

Canine distemper (*hardpad disease*)

Canine distemper (sometimes termed *hardpad disease* in canine) is a **viral disease** that affects a wide variety of animal families, including domestic and wild species of dogs, coyotes, foxes, pandas, wolves, ferrets, skunks, raccoons, and large cats—though not **domestic cats** as well as pinnipeds, some primates, and a variety of other species.

In canines, distemper impacts several body systems, including the gastrointestinal and respiratory tracts and the spinal cord and brain, with common symptoms that include **high fever, eye inflammation and eye/nose discharge, labored breathing and coughing, vomiting and diarrhea, loss of appetite and lethargy, and hardening of nose and footpads**. The viral infection can be accompanied by secondary bacterial infections and can present eventual serious neurological symptoms.

Etiology

Canine distemper is caused by a single-stranded **RNA virus** of the family **paramyxovirus** (the same family of the distinct virus that causes **measles** in humans).

Epidemiology

- 1-The disease is highly contagious via inhalation and fatal 50% of the time
- 2-Despite extensive vaccination in many regions, it remains a major disease of dogs,
- 3- The virus, a single-stranded negative RNA, can cause systemic infection in the host carnivore.
- 4- Puppies from three to six months old are particularly susceptible.
- 5- CDV spreads through aerosol droplets and through contact with infected bodily fluids, including nasal and ocular secretions, **feces**, and **urine**, six to 22 days after exposure.
- 6- It can also be spread by food and water contaminated with these fluids. leading cause of infectious disease death in dogs.
- 7 - The time between infection and disease is 14 to 18 days, although a fever can appear from three to six days after infection .
- 8- The **virus** is destroyed in the environment by routine cleaning with disinfectants, detergents, or drying. It does not survive in the environment for more than a few hours at room temperature (20–25°C), but can survive for a few weeks in shady environments at temperatures slightly above freezing. It, along with other labile viruses, can also persist longer in serum and tissue debris.

Pathogenesis

Canine distemper virus tends to orient its infection towards the [lymphoid](#), [epithelial](#), and [nervous tissues](#).

The virus initially replicates in the lymphatic tissue of the respiratory tract. The virus then enters the blood stream and infects the [respiratory](#), [gastrointestinal](#), [urogenital epithelial](#), and [central nervous systems](#), and [optic nerves](#).

transmission and Pathogenesis

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Virus is engulfed by cells of the immune system called "macrophages." The idea is that the virus will be engulfed, walled off within the cell and then destroyed by enzymes. Unfortunately for the new host, this process does not damage the virus as intended; instead, the virus is able to use the macrophage as a means of transportation through the host's body. Within 24 hours, the virus has traveled to the lymph nodes of the lung. By the 6th day, the virus has migrated to the spleen, stomach, small intestine, and liver. Fever is developing at this point.

By day 8 or 9 an important crux is reached in the timetable of infection. The host is mounting an immune response during this time and the outcome depends on how fast and how well this is accomplished.

A strong immune response begins to clear the virus at this point and has eliminated all traces of virus with no symptoms of illness by Day 14. A weak immune response allows the virus to reach the "epithelial cells," the cells which line every interface the body has with the outside world. The tender epithelial cells lining the chambers of the brain are infected as well. The host begins to get sick as the virus spreads but as the host's immune response grows symptoms wane. This phenomenon accounts for the wide variability in symptoms; some dogs get only a few mild symptoms while others get a full lethal combination.

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Therefore, the typical pathologic features of canine distemper include lymphoid depletion (causing [immunosuppression](#) and leading to secondary infections), interstitial [pneumonia](#), [encephalitis](#) with [demyelination](#), and [hyperkeratosis](#) of the nose and foot pads.

The mortality rate of the virus largely depends on the immune status of the infected dogs. Puppies experience the highest mortality rate, where complications such as [pneumonia](#) and [encephalitis](#) are more common.

In older dogs that develop distemper [encephalomyelitis](#), [vestibular disease](#) may present.

Around 15% of canine inflammatory central nervous system diseases are a result of CDV.

Clinical signs

- The time between infection and disease is 14 to 18 days, although a fever can appear from three to six days after infection.

The virus first appears in bronchial lymph nodes and tonsils two days after exposure. The virus then enters the blood stream on the second or third day.

A first round of acute fever tends to begin around three to eight days after infection, which is often accompanied by a low white blood cell count, especially of lymphocytes, as well as low platelet count.

-These signs may or may not be accompanied by anorexia, a runny nose, and discharge from the eye. This first round of fever typically recedes rapidly within 96 hours, and then a second round of fever begins around the 11th or 12th day and lasts at least a week.

-Gastrointestinal and respiratory problems tend to follow, which may become complicated with secondary bacterial infections.

- Inflammation of the brain and spinal cord, otherwise known as encephalomyelitis, either is associated with this, subsequently follows, or comes completely independent of these problems.

A thickening of the footpads sometimes develops, and vesicular-pustular lesions on the abdomen usually develop.

- Neurological signs typically are found in the animals with thickened footpads from the virus. About half of sufferers experience meningoencephalitis.

Gastrointestinal and respiratory signs:

Commonly observed signs are a runny nose, vomiting and diarrhea, dehydration, excessive salivation, coughing and/or labored breathing, loss of appetite, and weight loss. When and if the neurological signs develop, incontinence may ensue

Neurological signs

The signs within the central nervous system include a localized involuntary twitching of muscles or groups of muscles, seizures often distinguished by salivation, and jaw movements commonly described as "chewing gum fits", or more appropriately as "distemper myoclonus".

The animal may also show signs of sensitivity to light, incoordination, circling, increased sensitivity to sensory stimuli such as pain or touch .

-Less commonly, they may lead to blindness and paralysis.

-The length of the systemic disease may be as short as 10 days, or the start of neurological signs may not come until several weeks or months later. Those few that survive usually have a small tic or twitch of varying levels of severity. With time, this tic will usually diminish somewhat in its severity.

Differential Diagnosis :

1-canine [hepatitis](#),

2- [herpes](#) virus,

3- [parainfluenza](#)

4-[leptospirosis](#).

Diagnosis

-Thus, finding the virus by various methods in the dog's conjunctival cells gives a definitive diagnosis.

-An additional test to confirm distemper is a [brush border](#) slide of the bladder transitional epithelium of the inside lining from the bladder, stained with Dif-Quick. These infected cells have inclusions which stain a carmine red color, found in the [paranuclear cytoplasm](#) readability. About 90% of the bladder cells will be positive for inclusions in the early stages of distemper.

In older dogs that develop distemper encephalomyelitis, diagnosis may be more difficult, since many of these dogs have an adequate vaccination history.

Treatment

There is no specific treatment for the canine distemper. As with measles, the treatment is symptomatic and supportive.

Rx
1-Vitamin A supplements

2-The distemper virus was observed to be susceptible to ribavirin *in vitro*, and 0.02 to 0.05 micromols are needed .

2- If the patient has pneumonia, antibiotics are used on the secondary bacterial infections. Airway dilators are used as needed. Physical therapy is used to promote cough.

3-If the patient has diarrhea, intravenous fluids are used to prevent dehydration .

4-Neurologic distemper is particularly difficult to treat. Still, it is possible for dogs to recover with livable deficits even from neurodistemper; **euthanasia is best left for progressive**, incapacitating neurologic symptoms.

Prevention

-A number of **vaccines** against canine distemper exist for **dogs** which in many jurisdictions are mandatory for pets.

- Infected animals should be **quarantined** from other dogs for several months owing to the length of time the animal may shed the virus..

- Puppies are vaccinated beginning at age 6-8 weeks and then every 2 to 4 weeks thereafter until age 16 weeks. The next vaccine is one year later. After that subsequent vaccination boosters are given every 1 to 3 years.

THE VIRUS ITSELF

The canine distemper virus is closely related to the human measles virus and, in fact, in older times, puppies were immunized for distemper with vaccine against measles. It has been said that a child in the home of a dog vaccinated with live distemper virus vaccine will become exposed to the virus and immunized against the measles (though we do not recommend such experiments at home).

The distemper virus consists of a single strand of RNA, encased in a protein coat which is again encased in a fatty envelope. This sounds esoteric but the fatty envelope makes all the difference in the world. The fatty envelope is easily disrupted in the environment which makes it impossible for infectious virus to persist in the environment. Because an intact fatty envelope is required for infection, virus transmission must involve dog to dog contact or at least contact with extremely fresh (less than 30 minutes old at 60 degrees and up to 3 hours old at room temperature) infected body secretions. As with other viruses, living virus happily freezes and can survive for years if kept frozen and protected from light. Routine disinfection and cleaning readily kills the distemper virus in the kennel setting.