

Parvoviridae

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Introduction

- Name derived from latin word “**Parvus**”- means “small”
- Parvoviruses are causative agents of several important animal diseases
- 2 subfamilies-
 - *Parvovirinae* - viruses of vertebrates, 8 genera
 - *Densovirinae*-viruses of insects/other invertebrates

Characteristics

- Small DNA virus, Genome-SS, linear, positive-sense or negative-sense
- Icosahedral symmetry and composed of 60 protein subunits
- Non-enveloped
- Resistant to: lipid solvents, pH 3 to 9, heating at 56°C for > 60 min.
- inactivated by formalin, β -propiolactone, sodium hypochlorite
- Remain viable in fomites for long time
- Site of replication of virus- Nucleus

Characteristics:

- Infection leads to large intranuclear inclusion bodies
- have haemagglutinating activity (except Aleutian mink disease virus and goose parvovirus) and used for identification.
- majority of pathogenic animal parvoviruses are included in the genus *Protoparvovirus*
- Shed in large numbers in faeces

- require mitotically active cells to replicate their DNA
- some parvoviruses show tropism for rapidly dividing cells
(hemopoietic precursors, lymphocytes, progenitor cells of intestinal mucosal lining)
- mitotically active cells in specific tissues in early life confers age-dependent susceptibility to several parvovirus diseases.

Subfamily *Parvovirinae*

08 genera:

1. <i>Amdoparvovirus</i>	5. <i>Dependoparvovirus</i>
2. <i>Aveparvovirus</i>	6. <i>Erythroparvovirus</i>
3. <i>Bocaparvovirus</i>	7. <i>Protoparvovirus</i>
4. <i>Copiparvovirus</i>	8. <i>Tetraparvovirus</i>

- *Dependoparvovirus* also includes adeno-associated viruses of mammals that need the presence of a helper virus for their efficient replication.

Viruses of Veterinary importance in subfamily Parvovirinae

Genus	Virus
<i>Protoparvovirus</i>	Feline panleukopenia virus Mink enteritis virus Canine parvovirus 2 Porcine parvovirus Parvoviruses of rodents Rabbit (lapine) parvovirus
<i>Amdoparvovirus</i>	Aleutian mink disease virus
<i>Aveparvovirus</i>	chicken and turkey parvoviruses
<i>Bocaparvovirus</i>	Bovine parvovirus Canine minute virus (canine parvovirus 1)/ canine bocavirus)
<i>Dependoparvovirus</i>	Goose parvovirus Duck parvovirus

Parvoviruses of veterinary significance

Virus	Host	Disease
Bovine Parvovirus	Bovine	Diarrhea in calves
Canine parvovirus 1 (Minute canine virus)	Dogs	subclinical enteric infection
Mink enteritis virus	Mink	Generalized disease analagous to feline panleukopenia
Goose parvovirus (goose plague virus)	Geese	Highly contagious, fatal disease of goslings (Derzsy's disease): hepatitis, myositis, including myocarditis
Aleutian mink disease virus	Mink, ferrets	Chronic, progressive disease, Persistent viraemia, immune complex-related lesions
Porcine parvovirus	Pigs	stillbirths, mummification, embryonic deaths and infertility (SMEDI syndrome)
Feline panleukopenia virus	Domestic and wild cats	systemic & enteric disease (Panleukopenia, enteritis)
Canine parvovirus 2	Dogs	Panleukopenia-enteritis syndrome, myocarditis in pups (now rare)

Feline panleukopenia

- also known as
 - feline infectious enteritis
 - feline distemper
- predominantly in young recently-weaned kittens
- Fleas and humans may act as mechanical vectors.
- Infection through ingestion or inhalation

Pathogenesis

- replication occurs in lymphoid tissues of oropharynx and associated lymph nodes.
- destruction of cells of intestinal crypts and lymphopoietic cells of bone marrow, thymus, lymph nodes and spleen.
- results in panleukopenia and villous atrophy.

Clinical signs

- I.P. - 4-5 days.
- **Subclinical infection-**
- common, mild fever and leukopenia
- usually followed by life-long immunity

Subacute disease-

- depression, fever and diarrhoea for 1-3 days
- followed by rapid recovery.

Severe disease-

- in unvaccinated kittens (6-24 wks of age)
- pronounced depression, anorexia, fever, vomiting, sometimes accompanied by diarrhoea or dysentery
- severe dehydration and electrolyte imbalance, abdominal pain
- Subnormal temp. followed by death within 24 hrs.
- mortality rate- 25 to 90% , Immunity long-lasting.

Infections early in gestation

- may result in resorption or abortion.

Infections during late pregnancy

- Stillbirths, early neonatal death
- teratological changes (cerebellar hypoplasia and retinal dysplasia) in litters
- Kittens with cerebellar hypoplasia exhibit cerebellar ataxia (incoordination, tremors)
- symptoms persist for life.

Diagnosis

- History of unvaccinated cats with diarrhoea
- Low WBC count
- Demonstration of virus in faecal samples by EM
- Detection of Viral antigen in faeces using ELISA
- Haemagglutination inhibition (HAI) by employing pig or Rhesus monkey red cells
- Virus neutralization test
- PCR

Treatment & Control

- Intensive supportive therapy- fluid therapy
- Whole blood or plasma from immune donors
- broad-spectrum antibiotics for secondary bacterial infections
- optimal diet supplemented with B complex vit.
- Modified live and inactivated vaccines
- thorough disinfection of premises with 1% sodium hypochlorite or 2% formalin

Canine parvovirus infection

- Canine parvovirus serotype 2 primarily involved
- acute enteric disease in young dogs between weaning and 6 months of age.
- considered as host-range mutant of feline panleukopenia virus
- Transmission predominantly by the faecal-oral route
- form and severity of disease depends on age and immune status of the animal

Pathogenesis

- Virus replicates initially in pharyngeal lymphoid tissues and Peyer's patches, viraemia develops.
- rapidly multiplying cell populations are main target tissues.
- During the first two wks of life- active cardiac myocyte division allowing viral replication
- results in necrosis and myocarditis.
- In older pups, virus invades the actively dividing epithelial cells of the crypts in the small intestine.

- blunting of villi- reduced absorptive and digestive capacity leading to diarrhoea.
- extensive haemorrhage of intestinal lumen in severely affected pups.
- Destruction of lymphoid tissues of intestinal mucosa and mesenteric LN -----immunosuppression
- Secondary Gram-negative bacteria invasion of damaged intestinal tissues--- Endotoxaemia, endotoxic shock

Clinical signs

Enteric form

- Incubation period- 4-7 days
- Sudden onset of vomiting and anorexia.
- Depression and fever may be observed.
- Diarrhoea, often blood-stained within 48 hrs, in severe cases, frank haemorrhage.
- Faeces with foetid smell, dehydration and weight loss.
- Severely affected animals die within three days.
- Survived animals –long lasting immunity.

Myocardial form (Now rare)

- results from infection in the first week of life
- Parvovirus infection of myocardium can occur due to rapid proliferation of myocytes in first week after birth
- usually manifested as acute heart failure and sudden death in pups
- Pups surviving acute myocardial injury may subsequently develop cardiomyopathy
- now rare due to widespread immunity in breeding bitches that protects most puppies during the susceptible period.

Diagnosis

- Sudden onset of foul-smelling, bloody diarrhea in young dogs is suggestive
- Hemagglutination of pig, cat, or rhesus monkey red blood cells by virus present in fecal extracts
- Immunocytochemical staining- For viral Ag in tissue sections
- Presence of basophilic intranuclear inclusions in cardiac myocytes is confirmatory
- Electron microscopy, ELISA , PCR
- Virus isolation- canine & feline cell lines e.g. canine A72 cells, Crandell feline kidney cell line (CRFK)

Treatment

- No specific treatment is available
- Intensive supportive therapy (anti-emetics and fluid administration)
- Broad-spectrum antibiotics for secondary bacterial infections.
- Dogs with sub acute or chronic heart failure- rest and diuretic therapy

Prevention & Control

- Immunity after natural infection appears to be lifelong.
- Inactivated vaccines - safe to use in pregnant bitches.
- Modified live vaccines- vaccination of pups
- Thorough disinfection of premises with 1% sodium hypochlorite and 2% formalin