

Review of *Neospora* Species and Neosporosis in Equines

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ABSTRACT

The parasitic coccidian *Neospora* found in animals. *Neospora caninum* and *Neospora hughesi* are the two species of *Neospora*. These parasites primarily affect cattle and dogs, but can also spread to goats, sheep, horses and deer. Dogs, coyotes, and dingoes are the definitive hosts of *N. caninum*. While the definitive host for *N. hughesi* remains uncertain. *Neospora* spp. is primarily transmitted to equines through the placenta. *Neospora* is a leading cause of abortion in equines. It causes different clinical, reproductive and neurological problems in equines. Developing protective immunity against abortion in equines with latent infections is a significant challenge. This article addresses the biology, life cycle, transmission, epidemiology and diagnosis of neosporosis in equines and other animals.

Introduction

Neospora spp. is obligate intracellular parasites found globally. They belong to the Apicomplexa phylum of the Sarcocystidae family. They are closely related to Sarcocystis spp. and *Toxoplasma gondii* [3]. Numerous hosts are susceptible to infection by *Neospora*. The only known hosts of *Neospora* species that may release environmentally resistant oocysts in their feces are dogs, coyotes, and dingoes. While the horses, canids, and other ruminant mammals like cattle can serve as intermediate hosts for *Neospora*.

It has two recognised species: *Neospora caninum* and *Neospora hughesi*. *N. caninum* is the leading cause of abortion in warm-blooded animals, including cattle and equine. While canid species such as dogs, dingoes, and wolves have been identified as perfect hosts for *N. caninum* but the final host for *N. hughesi* is still unclear [1].

Life Cycle

The life cycle of this particular group of parasites is heteroxenous, meaning that asexual stages develop in the tissues of the intermediate host, whereas sexual reproduction takes place in the gut of the definitive host [10]. Three infectious phases; tissue cysts, tachyzoites and oocysts characterize the life cycle of *N. caninum* (Fig. 1). The intracellular stages of tissue cysts and tachyzoites are present in intermediate hosts. The size of tachyzoites is roughly $6 \times 2 \mu\text{m}$. Tissue cysts are mostly located in the brain, are frequently spherical or oval in appearance, and can grow up to $10^7 \mu\text{m}$ in length. The encapsulated bradyzoites measure $7-8 \times 2 \mu\text{m}$, whereas the tissue cyst wall can reach a thickness of $4 \mu\text{m}$ [4].

Clinical signs

Neospora infection is considered quite serious on account of abortion, dead fetus, and death of young ones in equines primarily caused by *N. caninum* and *N. hughesi* [6]. Equine *N. caninum* infection is mainly linked to reproductive problems like neonatal congenital illnesses, but equine *N. hughesi* infection is linked to neurological problems like equine protozoal myeloencephalitis (EPM) [1].

Diagnosis

Neospora infection in intermediate hosts usually shows no symptoms; exposure is indicated by the existence of antibodies. [7]. *Neospora* spp. can be diagnosed either by various serological assays like immunofluorescence antibody test (IFAT), ELISA, agglutination test, immunofluorescence assay, western blotting technique [5] or by molecular technique like PCR with primers of Sarcocystidae rRNA gene ITS1 [2].

Conclusion

Neosporosis is a protozoal infection which is caused by *Neospora* spp. (*N. caninum* and *N. hughesi*). It causes different clinical issues, including myositis and encephalomyelitis. It also contributes to reproductive problems like abortions, congenital abnormalities, neurological dysfunction and diseases in neonates as well as in adult equines. In equines, *Neospora* spp. can be transmitted either vertically or trans-placentally [8]. It can be diagnosed by different serological and molecular techniques. From the previous research, it is stated that the prevalence of *Neospora* spp. is 26.9% in 89 mules, 32.6% in donkeys, and 16.0% in horses in Pakistan [8].

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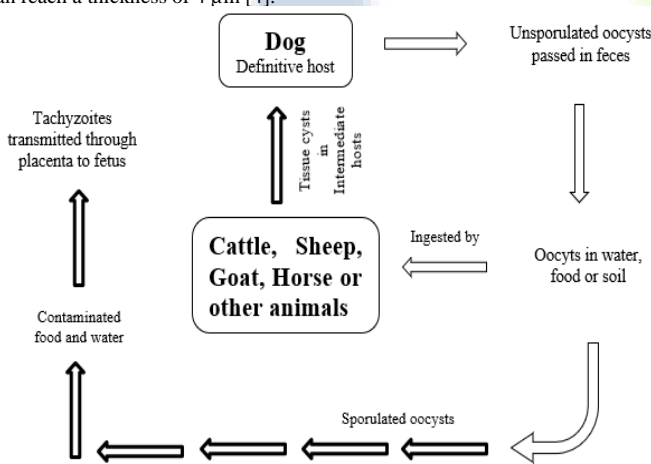


Fig 1: Life Cycle of *Neospora*

Transmission

The tissue distribution and manner of propagation of *N. caninum* in animals through natural routes are poorly understood [4]. It can happen vertically as well as horizontally. The parasite can spread transplacentally in a number of hosts, and in these hosts, the vertical route is the primary means of transmission. By consuming contaminated tissues, carnivores can become infected [9].

Neosporosis in Equines

N. caninum and *N. hughesi* are the two species of *Neospora* that cause equine neosporosis, which is characterized by neurologic symptoms and reproductive loss.