

# Canine Parvovirus

Canine parvovirus (CPV) is a highly contagious viral disease of dogs that commonly causes acute gastrointestinal illness in puppies. The disease most often strikes in pups between six and 20 weeks old, but older animals are sometimes also affected. A rare variant of the disease may be seen in very young (neonatal) puppies is myocarditis (an inflammation of the heart muscle).

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## Cause

### *What causes parvovirus infection?*

The virus that causes the disease known as “parvo”, canine parvovirus type 2 (CPV), first emerged among dogs in Europe around 1976. By 1978 the virus had spread unchecked, causing a worldwide epidemic of myocarditis and inflammation in the intestines (gastroenteritis). We now know the virus is not limited to dogs, but is capable of causing infections in wild canines such as coyotes and wolves, and other wild animals, including foxes, raccoons and skunks. CPV is closely related to feline panleukopenia virus (FPV), a virus that has been known since the 1920s to infect cats and mink and other animals. CPV probably arose as the result of 2 or 3 genetic mutations in FPV that allowed it to expand its host range to infect dogs.

Three decades after its first appearance, CPV strikes puppies with deadly disease much less frequently due to the development of effective vaccines in the late 1970s, but outbreaks still occur frequently, and vaccinating your dog is of the utmost importance. Puppies and adolescent dogs are especially susceptible to parvovirus, and you should avoid bringing your puppy to public places where there is likely to be lots of virus (animal shelters and kennels) until after their vaccinations are complete.

### *Why and how might my dog become infected?*

Canine parvovirus can be found in almost any environment, but not every dog who comes into contact with the virus becomes infected. Several factors come into play in infection, including the immune status of the dog and the number of viruses the dog is exposed to. If the combination of factors is just right and a dog does become infected, a specific sequence of events is begun as the virus attacks the body.

### *What happens during infection?*

Once a dog or puppy is infected, there is an incubation period of three to seven days before the

onset of first symptoms. Inside the dog, CPV needs the help of rapidly dividing cells in order to successfully cause disease, and the virus usually begins by attacking the tonsils or lymph nodes of the throat. Once inside the lymph nodes, the virus typically invades lymphocytes (a type of white blood cell) for one or two days, creating many copies of itself. These viruses hitch a ride inside the lymphocytes, where they are sheltered from the host defenses, and enter the bloodstream. Many of these CPV-infected lymphocytes are ultimately killed, causing a reduction in the number of circulating lymphocytes, a condition called lymphopenia.

Once in the bloodstream, the virus again targets rapidly dividing cells, hitting hardest in the bone marrow and in the cells that line the walls of the small intestine. In very young dogs, CPV can also infect the heart, leading to inflammation of heart muscle, poor function, and arrhythmias.

In the bone marrow, the virus weakens the body's ability to protect itself by destroying young immune cells and causing a drop in the protective white blood cell count. This probably makes it significantly easier for the virus to invade the gastrointestinal tract, where the virus does its worst damage.

The virus causes this destruction by targeting the epithelium of the small intestine, the lining that helps to absorb nutrients and provides a crucial barrier against fluid loss and bacterial invasion from the gut into the body. The cells that make up the epithelial surface are short-lived and are replaced continually by new cells born in the rapidly-dividing areas known as the crypts of Lieberkühn. The virus invades these crypts where new epithelial cells are born and disables the body's ability to replenish the intestinal surface.

By preventing the replacement of old and dying cells with fresh new cells, the virus leaves the intestinal surface unable to adequately absorb nutrients, prevent fluid loss into the stool, or prevent bacteria from moving from the gut into the body. Severe diarrhea and nausea are the initial result, but eventually the intestinal surface can become so damaged that it begins to break down, and the bacteria that are normally confined to the gut penetrate the intestine walls and enter the bloodstream. This causes both significant fluid loss from diarrhea and widespread infection inside the body. To make matters worse, the body's immune system is already weakened, as its ability to produce new white blood cells to combat infection has been hampered by the invasion of CPV into the bone marrow. CPV is not always fatal, but when it does kill, death is as a result of either dehydration and shock, along with the effects of septic toxins produced by the intestinal bacteria roaming throughout the bloodstream.

## **Symptoms and complications**

Symptoms often associated with CPV include lethargy, depression, and loss or lack of appetite, followed by a sudden onset of high fever, vomiting, and diarrhea. If your dog is experiencing bouts of bloody diarrhea and/or vomiting, CPV is only one of several potential culprits. Your veterinarian can run several tests to help determine whether your dog is infected with CPV.

## **Tests and diagnosis**

### ***How will my vet diagnose CPV?***

By far the most common and most convenient method of testing for the presence of CPV is the fecal ELISA test. ELISA is an acronym for enzyme-linked immunosorbent assay, a technology is similar