

**GENERAL AND SYSTEMIC VIROLOGY
(MICRO – 303)**

FAMILY:

PARAMYXOVIRIDAE

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PARAMYXOVIRIDAE*Continued*

1. PARAMYXOVIRUS

AVIAN PARAMYXOVIRUSES (APMV)

According to an old classification, avian paramyxoviruses are of nine types as follows:

APMV – 1: It regarded as Newcastle disease virus (NDV) but later on it was placed in separate genus *Avulovirus* in the same subfamily.

APMV – 2: Isolated from chicken.

APMV – 3: Isolated from turkey.

APMV – 4: Isolated from duck.

APMV – 5: Isolated from Budgerigar, associated with a highly fetal epizootic.

APMV – 6: Isolated from healthy domestic duck.

APMV – 7: Isolated from hunted killed dove.

APMV – 8: Isolated from Goose.

APMV – 9: Isolated from a sick domestic duck.

PARAINFLUENZA VIRUS (PIV)

Family: Paramyxoviridae

Subfamily: Paramyxovirinae

Genus: Paramyxovirus

Association with disease: The virus causes disease mainly of the upper respiratory tract in a variety of vertebrates. Parainfluenza virus is of following four types;

PI – 1 also known as *Sendai* virus, HA virus of Japan causes latent infection in mice

PI – 2 Human pathogen which causes “*Croup*” in children. Croup is a disease of upper respiratory tract in children. The virus also affects animals and has been isolated from the dog in which it causes “*Kennel Cough*”

PI – 3 It is associated with upper respiratory tract infections of man, cattle, sheep, horses, and monkeys. It plays its role as a part of “*Shipping fever*” in cattle in the presence of *Pasteurella* and *E.coli*. This virus has also been isolated from bull’s semen and from the genital tract of cows and thus, may cause permanent infertility.

PI – 4 It is less frequent and usually associated with mild respiratory disease in human (children and adult) like “*Common cold*”.

Cultivation: Nasopharyngeal aspirates propagation in primary monkey kidney or human embryo cell culture upto 3 weeks of incubation at 33-36⁰C.

CPE i) Rounding or fusion of cells ii) Syncytial formation iii) Eosinophilic intracytoplasmic inclusion bodies may be seen.

Haemagglutination: Human or guinea pig RBCs.

2. RUBULAVIRUS

MUMPS VIRUS

Family: Paramyxoviridae
Subfamily Paramyxovirinae
Genus Rubula virus

Association with disease: It causes parotitis (inflammation of parotid glands) in human, but sometimes complicated by meningo-encephalitis, orchitis, oophoritis, and less frequently pancreatitis, thyroiditis, neuritis, otitis, conjunctivitis, keratitis, iritis (inflammation of iris), and retinitis (inf. of retina). Associations with diabetes & congenital defects have been suggested. Orchitis (inflammation of testicular parenchyma) may lead to permanent sterility.

Isolation Virus can be isolated from saliva, CSF (cerebrospinal fluid) of the patients with neurological complications, or from urine.

Cultivation: *Embryonated Eggs:* 7 – 8 days - via amniotic cavity and incubated at 33-36 °C for 4-5 days. The viral growth can be detected by HA or CFT.

Cell Culture: Primary cell culture of monkey kidney.

CPE i) Syncytial formation ii) Cytoplasmic intranuclear inclusion bodies.

Haemagglutination: Chicken or guinea pig RBCs.

Antigenic cross may occur with NDV and PI viruses with no cross immunity.

Vaccination: MMR vaccine has been trialed very successfully for mumps. MMR stands for Mumps, Measles, Rubula. It is live attenuated viral vaccine. It is given 2 times, first at the age of 15-24 month and then 4-6 year age. The efficacy of this vaccine has been reported 95%.

Man is only the natural host. Transmission may be by salivary secretions, direct contact to infected person and respiratory droplets. Virus is also secreted in the urine and milk.

Mumps Virus → Epithelium of respiratory tract → blood stream → viraemia → Inflammation of parotid, testes, pancreas and CNS involvement.

3. MORBILLIVIRUS

This genus contain viruses of both human and animals which cause many diseases such as; Measles, Rinderpest, PPR, and Canine Distemper.

MEASLE VIRUS

Family: Paramyxoviridae
Subfamily: Paramyxovirinae
Genus: Morbillivirus

Association with disease: It causes a classic disease of childhood, **measles**, which is characterized by fever, cough and conjunctivitis. Specifically, maculopapular exanthema (red spots having bluish white centre) known as "**Koplik spots**" on the labial and buccal mucosa is a typical feature of measles. Complications may affect the respiratory tract and CNS. These include rhinotrachitis, pneumonia and otitis. In CNS involvement, optic neuritis, demyelination and myelitis may occur.

After primary measles infection, subacute **sclerosing** panencephalitis (SSPE) may start with behavioral disturbances, loss of neuronal function and ultimately death may occur.

Entrance: It may be taken up by the respiratory and buccal mucosa as well as mucous membrane of genital tract.

Isolation: Virus can be isolated from blood, respiratory secretions or urine.

Cell Culture: Human embryo cell or Monkey kidney cells

CPE: Nuclear and cytoplasmic eosinophilic inclusions.

Haemagglutination: Monkey RBCs.

Antigenic cross may occur within the genus.

Vaccine: MMR vaccine – attenuated viral vaccine.

CANINE DISTEMPER VIRUS (Hard Pad)

Family: Paramyxoviridae

Subfamily: Paramyxovirinae

Genus Morbillivirus

Association with disease: The virus is particularly responsible for causing disease in young dogs results into high fever, running nose and eyes, skin eruptions. Nervous signs (such as *posterior paralysis*) persist for long period. There is keratinization of feet in this disease thus it is also called **Hard Pad** disease.

Susceptible Hosts: It occurs naturally in canine family include, dogs, wolves, foxes, mink. Bears and feline are not susceptible.

Pathogenesis: Spread by direct contact. **Portals of entry** include tonsils, respiratory epithelium and conjunctiva. After 48 hours, the virus appears in the cervical lymph nodes. On 4th day, it is present in blood, mediastinal and mesenteric lymph nodes & in the spleen (persists for about 19-21 days). From about 9th day onward, mononuclear cells laden with the virus appear throughout the body. Virus is in abundance in the discharges of nose & eyes.

Virus appears in urine and faeces upto 6-8 weeks.

Isolation: Virus can be isolated from spleen and nasopharyngeal secretions.

Cultivation: Canine and ferret kidney cell culture.

CPE: Giant cells, eosinophilic cytoplasmic inclusions.

Haemagglutination: None

Antigenic cross may occur with other morbillivirus.

Immunity: Interferon during early viraemic stage. Puppies born of immune dams are passively immunized through the colostrum. Maternal antibodies fall below the protective level in about 8 weeks. From this age to onward, protection by vaccine is required. Developed immunity after infection is solid for whole life

Vaccines:

- i) Formalinized Puppy spleen tissue
- ii) Using virulent virus plus immune serum
- iii) Egg adapted vaccine
- iv) Ferret adapted distempered virus vaccine

- v) Puppy kidney cell culture vaccine
 - vi) Multiple vaccines (i.e. Pentadog, Hexadog etc.)
 - vii) Attenuated measles virus vaccine
- All other vaccines are given usually subcutaneously but intramuscular route is essential for attenuated measles virus vaccine.

RINDER PEST

The disease is also known as “*Cattle Plaque*”. The earliest recognizable description of the disease was from European countries. It causes devastating death of cattle population in Europe during 1760-64 and because of the disease problem the first Veterinary School was established in 1762 in Lyon, France.

Causative agent: Rinderpest virus belongs to the genus *Morbillivirus* of subfamily *Paramyxovirinae* of family *Paramyxoviridae*.

Association with disease: Bovine (cattle, buffaloes, yak) are the important natural hosts but infection also occur possibly in camels. The disease is characterized by inflammation, hemorrhages and erosions of the mucus membranes of alimentary tract accompanied by profuse diarrhea. Diarrhea and ultimately dehydration are the causes of death.

Pathogenesis: Primary site of entry of virus is via nasopharyngeal mucosa. During inhalation process, the virus passes through the mucosa of upper respiratory tract to associated lymph nodes. Via blood stream it reaches the final site where it has to replicate and multiply i.e. GIT.

Isolation: Virus can be isolated from lymph nodes, spleen, eye or nasal discharge.

Cultivation: Bovine kidney cell culture

CPE: Giant cells and eosinophilic cytoplasmic inclusions.

Haemagglutination: None

Immunity: Animals recovered from rinderpest develop a solid long lasting immunity. Calves born of immune dams acquire passive immunity via colostrum during first 36 hours of life. Calves that ingest colostrum from recently immunized mothers/dams, they resist infection until they are 8-12 month of age and should not be vaccinated during this period. In exotic and cross bred animals, usually CC vaccine is used.

Vaccines: Avianized vaccine: virus is grown in egg
 Caprinized vaccine: virus is grown in goat
 Laprinized vaccine: virus is grown in the rabbit
 Molecular vaccine: Here, glycoproteins are cloned.
 Cell culture vaccine:

PESTE DES PETITS RUMINANTS (PPR)

It is also known as “**Kata**”.

Causative agent: Peste des petits ruminants virus (PPR virus) belongs to the genus *Morbillivirus*, of subfamily *Paramyxovirinae* of family *Paramyxoviridae*.

Associations with disease: It is rinderpest like disease of goats and sheep characterized by necrotic stomatitis and intestinal changes resembling rinderpest in cattle.

Clinically fever, mucosal lesions, diarrhea become more profuse and mucopurulent - complicated by pneumonia. Many animals die within a week of the onset of fever. Recovered animals show humeral antibodies which can be detected by neutralization test or by their ability to inhibit measles haemagglutination.

Susceptible Hosts: Natural hosts are goat and sheep.

Immunity: Cell culture rinderpest vaccine has been advocated.

4. HENIPAVIRUS

NIPAH AND HENDRA VIRUS

Family: Paramyxoviridae

Subfamily: Paramyxovirinae

Genus: Henipavirus

These are two new paramyxoviruses which are closely related to each other.

They have a broad host range (pig, man, dogs, horses, cats and other mammals).

About NIPAH VIRUS

Fruit bat (Flying fox) is reservoir. This virus can be amplified in pigs and may spread to humans. Human is an accidental host for these viruses. Outcome of virus infection in human is severe encephalitis. In Malaysia, out of 269 cases 108 prove fatal.

5. PNEUMOVIRUS

RESPIRATORY SYNCYTIAL VIRUS (RSV)

Family: Paramyxoviridae

Subfamily: Pneumovirinae

Genus: Pneumovirus

Association with disease: It is responsible for upper respiratory tract infections in humans and animals. A wide range of strains are there to infect human, cattle, sheep and goat. In human, it causes acute lower respiratory tract disease in infants frequently presenting bronchitis, bronchiolitis and bronchopneumonia. In cattle, it presents fever, conjunctivitis, pulmonary consolidation and interstitial emphysema. In caprine and ovine, virus has been isolated from animals with respiratory diseases.

Isolation: Bovine strains can be isolated from upper respiratory tract lesions and nasopharyngeal secretions.

Cultivation: Primary bovine cell culture

CPE: Giant cells, and eosinophilic cytoplasmic inclusion bodies.

