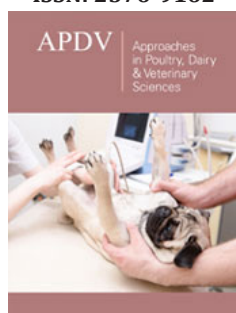


Neosporosis in Small Ruminants

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Abstract

Neosporosis is a parasitic disease caused by the protozoan *Neospora caninum* causing reproductive problems and neurological disorders in animals. Wild and domestic canids are definitive hosts, and sheep and goats, among intermediate hosts, are one of the susceptible species. This disease causes serious economic damage to small ruminants' industry in the world. The recommended therapy is based on allopathic drugs, with a poor prognosis. There are no vaccines available, but prophylactic measures are very efficient, mainly because they avoid environmental contamination and consequently infection of other animals.

Keywords: *Neospora caninum*; Protozoosis; Goat; Sheep

Mini Review

Neospora caninum is a mandatory intracellular protozoan that causes neosporosis, a worldwide disease that can affect a considerable range of domestic and wild animal species [1]. It is an emerging disease, associated with reproductive problems and neurological disorders, with progressive character, manifesting with greater severity in young animals, recognized worldwide as an important cause of abortion [2]. The description of the dog as a definitive host occurred in 1998 with the finding that in these animals the sexual phase of the parasite develops, and oocysts are eliminated in the feces. This is an important factor in epidemiological chain, as it emphasizes the importance of dogs in the horizontal transmission of the parasite [3]. *Neospora caninum* and *Toxoplasma gondii* are morphologically similar but biologically different coccidian's. Both parasites have a wide host range but unlike *T. gondii*, *N. caninum* is not considered zoonotic [4]. Transplacental transmission is a major route of propagation. The genus *Neospora* has two species, *N. caninum*, and *N. hughesi*; only horses are reported as an intermediate host for *N. hughesi* [5].

Sheep and goat farming are growing worldwide. Thus, the production chain must pay attention to health problems, among them the reproductive effects that have a direct effect on herd productivity. Among the parasitic diseases that affect reproduction stands out the neosporosis, responsible for abortion, embryonic death, fetal malformation and birth of weak or persistently infected lambs [6]. The clinical signs presented by animals with neosporosis are similar for several infectious and parasitic diseases and should always consider it as a differential diagnosis for reproductive problems in sheep herds [7].

Parasite detection by direct and/or indirect methods is of high importance for the diagnosis and prognosis of the disease and prevention and control of the infection in urban, rural, and wild areas. The available methodologies allow clinicians and researchers to amplify knowledge about classical and molecular epidemiology and pathogenesis of the disease, evaluate the efficacy of available and future drugs used to treat the clinical signs, and adopt measures to avoid dissemination of the parasite [8]. Direct methods consist in the visualization of oocysts, tissue cysts, or tachyzoites, stained or not, by light microscopy, histopathology, immunohistochemistry, *in vitro* cell culture and *in vivo* isolation by gerbil and/or mouse bioassay, fecal flotation of dog feces, and molecular methods, ie, polymerase chain reaction (PCR) [9].

The indirect fluorescent antibody test (IFAT), *Neospora*-agglutination test, and enzyme-linked immunosorbent assay (ELISA) are the most used techniques for *N. caninum*-antibody research [10]. IFAT was the first serological test used. It has been used extensively

for diagnosis, is considered a gold-standard test, and used in epidemiological studies for domestic and wild animals. ELISA and IFAT are usually used to detect *N. caninum* infection in adult animals and herds, and both are also considered complementary techniques in the diagnosis of neosporosis [9-11]. There is no effective treatment against neosporosis yet. Studies using antiprotozoal drugs in infected calves have shown some effect in decreasing the spread of the parasite in the animal [12]. Regarding vaccination, some indications inactivated vaccines confer some immunity in preventing vertical transmission. However, the prevention of abortion is debatable, and the use is recommended only for bovine species [13].

Prevention and control measures for sheep and goat are: use of seronegative receptors for embryo transfer, use of individual maternity wards, reduced exposure of dogs to aborted fetuses and placentas, sending aborted fetuses and placentas to the laboratory to diagnose the cause of abortion, reduce the number of dogs cohabiting with the herd, prevent access of domestic or wild canids to silos and feed deposits, and perform serology of the herd and cohabiting dogs [14]. The lack of information on the epidemiology of the agent has substantially limited the proposition of objective and practical solutions to prevent infection, and the main prophylactic measures consist in reducing the exposure of animals to possible sources of infection. There is a growing demand for a vaccine to be prepared to prevent abortion in sheep and goats and/or to prevent oocyst excretion by permanent hosts.

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