

CANINE DISTEMPER VIRUS IN ASIAN CLAWLESS OTTER (*AONYX CINEREUS*) LITTERMATES IN CAPTIVITY

Hondenziekte bij een nest Aziatische otters (Aonyx cinereus) in gevangenschap

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SUMMARY

Canine distemper is recognized as a worldwide problem of carnivores. It has been reported in all families of carnivores, including Mustelidae. The various mustelids (e.g. otters, ferrets) are among the species most susceptible to canine distemper virus (CDV) disease and, with some exceptions, the clinical presentation is similar to that seen in domestic dogs. Veterinarians, including those working with non-domestic carnivores, should be familiar with the clinical signs, diagnosis and clinical management of this disease. This paper is the first description of an acute outbreak of CDV in Asian clawless otter or Asian small-clawed otter (*Aonyx cinereus*) littermates.

SAMENVATTING

Hondenziekte bij carnivoren is een wereldwijd gekend probleem. Ze werd reeds beschreven bij alle families van carnivoren waaronder Mustelidae. Mustelidae, zoals otters en fretten, zijn één van de meest gevoelige families voor het (caniene) hondenziektevirus. De klinische symptomen zijn vergelijkbaar met deze waargenomen bij de hond, mits enkele uitzonderingen. Dierenartsen die in contact komen met niet-gedomesticeerde carnivoren, moeten op de hoogte zijn van de klinische symptomen, de diagnose en het management van deze ziekte. Dit artikel is de eerste beschrijving van een uitbraak van hondenziekte bij een nest Aziatische dwergotters (*Aonyx cinereus*).

INTRODUCTION

Canine distemper is an important worldwide infectious disease of domestic dogs (*Canis familiaris*). It has been known in Europe for at least 200 years (Williams, 2001) and was first isolated by Carré in 1905 (Carré, 1905). Canine distemper virus (CDV) is an infectious disease of major concern for managers of free-ranging and captive carnivores (Montali *et al.*, 1987). However, the epidemiology of CD in free-ranging species is poorly understood (Williams, 2001). Some of the natural hosts of this disease are members of the Canidae (dog, fox, coyote and wolf), Procyonidae (raccoon) and Mustelidae (weasel, mink, skunk, otter and ferret) (Lopez, 1995), but evidence of CDV susceptibility has been reported in all families of terrestrial and marine carnivores (Osterhaus *et al.*, 1995, Deem *et al.*, 2000, Williams, 2001, Mos *et al.*, 2003).

The Mustelidae family is the most severely affected (Deem *et al.*, 2000). Canine distemper virus (CDV) is essentially 100% fatal in the ferret (Davidson, 1986). Several reports of CDV infections in European otters (*Lutra lutra*) (Giesel, 1979) and in free-ranging otters (*Lutra canadensis*) in Alaska, North America and New York, as well as captive otter in the Bronx Zoo, New York have been reported, thus confirming the susceptibility of this species to this virus (Duplaix-Hall, 1975, Hoover *et al.*, 1985, Mos *et al.*, 2003).

CASE REPORT

In a Belgian zoo park, acute death over a period of 48 hours was observed in five littermates of Asian clawless or small-clawed otters (*Aonyx cinereus*, Illiger, 1815) (Fig. 1). Some days before the outbreak, the otters were stressed as two juveniles of a previous



Figure 1. Photograph of an Asian clawless otter or Asian small-clawed otter (*Aonyx cinereus*, Illiger, 1815). These are the smallest otters in the world, being about two feet long and weighing under ten pounds. They have a glossy brown coat with a lighter colored underside, sometimes with white markings generally around the face, throat, and chest area. Their feet are webbed to the last joint of the toe instead of being webbed all the way to the beginning of their short blunt claws. This gives the otter an excellent sense of touch and coordination. Their large broad cheek teeth are used for crushing the shells of crabs and mollusks.

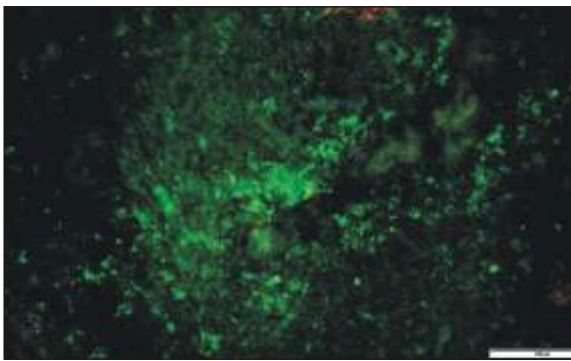


Figure 2. Direct immunofluorescence (DIF) microphotograph: positive (green color) stomach sample for CDV.

litter were captured for relocation. The puppies were two months old and did not show any clinical sign of illness. The litter consisted of five animals. The parents, a 3-year-old male and a 5-year-old female, remained healthy. They had not been vaccinated against any infectious diseases. The animals were living in an isolated pool, without any contact with other animals (domestic, non-domestic or wildlife CDV susceptible species). The diet consisted mainly of (fresh water) fish, some crustaceans and occasionally a day-old chick, all supplemented with vitamins. On necropsy, the five littermates showed signs of fibrinous to hemorrhagic gastritis and enteritis. Congestion and petechiae were noticed in the lungs. Histopathology (hematoxylin-eosin staining) revealed a mild mononuclear perivascular and interstitial inflammatory reaction in the liver, lungs and stomach. Additionally,

the lungs showed edema, bronchointerstitial pneumonia and scattered alveolar syncytia, and rare intracytoplasmic eosinophilic inclusions were observed in epithelial cells. Viral inclusions were also present in some of the otter's stomachs and urinary bladders. Based on the macroscopic and microscopic lesions, a presumptive diagnosis of CDV was made. Direct immunofluorescence (DIF) specific for CDV on stomach, lung, urinary bladder, spleen and mesenteric lymphnode was carried out. All five otters were positive on DIF for CDV in the stomach, lung and urinary bladder in variable degrees (Fig. 2). This is to our knowledge the first description of CDV in this species. As a result of our findings, the remaining 2 adult otters were vaccinated twice with an interval of 3 weeks using Nobivac puppy DP (Intervet). All new otter members (e.g. new litters, new imports) will be vaccinated (Nobivac puppy DP (Intervet)) in the future against CDV.

DISCUSSION

Transmission of CDV can occur either by direct or by indirect contact. The major mode of CDV transmission is through the aerosolization of nasal discharge and through other excretions and secretions from the body of an affected animal (Deem *et al.*, 2000, Williams, 2001). CDV is relatively fragile and quickly inactivated in the environment by ultraviolet light and by heat and drying, so close association between affected and susceptible animals is necessary (Williams, 2001). Viral shedding occurs even if animals are subclinically infected (Appel, 1987), and the virus may be shed for up to 90 days after infection (Greene and Appel, 1998). In the present case, the infection with CDV presumably occurred indirectly via the zookeepers, who may have had contact with a (sub) clinical CDV infected dog or a CDV contaminated item, as direct contact with CDV infected animals was excluded due to the husbandry.

In all species, the respiratory, gastrointestinal, integumentary and central nervous systems are most commonly affected. In mustelids, the most commonly observed signs are high fever, ocular and nasal discharge, diarrhea, anorexia, seizures and myoclonus, severe hyperkeratosis of the foot pads, whole body erythema, pruritus and lethargy (Deem *et al.*, 2000). Many of these symptoms are never seen because the animal dies quickly after infection, as was observed in the present case. Puppies usually do not develop any skin lesions, but will develop an acute loss of appetite, fever,

seizures and death within a few days. In an experimental study of CD in coyotes, all pups died, but all adults survived (Gier and Ameel, 1959). Williams *et al.* (1992) suggested that coyote pups might be more susceptible to CD mortality than yearlings and adults. Most likely otter pups are also more susceptible to CD mortality, as was demonstrated in the present case.

The pathogenesis in domestic dogs has been well characterized and may be similar in non-domestic species. After entering the respiratory tract, the CDV spreads to tonsils and bronchial lymph nodes, where it replicates. After viremia, the CDV proliferates widely in lymphoid organs (spleen, thymus, lymph nodes) and spreads through a secondary viremia to the epithelial and central nervous system tissues (CNS). The pathogenesis and CNS involvement is variable and dependent on the host's humoral and cellular immune response (Deem *et al.*, 2000). The signs of canine distemper can vary according to strain virulence, environmental conditions, host age, immune status and the infected species (Deem *et al.*, 2000). Susceptibility in some species may be influenced by predisposing factors such as stress, immunosuppression, vaccination and exposure to a high doses of virus (Greene and Appel, 1998). Stress imposed on otters can cause immunosuppression, impaired antibody response, and altered biochemical and hematologic profiles (Fowler, 1986). As described above, the stress related to capturing the two subadults for relocation may have triggered the CD outbreak.

Gross lesions may vary from no obvious lesions to those reflective of clinical signs. Thymic atrophy is a consistent but nonspecific gross lesion. (Broncho) pneumonia, catarrhal to hemorrhagic gastro-enteritis (present in our case) and hyperkeratosis of the nose, lips, eyelids, ears, anus and foot pads may be present (Williams, 2001). Common microscopic lesions include the depletion of lymphoid tissues (lymph nodes, spleen, thymus). Interstitial pneumonia, suppurative bronchopneumonia, and the formation of syncytial cells in pulmonary alveoli have been described. An important disease feature of CD is the presence of intracytoplasmic and intranuclear eosinophilic inclusion bodies in epithelia, neurons and astroglia (Williams, 2001). Some of these findings were present in these five otter pups.

Diagnosis is mainly based on history, clinical observations and typical gross and microscopic lesions. Immunohistochemistry, polymerase chain reaction, nucleic acid hybridization and isolation of CDV are also very useful for the detection of CDV infection (Williams, 2001).

Since CD in mustelids is virtually 100% fatal, the treatment of captive wild species with CD is symptomatic, though the prognosis is guarded (Williams, 2001). In some mild cases, supportive care may be advised. Supportive care consists of fluids, force-feeding, antibiotics, antihistamines, and possibly an antiviral medication (Greene and Appel, 1998). Because of the ubiquitous appearance of the virus, all animals should be vaccinated against CD. However, the use of modified live virus vaccines in wild species should be approached cautiously and with knowledge of the specific vaccine and sensitivity of the species. As otters are more closely related to ferrets than to dogs, and ferrets are very susceptible to distemper, care should be taken when vaccinating otters against the CDV. Cases of ferrets getting canine distemper from a canine distemper vaccine not approved for the ferret have been described (Gill *et al.*, 1988). Some of the dog combination vaccines may contain live CD viruses. Therefore highly susceptible species should be vaccinated either with killed CDV, though this does not provide complete protection (Williams, 2001), or else with recently developed CD vaccines (purified glycoproteins, immune-stimulating complexes and various recombinant poxviruses expressing F and H glycoproteins) (Williams, 2001). Vaccination schedules for nondomestic species are based on recommendations for the domestic dogs (Chapuis, 1995), i.e. a vaccination every 3-4 weeks between 6 and 16 weeks of age. Data on maternal antibody interference with vaccination of ferrets suggests that a final CDV vaccination should be administered after 10 weeks of age. (Gorham, 1999). In Belgium, no vaccine is registered for CDV vaccination of ferrets (and otters). However, good results have been obtained in ferrets with Nobivac puppy DP (Intervet) (Hermans K., personal communication), although this is a live vaccine. The remaining two otters were also vaccinated with this vaccine without any side-effects.

In conclusion, CD is one of the most important infectious diseases of free-ranging and captive carnivores. In free-ranging populations, it may have significant impact on populations of highly susceptible species (e.g. black-footed ferrets) (Williams and Thorne, 1996). In captive carnivores it must be considered in the design of husbandry protocols, including vaccination, quarantine and housing arrangements (Williams and Thorne, 1996).

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