

CANINE DISTEMPER VIRUS

Animal Group(s) Affected	Transmission	Clinical Signs	Severity	Treatment	Prevention and Control	Zoonotic
All terrestrial families in the order Carnivora. Also known cases in tayassuids, phocids, and primates.	Highly contagious! Aerosol of respiratory exudate is primary mode but other body excretions and secretions may be infective. Vaccinal, or vaccine-induced, distemper possible.	Respiratory, gastrointestinal, integumentary, CNS. Hyperkeratosis of footpads and myoclonus.	Variable. Inapparent to peracute death.	Secondary infections.	Vaccination ! Keep infected animals isolated. Exclusion of potential reservoirs (e.g., domestic dogs, raccoons).	No. However, evidence of correlation of CDV with some human diseases.

Fact Sheet compiled by: Sharon L. Deem

Sheet completed on: 18 October 2010; updated 3 December 2012

Fact Sheet Reviewed by: Edward Dubovi, Jean Paré

Susceptible animal groups: Species within all terrestrial families of the order Carnivora (Canidae, Mustelidae, Procyonidae, Mephitidae, Hyaenidae, Ursidae, Viverridae, Herpestidae, and Felidae). Phocids also infected with CDV, and pinnipeds and cetaceans susceptible to closely related viruses (e.g., PDV, PMV, and DMV). Additionally known, CDV disease in primates and tayassuids. Mustelids are exquisitely susceptible, with mortality approaching 100%.

Causative organism: Canine distemper virus. Single-stranded, enveloped RNA virus within the family Paramyxoviridae, subfamily Paramyxovirinae, and genus Morbillivirus. Related to measles, rinderpest, and peste des petits ruminants.

Zoonotic potential: No. Some correlation with human diseases and growing concern with the mutability and changing epidemiology of CDV.

Distribution: Worldwide.

Incubation period: 7-18 days in domestic dogs. Variable with species and across individuals but estimated 1 week to 1 month.

Clinical signs: Signs associated with respiratory, gastrointestinal, integumentary, and the central nervous systems are commonly seen. Which system(s) is/are affected depends on species, as well as strain virulence and environmental conditions. Animals are often depressed with mucopurulent, oculonasal exudates. Nasal and digital hyperkeratosis (hard pad) and involuntary muscle twitching are characteristic in domestic dogs. Differential diagnoses must include rabies and other viral encephalitides, respiratory infections, toxoplasmosis, canine parvovirus, lead poisoning, and bacterial enteritides.

Post mortem, gross, or histologic findings: Most significant gross lesions are pneumonia, depletion of lymphopoietic organs, and hyperkeratosis of the nose, foot pads, and eyelids. Common histologic findings are hyperkeratosis of the nose, foot pads, and eyelids. Eosinophilic inclusion bodies are present in many

CANINE DISTEMPER VIRUS

organs (most commonly cytoplasmic but occasionally intranuclear) including the CNS, urinary bladder, and bronchial epithelium. Cytoplasmic inclusion bodies in the gastric mucosa and bile ducts and diffuse interstitial giant cell pneumonia often followed by suppurative bronchopneumonia. Often lymphoid depletion, diffuse interstitial pneumonia, and perivascular lymphoplasmacytic infiltration in areas of demyelination and neuronal degeneration of the CNS. Syncytial giant cells in the lungs and CNS white matter, anterior uvea, and lymph nodes may also be present. In contrast to histologic lesions identified in the domestic dog, lungs of large felids may show diffuse alveolar type 2 cell hyperplasia with intracytoplasmic and intranuclear viral inclusion bodies. Additionally, feline brain histopathology may lack the typical canid pattern of demyelination with astrocytosis and vascular cuffing. Most cats have had mild, patchy CNS lesions compared with those of canids.

Diagnosis: Clinical signs, especially hyperkeratosis of foot pads and nose, and myoclonus are highly suggestive of CDV. Clinical pathologic changes including absolute lymphopenia, thrombocytopenia, regenerative anemia, decreased albumin, and increased alpha and gamma globulin concentrations may be present. Cytologic evaluation and/or immunofluorescence of conjunctival scrapes, buffy coat smears, CSF, skin or foot pads may also demonstrate intracytoplasmic inclusion bodies. Paired sera by viral neutralization or the indirect fluorescent antibody test to show a four-fold rise in antibody titer may be of value although often unrewarding as many animals die before building measurable antibody titers. Antibodies in CSF may be more diagnostic than serum. Newer ELISAs have been developed to detect IgM and IgG antibodies allowing determination of recent infection or vaccination.

Material required for laboratory analysis: Unfixed lung, liver, lymph nodes, brain, and spleen of dead animals with suspected CDV infection should be collected for viral isolation, fluorescent antibody and/or RT-PCR. RT-PCR assays are the test of choice for antemortem testing on oral swabs, blood, skin biopsies or urine samples. Immunohistochemistry on formalin-fixed tissues or FA on frozen sections provides definitive evidence of CDV infection. Vaccine virus may be differentiated from street virus by different target cell susceptibility, but sequencing of PCR products is the most definitive test to differentiate between vaccine and wild type viruses.

Relevant diagnostic laboratories: In the US, the Animal Health Diagnostic Center at Cornell, Michigan State Diagnostic Laboratory, and Colorado State Diagnostic Laboratory all routinely perform diagnostic tests for CDV. In Canada, biomaterials can be sent to Ontario Veterinary College. Other provincial laboratories in Canada should also be able to run CDV diagnostics.

Treatment: No specific therapy for animals with clinical canine distemper is available. Nonspecific treatment is supportive and includes fluids, antibiotics (for secondary bacterial infections), and medications to minimize CNS inflammation and seizure activity.

Prevention and control: Vaccination is the mainstay of prevention. In non-domestic species, recombinant vaccines are the safest. Exclusion of reservoir species from zoo sites, whenever possible, is important. Quarantine all animals suspected of being infected with CDV. Checking CDV titers should be used to monitor potentially naïve carnivores particularly when in quarantine before putting with others, or with breeding females to enhance pup titers.

Suggested disinfectant for housing facilities: CDV, being an enveloped virus, is fairly liable in the environment. Extremely susceptible to ultraviolet light, heat, desiccation, and common disinfectants (e.g., formaldehyde, ether, chloroform, phenolic compounds, and quaternary ammonium compounds.)

Notification: None required.

Measures required under the Animal Disease Surveillance Plan: Currently none.

Measures required for introducing animals to infected animal: Maintain infected animal in a quarantine situation until asymptomatic. May be necessary to cull some animals with residual CNS complications.

Conditions for restoring disease-free status after an outbreak: Clean infected environment with any of

CANINE DISTEMPER VIRUS

the common disinfectants. Vaccination of susceptible species is imperative. Vaccines available are modified live (MLV), killed and recombinant. MLV in species safe to vaccinate probably promotes life-long immunity but many vaccinal or vaccine-induced, infections have resulted from MLV vaccines in wildlife species. Currently the Purevax® Canine Distemper recombinant vaccine (by Merial) is recommended for non-domestic carnivore species.

Experts who may be consulted:

Edward J. Dubovi, PhD
Animal Health Diagnostic Center
Director – Virology Section
College of Veterinary Medicine at Cornell
Ithaca, NY 14853
Phone: 607-253-3923
Cell: 607-592-0575
ejd5@cornell.edu

Jean Paré, DMV, DVSc, DACZM
Global Health Program
Wildlife Conservation Society
2300 Southern Boulevard
Bronx, New York 10460
Phone: 718-741-1174
Fax: 718-220-7126
jpare@wcs.org

References:

1. Deem, S.L., L.H. Spelman, R.A. Yates, and R.J. Montali. 2000. A review of canine distemper virus in terrestrial mammals. *J. Zoo. Wildl. Med.* 31: 441-451.
2. Greene, C.E., and M.J. Appel. 1998. Canine Distemper. *In: Greene, C.E. (ed.). Infectious diseases of dogs and cats.* W.B. Saunders, Philadelphia, Pennsylvania. Pp. 9-22.
3. Kennedy, S. 1998. Morbillivirus infections in aquatic mammals. *J. Comp. Pathol.* 119: 201-225.
4. Meli, M.L., P. Simmler, V. Cattori, F. Martínez, A. Vargas, F. Palomares, J.V. López-Bao, M.A. Simón, G. López, L. León-Vizcaino, R. Hofmann-Lehmann, and H. Lutz, H. 2010. Importance of canine distemper (CDV) in free-ranging Iberian lynxes (*Lynx pardinus*). *Vet. Microbiol.* 146: 132-137.
5. Origgi, F.C., P. Plattet, U. Sattler, N. Robert, J. Casaubon, F. Mavrot, M. Pewsner, N. Wu, S. Giovannini, A. Oevermann, M.H. Stoffel, V. Gaschen, H. Segner, and M.P. Ryser-Degiorgis. 2012. Emergence of canine distemper virus strains with modified molecular signature and enhanced neuronal tropism leading to high mortality in wild carnivores. *Vet. Path.* 49(6):913-29.
6. Qiu, W., Y. Zheng, S. Zhang, Q. Fan, H. Liu, F. Zhang, W. Wang, G. Liao, and R. Hus. 2011. Canine distemper outbreak in rhesus monkeys, China. *E.I.D.* 17: 1541-1543.
7. Roelke-Parker, M.E., L. Munson, C. Packer, R. Kock, S. Cleaveland, M. Carpenter, S.J. O'Brien, A. Pospischil, R. Hofmann-Lehmann, H. Lutz, G.L.M. Mwamengele, M.N. Mgasa, G.A. Machange, B. Summers, and M.J.G. Appel. 1996. A canine distemper virus epidemic in Serengeti lions (*Panthera leo*). *Nature* 379: 441-445.
8. Williams, E.S. 2001. Canine distemper. *In: Williams, E.S., and I.K. Baker (eds). Infectious Diseases of Wild Mammals.* Iowa State University Press, Ames, Iowa. Pp. 50-59.