Morbillivirus

College of Veterinary Medicine

BASICS

Morbilliviruses are a genus of paramyxoviruses that cause significant disease outbreaks with high mortality rates in some marine mammals. Cetacean morbillivirus (CeMV) infects whales, dolphins, and porpoises, and phocine distemper virus (PDV) infects seals and sea lions.

CeMV and PDV are found around the world. Outbreaks and infections have been reported in numerous species of marine mammals, including grey seals, harbor seals, harp seals, bottlenose dolphins, killer whales, pilot whales, and sea otters, among others.

Like other morbilliviruses, CeMV and PDV are **HIGHLY INFECTIOUS** and spread by the respiratory route and direct contact. Virus is shed by infected animals in ocular and respiratory secretions, urine, feces, and sloughed skin. **TRANSMISSION** among seals is facilitated by close contact when large groups of seals haul-out onto shore. Dolphins, porpoises, and toothed whales may become infected by sharing exhaled air during synchronized surfacing.

Morbilliviruses cause **SEVERE SYSTEMIC DISEASE** of the respiratory, immune, and nervous systems, often leading to death. Immunosuppression can lead to secondary infections and death.

CLINICAL SIGNS differ between cetaceans and pinnipeds but may include difficulty breathing, eye inflammation, muscle tremors, incoordination, and lethargy. Skin lesions, appearing as irregular, slightly raised, discolored areas, may also be seen.

DIAGNOSIS of marine mammal morbillivirus infection is made by virus isolation, immunohistochemistry, or PCR analysis followed by genetic sequencing.

There is **NO TREATMENT** for morbillivirus infections in marine mammals, only supportive care.

MASS MORTALITY events resulting from morbillivirus infections are a serious threat to endangered species.

DETAILS

Marine mammal morbilliviruses are related to canine distemper virus in carnivores, rinderpest virus in cattle, and measles virus in humans. PDV and CeMV were discovered in the late 1980s during mass mortality events in seals and dolphins. Morbilliviruses have high host specificity and several strains of CeMV have been recognized and named for their hosts: dolphin morbillivirus (DMV), porpoise morbillivirus (PMV), pilot whale morbillivirus (PWMV), and beaked whale morbillivirus (BWMV).

In the United States, outbreaks of morbillivirus infections occur sporadically, resulting in hundreds to thousands of marine mammal deaths.

PDV was first reported in the US in 1992 when an outbreak occurred among harbor seals on Long Island. In 2006, an estimated 800 seals, including harbor seals, harp seals, hooded seals, and gray seals, were killed by PDV along the northeastern coast. Increased strandings of harbor and gray seals occurred along the New England coast in 2018-20 and were also attributed to PDV.

CeMV was first reported in the US in bottlenose dolphins along the Atlantic coast in 1987-88. Another outbreak in 2013-15 resulted in strandings of more than 1,600 dolphins along the Atlantic coast.

CLINICAL SIGNS Seals infected with PDV develop fever, oculonasal discharge, eye inflammation, coughing, difficulty breathing, diarrhea, and lethargy. Pockets of air may develop in the tissues of the neck and chest making it difficult for animals to dive.

CeMV-infected dolphins, porpoises, and whales exhibit poor body condition, abnormal breathing, weak vocalizations, muscle tremors, lethargy, and incoordination. Severe bilateral pneumonia is the most common symptom in cetaceans.

Antibodies to morbilliviruses have been found in walruses, manatees, sea otters, and polar bears indicating exposure to these viruses.

TRANSMISSION In addition to transmission by aerosol and direct contact, it is suspected that marine mammal morbilliviruses may also be transmitted from mother to offspring in utero or via milk. Females infected during pregnancy may abort their fetuses.

Morbilliviruses cause severe immunosuppression in infected animals making them susceptible to secondary bacterial, viral, fungal, and parasitic pathogens, such as herpesvirus, *Aspergillus* spp., and *Toxoplasma gondii*.

Infection by morbilliviruses induces lasting immunity in surviving animals, so maintenance of the virus within a population requires a steady source of new susceptible animals.

PRECAUTIONS AND PREVENTION Because there is no treatment for morbillivirus infection, prevention of infection is important. In marine mammals, exposed animals can be identified by serology. Animals introduced to a captive group should be quarantined before introduction and of the same serologic status as the captive animals.

To protect highly endangered Hawaiian monk seals, a vaccination program is underway. A recombinant canine distemper vaccine developed for ferrets is being given to wild monk seal pups to protect them against PDV.

Dolphins, like this short-beaked common dolphin (*Delphinus delphis*) that was submitted for necropsy, are susceptible to morbillivirus infections. Dolphin carcass recovered by the Marine Mammal Stranding Center under a stranding agreement with NOAA NMFS.