

## A Case of *Neospora* Associated Bovine Abortion in Sweden

*Neospora caninum* is a recently recognized protozoan organism that causes fatal neuromuscular disease in dogs and abortions and stillbirths in cattle and other animals (Dubey & Lindsay 1993). The parasite is morphologically similar and phylogenetically very closely related to the cyst-forming coccidium *Toxoplasma gondii* (Ellis et al. 1994, Holmdahl et al. 1994). This group of parasites has a two-host life cycle principally involving a carnivorous definitive host and a herbivorous or omnivorous intermediate host. However, with *N. caninum*, there is as yet no knowledge of any definitive host harbouring sexual stages of the parasite. The only known route of transmission is vertical from mother to foetus (Dubey & Lindsay 1993).

Abortions constitute a regular problem in dairy cattle worldwide, causing considerable economic setbacks. Among infectious causes, viral, bacterial, fungal, as well as protozoan agents, are recognized. Although *T. gondii* is well known as a major cause of ovine and caprine abortion, this parasite has not been incriminated for abortion in cattle. However, since the first report of *Neospora*-like organisms as the cause of bovine abortion (Thilsted & Dubey 1989) this agent has been reported from all continents as responsible for single cases, as well as outbreaks, of abortions in cattle (Dubey & Lindsay 1993). *N. caninum* has been demonstrated as a cause of neurological disorder in dogs in Sweden (Uggla et

al. 1989), but the parasite has not been described from other host species in this country. A dairy farm in the vicinity of Uppsala, Sweden, free of bovine virus diarrhoea virus (BVDV) infection, had experienced excessive numbers of abortions with unknown etiology. As part of an investigation all adult animals (n = 35) on the farm were bloodsampled for antibodies against *N. caninum* and *T. gondii*. The serum analyses for *N. caninum* were carried out with an indirect fluorescent antibody test (IFAT) and an enzyme linked immunosorbent assay (ELISA), employing an iscom (immunostimulating complex) antigen as modified from Björkman et al. (1994). Tachyzoites of the canine isolate, *N. caninum* NC-1 (Dubey et al. 1988) were used as antigen in the IFAT analyses and for the production of iscoms. The analyses for *T. gondii* were carried out with a direct agglutination test (Toxoscreen DA; bioMérieux, Marcy-l'Etoile, France). During the course of the investigation on the farm, a foetus, which had been aborted at 4.5 months of gestation, was referred to the laboratory for post mortem analysis. The foetus was necropsied and specimens of the brain, spinal cord, heart, liver, lung and spleen were fixed in 10% neutral buffered formalin for histological examination. Sections were stained with haematoxylin and eosin and with a peroxidase anti-peroxidase immunohistochemical technique (PAP) employing a rabbit anti *N. caninum* serum

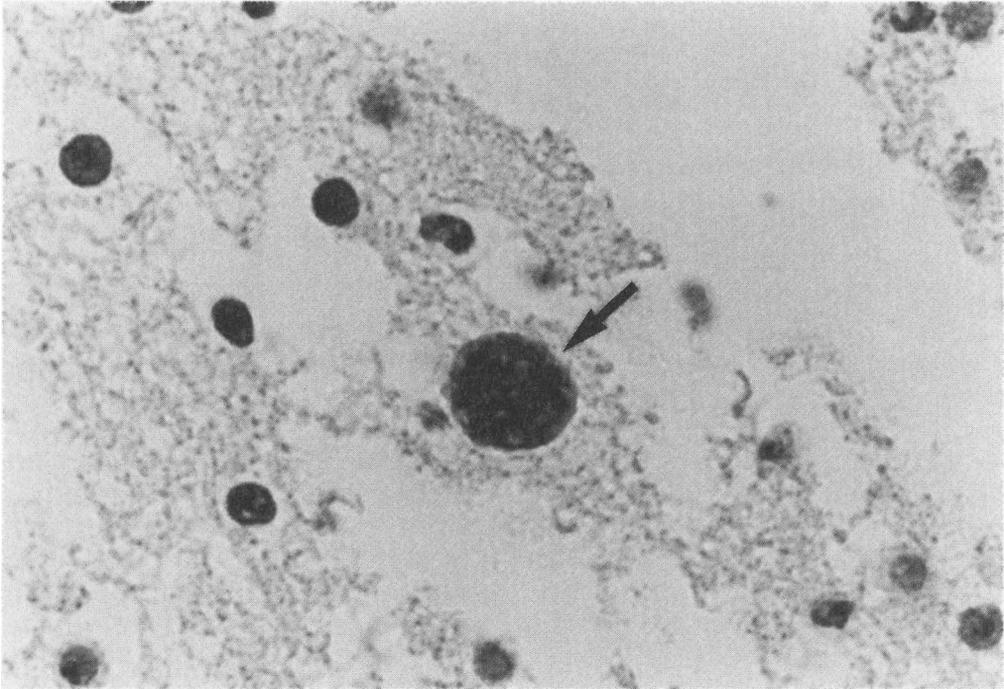


Figure 1. Cerebrum of aborted bovine foetus. A group of *Neospora* organisms stained with anti *N. caninum* antibodies (arrow). PAP x 1300.

(Lindsay & Dubey 1989). Sections of the brain were also stained with a *T. gondii* PAP (Uggla et al. 1987).

The serological investigation revealed that 10 of the 35 animals tested had antibodies to *N. caninum*, but none had antibodies to *T. gondii*. At necropsy of the foetus no gross lesions were seen. Histologically, no obvious changes were detected in the fetal tissues investigated. Especially the sections of the central nervous system were difficult to judge due to autolytic changes. In the cerebrum, however, the immunohistochemical staining revealed a few groups of protozoan organisms that stained specifically with the anti *N. caninum* serum (Fig. 1.), but not with the anti *T. gondii* serum. No protozoan organisms were detected else-

where. Significant levels of antibodies to *N. caninum* were detected in sera from both the mother and the grandmother of the foetus.

The immunohistochemical findings tallies with previous descriptions of *Neospora* associated abortions in cattle (Dubey & Lindsay 1993), and the serological results further support the diagnosis. Since the present case represents the first documentation of *Neospora* associated bovine abortion in Sweden, it is essential that further clinical as well as laboratory attention is paid to this problem, also in Scandinavia.

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