

## SEAL MORBILLIVIRUS INFECTIONS

ANIMAL GROUP AFFECTED	TRANSMISSION	CLINICAL SIGNS	FATAL DISEASE ?	TREATMENT	PREVENTION & CONTROL
<i>Phocidae, Odobenidae</i>	By aerosol, but also by contact with body fluids of shedders/ carriers, including asymptomatic species (harp, and potentially grey and hooded seals!)	Depend on species: in harbour, Caspian and Baikal seals pneumonia, immune suppression, death; in other species inapparent or mild disease	Yes (species-dependant)	Symptomatic	<i>In houses</i>  <i>in zoos</i> Hygienic and husbandry protocols

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<b>Susceptible animal groups</b> Harbour seal ( <i>Phoca vitulina</i> ) and, to a lesser extend, other phocid species and Atlantic walrus ( <i>Odobenus rosmarus rosmarus</i> ); Baikal seals ( <i>Phoca sibirica</i> ) and Caspian seals ( <i>Phoca caspica</i> ) are susceptible to canine distemper virus (CDV).	
<b>Causative organism</b> Phocine distemper virus (PDV), a morbillivirus of the familiy Paramyxoviridae, closely related to canine distemper (CDV, see there); the latter infects and causes epizootics in Baikal and Caspian seals.	
<b>Zoonotic potential</b> None.	
<b>Distribution</b> In the wild: northern Atlantic, including central and northern Europe, the North Sea, Subarctic and Arctic, North America; Asia (lake Baikal and Caspian Sea); occasional cases have occurred in zoos and aquaria in Europe and Japan.	
<b>Transmission</b> By aerosol, contact, body fluids; indirect carriers (humans) suspected.	
<b>Incubation period</b> Several days (in harbour seals suspected 3-6 days).	
<b>Clinical symptoms</b> In harbour, Caspian and Baikal seals: pneumonia, immune suppression, death of > 50% of infected animals; in other species varying between inapparent and mild disease, with only few (if any) deaths. Clinical disease is very similar to canine distemper in domestic dogs: severe general malaise, fever, oculonasal discharge (serous or mucopurulent), conjunctivitis, keratitis, coughing, severe dyspnoe, diarrhoea, abortion, CNS symptoms, subcutaneous edema in neck and thorax (leading to imbalance in water and inability to dive properly), death of 40-80% (in unprotected harbour seals); one harp and one hooded seal showed a dermatitis with crusts and alopecia positive for PDV (Lipscomb et al., 2001).	
<b>Post mortem findings</b> Bronchopneumonia (bronchointerstitial pneumonia with congestion, edema, serofibrinous exudation, proliferation of type II pneumocytes; syncytia are rare but pathognomonic, intranuclear or intracytoplasmatic inclusion bodies). Distemper-like lesions in CNS: neuronal necrosis, lymphocytic and plasmocytic perivascular cuffing, demyelination with astrocytosis, edema, syncytium formation, inclusion bodies in neurons and astrocytes. Most changes occur in cerebrum. Lymphoid depletion. Necrosis with viral inclusion bodies in epithelia of gastrointestinal and urinary tract. Immune fluorescence uses cross reaction with canine distemper antigen.	

**Diagnosis**

By clinical picture, serology (paired titers or high IgM titer), PCR and possibly virus isolation (no CPE!) or electronmicroscopy

**Material required for laboratory analysis**

Serum, organ samples (lung, lymphoid tissues, spleen, brain, bladder, stomach, etc.)

**Relevant diagnostic laboratories**

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**Treatment**

Symptomatic, including intravenous rehydration by infusion into the extradural vein; control secondary infections, including Herpes virus; experimentally: hyperimmune sera available for dog distemper might be useful

**Prevention and control in zoos**

Incidence of PDV in zoos is –so far- very low: hygienic measures and avoiding the import of the virus into the collection are of paramount importance. Keepers and others working close to seals should be instructed; visits to seal rehabilitation centers by zoo personnel should be made known to the zoo veterinarian and special instructions on adequate hygienic measures should exist; in times of epizootics, any visit to seal rehabilitation centers should be strictly controlled.

Since CDV may cause significant mortality in at least two seal species, visitors should either not be allowed to take dogs into the zoo, or the direct contact between seals and visiting dogs should be made impossible by exhibit design (no fences!)

Preventive vaccination is generally not used and might not be necessary in a typical zoo setting. Successful challenging experiments have been carried out with a canine distemper ISCOM vaccine (Visser et al., 1992); Several clinicians have successfully used commercial attenuated canine distemper vaccines (Carter et al., 1992, Hughes et al, 1992). Inactivated vaccines are not recommended (Visser et al., 1989) or not available.



<b>Suggested disinfectant for housing facilities</b> See CDV
<b>Notification</b>
<b>Guarantees required under EU Legislation</b>
<b>Guarantees required by EAZA Zoos</b>
<b>Measures required under the Animal Disease Surveillance Plan</b>
<b>Measures required for introducing animals from non-approved sources</b>
<b>Measures to be taken in case of disease outbreak or positive laboratory findings</b> Immediate isolation of all sick individuals, disinfection of the seal exhibit, vaccination of all phocids and walruses with an ISCOM-vaccine or a commercial canine distemper vaccine (see above); shedding of virus suspected for several weeks after overcoming clinical disease.
<b>Conditions for restoring disease-free status after an outbreak</b>
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<b>References</b> <u>Recommended reading:</u> <ol style="list-style-type: none"><li>1. Duigan, P.J. 1999. Morbillivirus infections of marine mammals. In: Zoo and Wild Animal Medicine: Current Therapy 4. Fowler, M.E. &amp; Miller, R.E. (Eds.), W.B. Saunders, Philadelphia, 497-501.</li><li>2. Kennedy, S. 1998. Morbillivirus infections in aquatic mammals. J. Comp. Pathol. 119: 201-225.</li><li>3. Kennedy-Stoskopf, S. 2001. Viral disease. In: CRC Handbook of Marine Mammal Medicine. 2<sup>nd</sup> edition. Dierauf, L.A., &amp; Gulland, F.M.D. (eds.). CRC Press, Boca Raton, pp. 296-298.</li></ol> <u>Literature cited:</u> <ol style="list-style-type: none"><li>1. Carter S.D., D.E. Hughes, V.J. Taylor, and S.C. Bell. 1992. Immune responses in common and grey seals during the seal epizootic. Sci Total Environ. 20; 115(1-2):83-91</li><li>2. Hughes D.E., S.D. Carter, I. Robinson, D.D. Clarke, and C.J. Clarke. 1992. Anti-canine distemper virus antibodies in common and grey seals. Vet Rec. 16; 130(20):449-50.</li><li>3. Lipscomb, T.P., M.G. Mense, P.L. Habecker, J.K. Taubenberger, and R. Schoelkopf. 2001. Morbilliviral dermatitis in seals. Vet. Pathol. 38: 724-726.</li><li>4. Visser I.K., E.J. Vedder, M.W. van de Bildt, C. Orvell, T. Barrett, and A.D. Osterhaus. 1992. Canine distemper virus ISCOMs induce protection in harbour seals (<i>Phoca vitulina</i>) against phocid distemper but still allow subsequent infection with phocid distemper virus-1. Vaccine 10(7):435-8.</li><li>5. Visser I.K., M.W. van der Bildt, H.N. Brugge, P.J. Reijnders, E.J. Vedder, J. Kuiper, P. de Vries, J. Groen, H.C. Walvoort, F.G. UytdeHaagl, and A.D. Osterhaus. 1989. Vaccination of harbour seals (<i>Phoca vitulina</i>) against phocid distemper with two different inactivated canine distemper virus (CDV) vaccines. Vaccine 7(6):521-6.</li></ol>