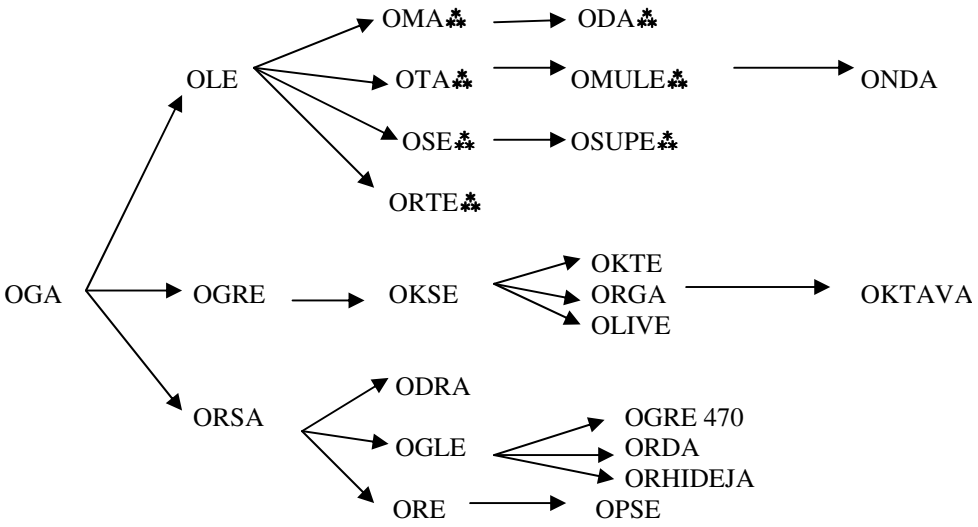

Figure 2. Herd 'B' cows' relationship in the herd and their serological status.
$_*{}^*{}_*$ - seropositive cows

Table 1

Blood biochemical parameters in seropositive and seronegative cows

Biochemical data	Seropositive cows	Seronegative cows	standard
Glucose, mmol l^{-1}	2.76 ± 0.67	2.97 ± 1.19	2.3-4.1
Creatine kinase,U l^{-1}	150.00 ± 20.78	125.50 ± 14.22	14.4-107.0
Total protein, g l^{-1}	77.30 ± 6.80	75.30 ± 7.93	61.6-82.2
Total bilirubin, μmol l^{-1}	1.97 ± 0.95	1.80 ± 0.85	0.7-14.0
AST, U l^{-1}	89.90 ± 23.95	104.00 ± 27.50	45.3-110.2
Cholesterol, mmol l^{-1}	3.05 ± 1.01	3.82 ± 1.17	1.6-5.0
Urea, mmol l^{-1}	2.93 ± 0.91	2.84 ± 0.99	2.8-8.8
LDH,U l^{-1}	2249.20 ± 273.74	2198.60 ± 189.06	308.6-938.1
Ca, mmol l^{-1}	2.31 ± 0.13	2.44 ± 0.15	2.1-2.8
P, mmol l^{-1}	2.14 ± 0.30	2.18 ± 0.70	1.4-2.5

consequently it constituted 18.4% of seropositive animals. The herd developed from three unconnected cows. Seropositive animals belong to one cow family (see Fig.2). Currently there are 8 cows, 7 of which are seroposotive to neosporosis. Findings indicate that fetus can acquire infection in any pregnancy through placenta (Anderson et al., 2000) because Onda, Omule's daughter, was seronegative to neosporosis.

Between seropositive and seronegative to neosporosis animal groups there is relevant difference ($p < 0.05$) between determined data unascertained (Tab 1). It indicates that parasite *N.caninum* has no direct affect on data such as glucose, creatine kinase, total protein, total bilirubin, aspartate aminotransferase (AST), cholesterol, urea, lactatdehidrogenasis (LDH), calcium and phosphorus. LDH was above standard that showed activation of hepatocellular enzyme. This can increase if there is extensive degenerated or necrotic damage of muscles (Liepa, 2000). It is known that parasite can cause neural and muscle cells damage. In our study LDH quantity increased in both groups, so this is not connected to parasite influence on organisms.

Conclusions

1. Infection of neosporosis in herds is mainly inherited through placenta (vertical transmission) it is indicated by seropositive animal relationship.
2. In seropositive dairy herds there were 24.1% (Jelgava district herd A) and 18.4% (Riga district herd B) of seropositive animals.
3. Relevant difference ($p < 0.05$) unascertained in determined data such glucose, creatine

kinase, total protein, total bilirubin, aspartataminotransferasis, cholesterol, urea, lactatdehidrogenasis, calcium and phosphorus between seropositive and seronegative to neosporosis animals. LDH was above standard in both groups.

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