# Canine Parvovirus and the Canine Parvovirus Monoclonal Antibody

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Canine parvovirus (CPV) is a highly contagious disease first recognized in the 1970s. Despite broadly available and effective vaccines, it remains dangerous for dogs today. Young puppies and dogs that have not been vaccinated are the most likely to contract CPV, as well as those with a weakened immune system. Transmission of CPV occurs via direct contact (dog to dog) or, commonly, through indirect exposure to environments, objects, etc., that have been contaminated with infected feces. Parvovirus is a very hardy virus, able to survive for months outside of an animal in the environment. The virus is resistant to extremes of temperature and humidity, and many common household cleaning products do not destroy it. Because a dog infected with CPV sheds a huge number of virus particles into the environment, another dog can be unknowingly exposed by visiting an area after an infected dog. Additionally, an infected dog can continue to shed viral particles for two weeks after the resolution of their clinical signs.

When a vulnerable dog is initially infected with CPV by ingesting the virus, there is an incubation period of ~3 days to 1 week before clinical signs are noted. During this time, the virus replicates in oropharyngeal and mesenteric lymph nodes, invading lymphocytes and spreading CPV elsewhere in the animal through the bloodstream. Then, CPV infects rapidly dividing cells from the bloodstream, notably those of the small intestinal epithelium and the bone marrow. The virus binds to the transferrin protein receptor on the cell's surface to enter cells.

The main clinical signs of CPV result from the injury to these rapidly dividing cells that the virus targets. Damage to the small intestinal epithelium results in a breakdown of the blood-intestinal barrier, an essential barrier preventing fluid loss through the GI tract and bacterial translocation from the GI tract into the bloodstream. It also prevents the absorption of nutrients and results in gastrointestinal bleeding. The

small intestinal epithelium in a healthy dog is continuously being replaced with new cells made in the crypts of Lieberkühn, but CPV prevents these new cells from being made. Meanwhile, CPV destroys the developing immune cells in the bone marrow, eventually resulting in decreased white blood cell counts. Clinical signs include anorexia, lethargy, profound vomiting and diarrhea, gastrointestinal bleeding, dehydration, and progressing to hypovolemic shock. They can progress to include infection and sepsis secondary to bacteria crossing the blood-intestinal barrier into the bloodstream.

Historically, treatment of CPV has been essentially supportive care and symptomatic treatment, with many patients developing clinical signs to the point that they require hospitalization. For dogs that are hospitalized, many will need more than three days in the hospital, which is a significant financial burden for the patient's family. The mainstays of treatment have been aggressive IV fluids, anti-emetics, analgesics, antibiotics to address secondary infections, and nutritional support. Ultimately, treatment has essentially supported the patient while the virus "runs its course."


In 2023, a targeted canine parvovirus monoclonal antibody (CPMA) became commercially available through USDA conditional approval. The CPMA is a chimeric antibody, meaning it has portions from two species: a dog constant region and a rat variable region. The rat variable component is the part of the CPMA that interacts with CPV; the CPMA rat variable portion binds to a location on CPV that would typically bind to the transferrin receptor on a host cell. With this CPV location blocked, the CPV cannot bind to the transferrin receptor and thus cannot enter the host cell. If CPV cannot enter cells, those cells will not be damaged, preventing adverse clinical sequelae.

Studies performed on CPMA have demonstrated that patients receiving CPMA had a quicker resolution of clinical signs, which can translate into a shorter hospitalization and prevent complications. In an efficacy study on puppies testing positive for CPV, those treated with CPMA versus a control group had a faster resolution of severe diarrhea, vomiting, fever, inappetence, and lymphopenia. Additionally, there was 0% mortality in the CPMA group versus 57% mortality in the control group. It also appears that dogs testing positive for CPV treated with CPMA shed less parvovirus in their feces within days of treatment, which could decrease the amount of CPV in the environment, which is of note given how resilient CPV is. In a study of 147 healthy dogs administered CPMA, it was well tolerated, with no anaphylactic reactions reported. 4% of these healthy dogs developed injection site reactions, which was the most common adverse reaction recorded.

CPMA is labeled for use in dogs at least eight weeks or older. It is dosed at 0.2 mL/kg and administered intravenously. CPMA is delivered frozen and must be kept frozen until use (stored at less than or equal to 5° F). When ready to be used, it should be thawed at room temperature and then administered

immediately. CPMA is only administered once to a patient, and it should be administered as early as possible in an affected patient, as blocking CPV from entering host cells will slow the effects of the virus. In a patient severely affected by CPV, administering CPMA may not help significantly, as CPV has already entered cells and caused the damage, resulting in observable clinical signs. It is also important to note that patients treated with CPMA should continue to be treated with all the other supportive measures used historically to treat CPV patients. CPMA is an addition to our treatment options but does not replace the existing mainstays of treatment.

Canine parvovirus is a disease that we treat with regularity, and it is exciting to have a targeted treatment for it beyond symptomatic and supportive care. Since CPMA is a newly available treatment option, there is little clinical experience. It has the potential to decrease the significant morbidity, mortality, financial burden, and emotional burden of treating dogs with CPV.