CANINE PARVOVIRUS INFECTION

BASICS

OVERVIEW

- Canine parvovirus (CPV) infection is characterized clinically by lack of appetite, vomiting, diarrhea, and weight loss; severe disease may result in generalized bacterial infection (known as "sepsis"), presence of bacterial toxins in the blood (known as "endotoxemia"), blood clotting disorder (known as "disseminated intravascular coagulopathy" or "DIC"), and acute respiratory distress syndrome (ARDS)
- The original canine parvovirus underwent genetic alterations, developing into CPV-1 and CPV-2; CPV-2 developed further into CPV-2a in 1980 and CPV-2b in 1984
- Most severe disease is associated with CPV-2b
- CPV-1 may cause unmanageable, usually fatal diarrhea in newborn puppies
- Recently CPV-2b has shown mutation into a variant form designated Glu426

GENETICS

- Unknown

SIGNALMENT/DESCRIPTION of ANIMAL

Species

- Dogs
- Cats—can be infected with CPV-2b

Breed Predilections

- Rottweilers, Doberman pinschers, pit bulls, Labrador retrievers, German shepherd dogs, English springer spaniels, Alaskan sled dogs are considered to be more susceptible to canine parvovirus infection than are other breeds of dog

Mean Age and Range

- Most cases are seen between 6 weeks and 6 months of age
- More severe disease is seen in younger puppies
- Incidence has decreased dramatically with vaccination of puppies against parvovirus

SIGNS/OBSERVED CHANGES in the ANIMAL

- Loss of energy, sluggishness (lethargy), lack of appetite (anorexia), vomiting, and profuse diarrhea with rapid, severe weight loss
- Rapid heart rate (tachycardia)
- Moist tissues of mouth and eyes (mucous membranes) may be pale or deep red, due to the blood vessels being filled with blood (injected), or yellowish (icteric)
- Dehydration
- Pain or discomfort when the veterinarian feels the abdomen (known as "abdominal palpation")
- Intestines may be fluid filled, or rarely, the veterinarian may detect the folding of one segment of the intestine into another segment (known as "intussusception")
- May have a fever or the body temperature may be lower than normal (hypothermia)
- May exhibit vomiting/diarrhea in the examination room

CAUSES

- CPV-2b (Canine Parvovirus-2b) infection

RISK FACTORS

- Breed predisposition as listed under "Breed Predilection"
- Possible simultaneous conditions, diseases or drug therapy that lead to an inability to develop a normal immune response (known as "immunosuppression"), such as heavy parasitism
- Incomplete vaccination protocol, vaccine failure, or normal interference of the puppy developing protective antibodies due to the presence of maternal antibodies
- Breeding kennels, pounds, shelters, and areas with a high number of puppies without adequate immune response or inadequately vaccinated puppies

TREATMENT

HEALTH CARE

- Hospitalization for intensive therapy and supportive treatment significantly improves survival
- Hospitalized cases must be kept isolated from other patients; hospital personnel must follow proper cleaning and disinfecting practices to prevent spread of the virus

- Intravenous fluid therapy is a mainstay of treatment; fluid rates must account for maintenance needs plus ongoing losses, which may be profound due to vomiting and diarrhea
- Colloid therapy (using certain fluids with larger molecular weight substances than found in typical IV fluids to expand the plasma volume) may be necessary in patients with low levels of albumin (a protein) in the blood (condition known as "hypoalbuminemia")
- Transfusions with plasma or hyperimmune serum may be used

ACTIVITY

- Activity should be restricted until puppies are recovering

DIET

- Food and water should be withheld if vomiting
- Small amounts of water may be introduced after 24 hours with no vomiting
- Nutrition utilizing some type of feeding tube (known as "enteral or microenteral nutrition") should be considered in cases with lack of appetite (anorexia) of 3 to 4 days' duration; early enteral nutrition may improve clinical outcome
- Providing nutrition via intravenous therapy (known as "parenteral nutrition") may be required in severe cases
- Glutamine supplementation has been shown to improve the health of intestinal cells
- A bland, easily digestible diet (such as Hill's Prescription Diet® i/d®, Purina Veterinary Diets® EN®) should be fed initially, with gradual transition to the normal ration

SURGERY

- The only surgical indication is for treatment of the rare complication of intestinal intussusception (the folding of one segment of the intestine into another segment)

MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

- Drugs to stop vomiting (antiemetics)—very frequently needed due to prolonged vomiting; examples include metoclopramide; phenothiazines, such as promethazine; serotonin receptor antagonists, such as ondansetron
- H_2-blockers—may reduce nausea; such as cimetidine; ranitidine; famotidine
- Antibiotics—to combat generalized bacterial infection (sepsis); should have spectrum to include gram-negative organisms
- Medications (known as "anthelmintics") to eradicate intestinal parasites
- Pain relievers (analgesics)—may be needed in severe cases
- Anecdotal reports describe the use of equine endotoxin antiserum; no controlled studies demonstrate a survival benefit with this therapy
- Recent studies have shown no survival benefit in using granulocyte colony-stimulating factor, anti-tumor necrosis factor (antiTNF), or recombinant bactericidal/permeability–increasing protein ($rBPI_{21}$)
- Activated protein C and interferon (IFN) Ω may be promising future treatment options
- Less severely affected puppies may be managed on an outpatient basis with fluids administered under the skin (subcutaneous) and/or into the abdominal cavity (intraperitoneal), if owner has financial constraints

FOLLOW-UP CARE

PATIENT MONITORING

- Aggressive therapy improves survival, but mortality rates may still approach 30%.
- If the puppy recovers, recovery is typically complete; immunity following canine parvovirus infection is long term and may be lifelong

PREVENTIONS AND AVOIDANCE

- Vaccination against canine parvovirus has been effective at drastically reducing disease incidence
- Modified live (high-titer) vaccines are recommended for puppies to minimize interference from maternal antibodies
- Interference from maternal antibodies is the main reason for vaccine failure; some puppies may have maternal antibodies present in their blood for up to 18 weeks of age
- Protocols recommend vaccinating at 6, 9, and 12 weeks of age
- High-risk breeds may require a longer initial vaccination protocol against canine parvovirus, extending up to 22 weeks of age
- Recent studies indicate immunity may last 3+ years after completion of the initial vaccine protocol

POSSIBLE COMPLICATIONS

- Generalized bacterial infection (sepsis)
- Presence of bacterial toxins in the blood (endotoxemia)
- Shock

- Intussusception (the folding of one segment of the intestine into another segment)
- Blood clotting disorder (disseminated intravascular coagulopathy or DIC)
- Acute respiratory distress syndrome (ARDS)

EXPECTED COURSE AND PROGNOSIS

- Mortality is primarily due to the presence of bacterial toxins in the blood (endotoxemia)
- Aggressive therapy improves survival, but mortality rates may still approach 30%

KEY POINTS

- Canine parvovirus is very stable in the environment, but may be destroyed by use of 1:30 bleach solution
- Vaccine does not produce immediate immunity, so susceptible puppies should be kept isolated
- Mortality is primarily due to the presence of bacterial toxins in the blood (endotoxemia)
- Aggressive therapy improves survival, but mortality rates may still approach 30%