

CANINE PARVO VIRUS

Introduction:

Canine parvovirus (CPV) is a highly contagious viral disease of dogs that commonly causes acute **Gastrointestinal Illness in Puppies**. The disease mostly strikes in pups between **Six and 20 weeks** old, but older animals may also be affected. A rare variant of the disease, causing **MYOCARDITIS** (an inflammation of the heart muscle) may be seen in very young (neonatal) puppies.

Etiology:

Disease is caused by CANINE PARVO VIRUS – 2 and the Parvoviruses are the **SMALLEST VIRUSES** of vertebrates. Single-stranded (DNA) Parvoviruses replicate inside the Nucleus and are Cytocidal. Unique feature of parvoviruses is that they depend on Cell Proliferation for viral DNA synthesis to occur. This restricts lesions to those tissues in which **cells are undergoing mitosis**, and explains the difference in cell tropism seen in foetal, neonatal, and adult animals. Inclusion bodies (if present) are **Intranuclear**.

Spread:

Canine parvovirus is a highly contagious virus that can affect all dogs, but unvaccinated dogs and puppies younger than 4 months (16 weeks) old are the most at risk. It spread by direct dog-to-dog contact and contact with contaminated feces (stool), environments, or people. The virus can also contaminate kennel surfaces, food and water bowls, collars and leashes, and the hands and clothing of people who handle infected dogs.

Pathogenesis:

Once a dog is infected, **Incubation period of 3-7 Days** is there before onset of first symptoms. CPV requires rapidly dividing cells, that virus usually begins by attacking the tonsils or lymph nodes of the throat. Once inside lymph nodes, the virus typically invades & multiplies in Lymphocytes. Inside the Lymphocytes, virus is protected from host defenses and enters the bloodstream. Many lymphocytes are ultimately killed, causing **Lymphopenia**. The virus further targets rapidly dividing cells, **mainly Bone Marrow and Cells on the walls of Small Intestine** (Crypts of Lieberkuhn in Intestinal Villi). In very young dogs, CPV can also infect the heart, leading to Myocarditis.

In the Bone Marrow, virus damages WBC lineages and causes immunosuppression that further make easier for virus, to invade the gastrointestinal tract, where it causes worst damage. Damage to epithelium hampers absorption of nutrients, fluid loss and secondary bacterial invasion.

Signs & Symptoms:

Clinical signs of Parvoviral **Enteritis** generally develop within 5–7 days but can range from 2–14 days. Initial clinical signs may be non-specific, like **Lethargy, Depression, Fever, Anorexia** with progression to **vomiting** and **hemorrhagic small-bowel diarrhoea** within 24–48 hr leading to **Dehydration**, and Intestinal loops that are dilated and fluid filled.

Severely affected animals may Collapse with **prolonged capillary refill time, poor pulse, tachycardia, and hypothermia**—signs closely similar to **septic shock**. CNS signs are more due to hypoglycemia, sepsis, or acid-base and electrolyte abnormalities.

LESIONS:

The CPV virus is almost identical to feline panleukopaenia virus, but causes disease only in dogs. The infection produces two different clinico-pathological forms of the disease:-

- 1) **Intestinal Form**, which is the main form, and
- 2) **Cardiac Form**, is rarely seen

Intestinal Form

This form occurs in **Dogs of All Ages**, but is most severe in dogs **older than 6 weeks**. It is characterized by vomiting, diarrhoea, and dehydration. There may be fever and leukopaenia.

Gross lesions include Thickened and Discolored Intestinal Wall; Watery or Mucoid or Hemorrhagic Intestinal contents; Edema and Congestion of Abdominal and Thoracic Lymph Nodes; Thymic Atrophy. *Microscopically*, there is a **Necrotizing Enteritis** of the Small Intestine like that of feline panleukopaenia, with dilated crypts and regeneration of epithelium. **Multifocal Necrosis of the Crypt Epithelium, Loss of Crypt architecture, and Villous Blunting (shortening) and Sloughing are characteristic**. Depletion of lymphoid tissue and cortical lymphocytes (Peyer's patches, peripheral lymph nodes, mesenteric lymph nodes, thymus, spleen) and bone marrow hypoplasia are also seen.

Intranuclear inclusion bodies are found in intestinal epithelial cells (in Crypts) with panleukopaenia. The lymphopaenia and neutropaenia results from necrosis of precursor cells. The signs and lesions of intestinal form may occur together with Cardiac form.

Lesions in lymphoid Organs resemble those seen in feline panleukopaenia. In the beginning, lymph nodes are oedematous and hyperaemic, and histiocytes proliferate. This is followed by necrosis of lymphocytes in follicular and paracortical regions in lymph

nodes, the Malpighian corpuscles of the spleen, the cortex of the thymus, and Peyer's patches.

Cardiac Form (canine myocarditis)

The cardiac form is confined to **Puppies of 2-8 weeks of Age, i.e., in very younger Dogs**. This form may exist with, or without, signs or lesions in the small intestine. Clinically, death may be sudden, or follow a brief period of dyspnoea and sometimes signs of enteritis.

Characteristic gross lesion is **Myocarditis**, that appears as **Pale Streaks in the Myocardium**. Microscopically, there are **multiple foci of Myocardial Necrosis** associated with a mononuclear cellular infiltration. Myocardial cells often contain intranuclear inclusion bodies in muscle fibres. At times, Vascular endothelium is severely affected, causing the lesions to be haemorrhagic. Lungs may be oedematous, most likely secondary to the heart failure. The age dependence of the myocardial infection is probably due to the active cell division of the myocardial cells in pups only under 15 days of age.

At times, Pulmonary edema, alveolitis, and bacterial colonization of the lungs and liver may be seen in dogs that die of complicating acute respiratory distress syndrome, systemic inflammatory response syndrome, endotoxemia, or septicemia. The CPV in Neonates may cause generalized infection with necrotizing lesions and inclusion bodies in tissues (other than the gastrointestinal tract and heart), such as brain, liver, lungs, kidneys and adrenal cortex.

Diagnosis

- Earliest indicative diagnosis is based on **Signs and Lesions**. The myocardial form is typical, but the intestinal form can be confused with other causes of enteritis, such as coronavirus infection. The latter is usually not milder clinically, and is not associated with leukopaenia, or significant necrosis of intestinal epithelium.
- Important field test for CPV infection is **Faecal ELISA Test**;
- Infections can be confirmed PCR from **Faecal Samples**.

Bovine Parvovirus Infection

Although the Bovine parvovirus is widely distributed and infection is common, bovine parvovirus rarely causes serious disease. Oral infection of **newborn calves** results in **mucoid to watery diarrhoea** in 24-48 hours. Intestinal cells of all levels become infected, but those of the small intestine are most clearly involved. Lesions are similar to those seen in feline panleukopaenia, but less severe.

Porcine Parvovirus Infection

The main effects of the Porcine parvovirus are on Reproduction. It causes **intrauterine death of foetuses**. Infected pig **FOETUSES** undergo **maceration** (softening into fluid, liquefaction) or **mummification** (drying and shrivelling), but are **NOT usually expelled prematurely**. So, Abortions are very Rare. The only noticeable sign of infection may be infertility.