PARAMYXOVIRUS

Mumps, Measles, Parainfluenza
Respiratory Syncitial Virus
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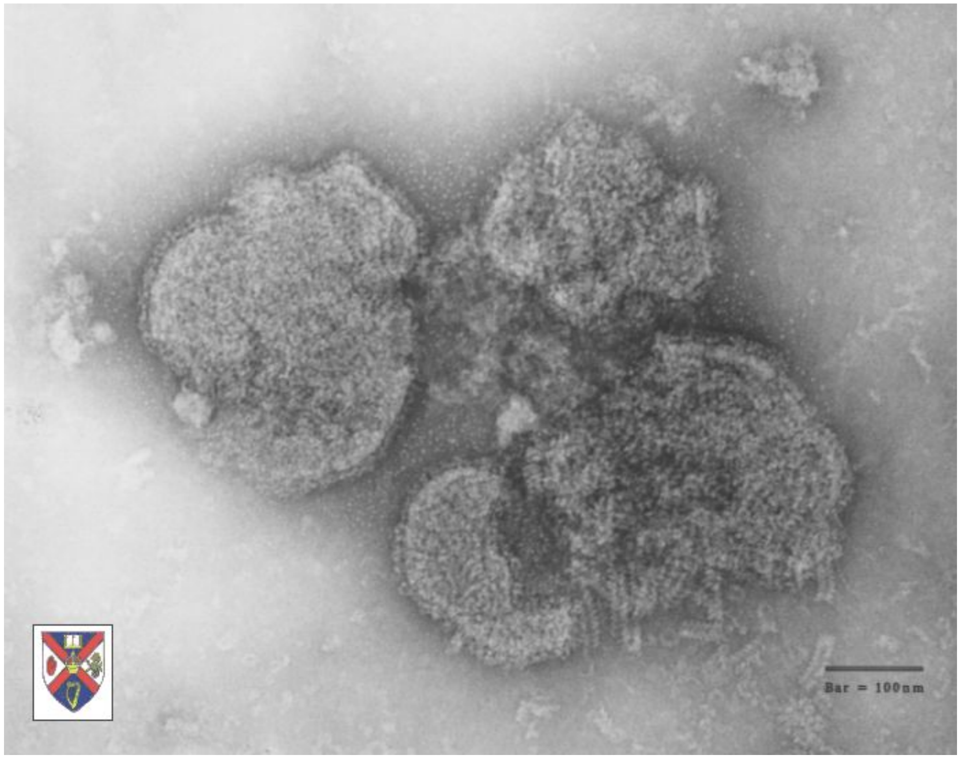
Animal paramyxovirus



- 2/3 of respiratory infections by viruses- rhino, corona, respiratory syncitial, parainfluenza and adeno virus
- Exanthem and enanthem- measles
- Systemic infection- mumps

- Group V Negative sense RNA virus
- Order Mononegavirales
- Family- Subfamily- Genus- Type Species- host
- Bornaviridae Borna virus - vertebrates
- Filoviridae Marburg, Ebola virus- vertebrates

- **Paramyxoviridae** - Vertebrates
  Avulavirus- Newcastle Disease virus-
  Henipavirus- Hendra virus
  Morbillivirus- Measles virus
  Respirovirus- sendai virus
  Rubulavirus- Mumps virus
  Pneumovirinae- Pneumovirus- Human RSV
  Metapneumovirus- Avian Pneumovirus

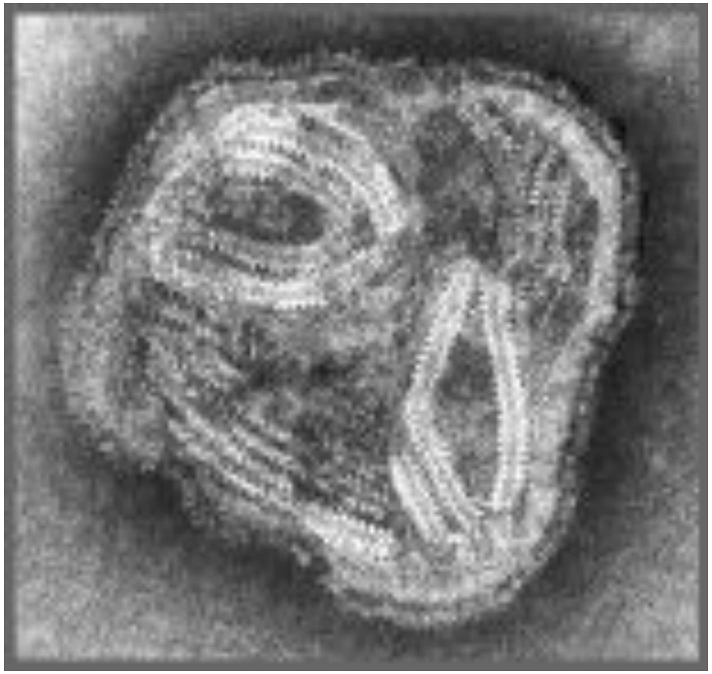
- **Newcastle disease virus** - avian paramyxovirus type 1- natural pathogen of poultry
- Ranikhet virus in india

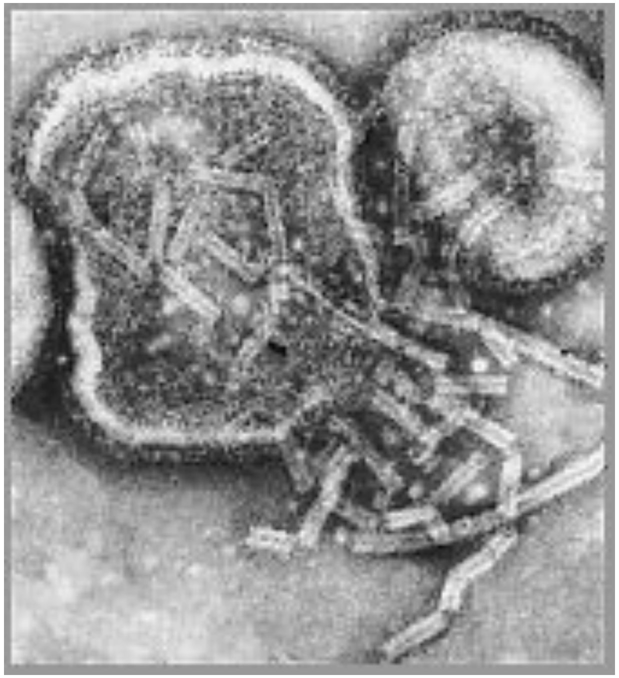
- Explosive outbreaks of pneumoencephalitis- high mortality
- Self-limited conjunctivitis in poultry workers

- **Pneumovirus- respiratory syncitial virus- RSV**
- First isolated in 1956
- Enveloped, replication in vitro leads to fusion of neighbouring cells into large multinucleated syncitia.
- ssRNA as helical nucleocapsid with a lipid envelope
- G protein for attachment and F protein for virus entry by fusing viral & host membranes

- Major respiratory pathogen in children- 1-6 mths- peak in 2-3 mths-- day-care centres with susceptible infants

Human paramyxovirus





- Pneumonia & bronchiolitis in young children
- Common cold in adults
- Pneumonia in elderly & immunosuppressed patients
- Highly infectious, transmits via cClose contact with contaminated fingers, fomites, self inoculation via conjunctiva, aerosols while sneezing
- RSV- 25-40% URTI in infants
- 37% mortality rate for infants with RSV pneumonia and congenital cardiac disease- ‘cot death’
- RSV pneumonia- increased morbidity & mortality in children with bone marrow & solid organ transplantation

- Class I MHC-restricted Cyotoxic cells important

- Specific diagnosis- isolation of RSV from respiratory secretions, - sputum, throat swabs, nasopharyngeal washes- IF, ELISA

- Treatment- URTI- alleviation of symptoms
- LRTI- hydration, suctioning of secretions, humidified oxygen, anti-bronchospastic agents
- Severe hypoxia- intubation, ventilatory assistance
- Aerosolized Ribavirin- nucleoside analogue- alleviates blood–gas abnormalities
- Human Ig with high titres of IgG antibody- palivizumab- infants less than 2 yrs

- **Parainfluenza**- 4 distinct serotypes :
  type 1-Sendai virus-1952
  type 2-croup-1955
  type 3 -1958 and type 4 -1960
- Enveloped, ssRNA genome-helical nucleocapsid, 2 glycoproteins- one with both haemagglutinin and neuraminidase activity & one with fusion activity

- By 8 yrs, children develop antibodies to serotypes 1,2, and 3
- Types 1 & 2- epidemics during fall, type 3 - during all seasons
- (Type 4- less reported because difficult to grow in tissue culture)

- 22% of respiratory infections in children by parainfluenza
- Type 1 – most important cause of croup
- Type 3- important cause of bronchiolitis & pneumonia- causes infection in the first month of life when passively acquired maternal antibody is still present

- Spread through infected respiratory secretions, primarily person to person or by large droplets

- Immunity to types 1,2 - local IgA antibodies in RT;
- Passively acquired serum neutralizing antibody -serotypes 1, 2, & 3

- Febrile illnes with coryza, sore throat, hoarseness, cough
- In croup- fever persists with worsening coryza and sore throat- a brassy or barking cough may lead to frank stridor

- Specific diagnosis by detection of virus in respiratory tract secretions, throat swabs & nasopharyngeal washings
- In tissue culture by

  -haemaggglutination or cpe;

  -by IF of viral antigens in RT exfoliated cells or ELISA
- PCR

- URTI- symptomatic treatment

- LRTI:

  -mild cases of croup treated- bed rest, moist air generated from vapourizers

  -more severe croup requires hospitalization, close observation for development of respiratory distress

  -humidified oxygen & intermittent racemic epinephrine, aerosolized or systemic glucocorticoids

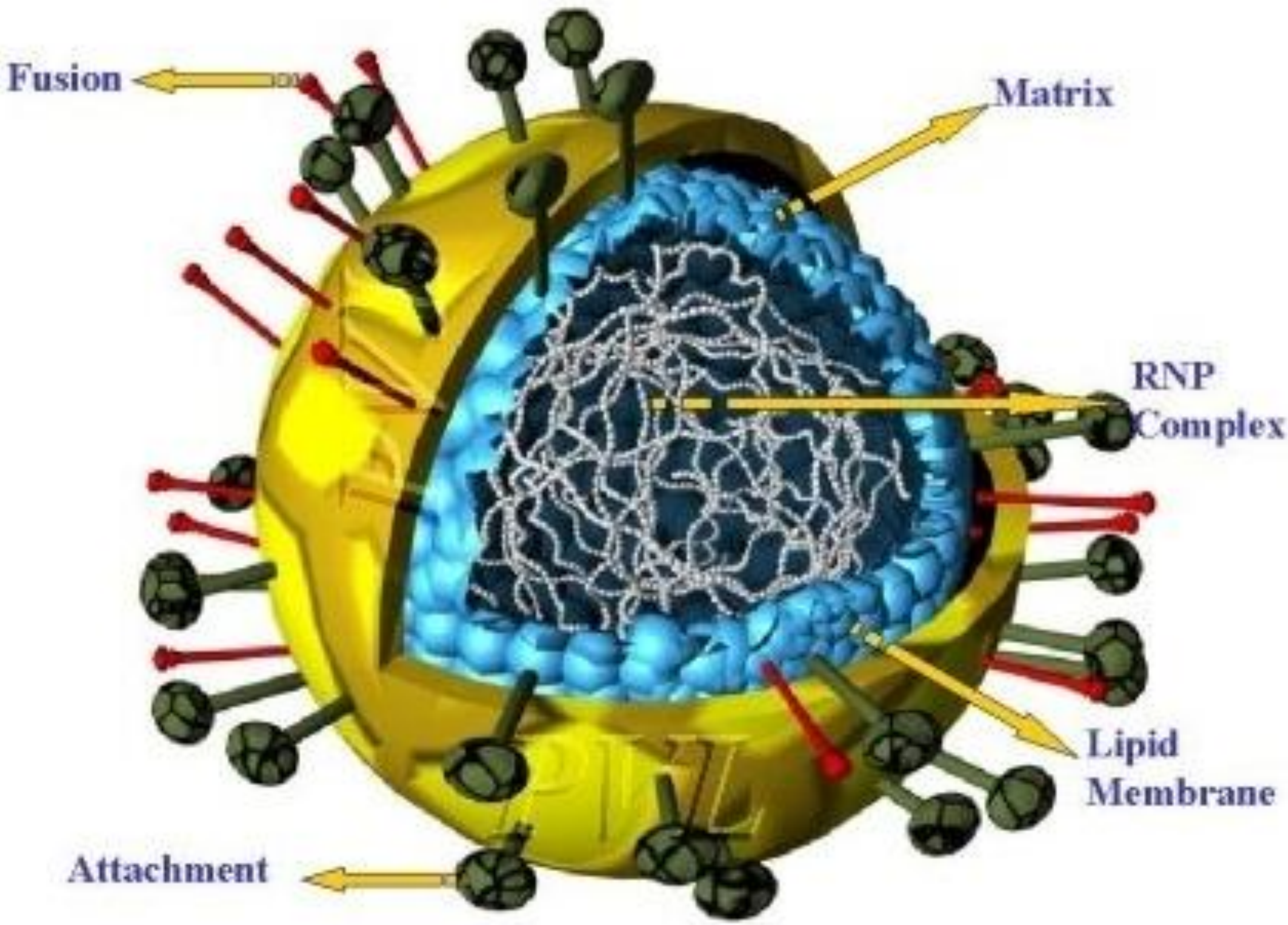
- Acute epiglottitis by H influenza type b, influenza A- must be differentiated from viral croup

- **Measles** - **Rubeola** - ancient disease since populated Babylonian cities, maintained in seal population in the Arctic Sea
- Highly contagious, acute exanthematous respiratory disease with a characteristic clinical picture and pathognomonic enanthem

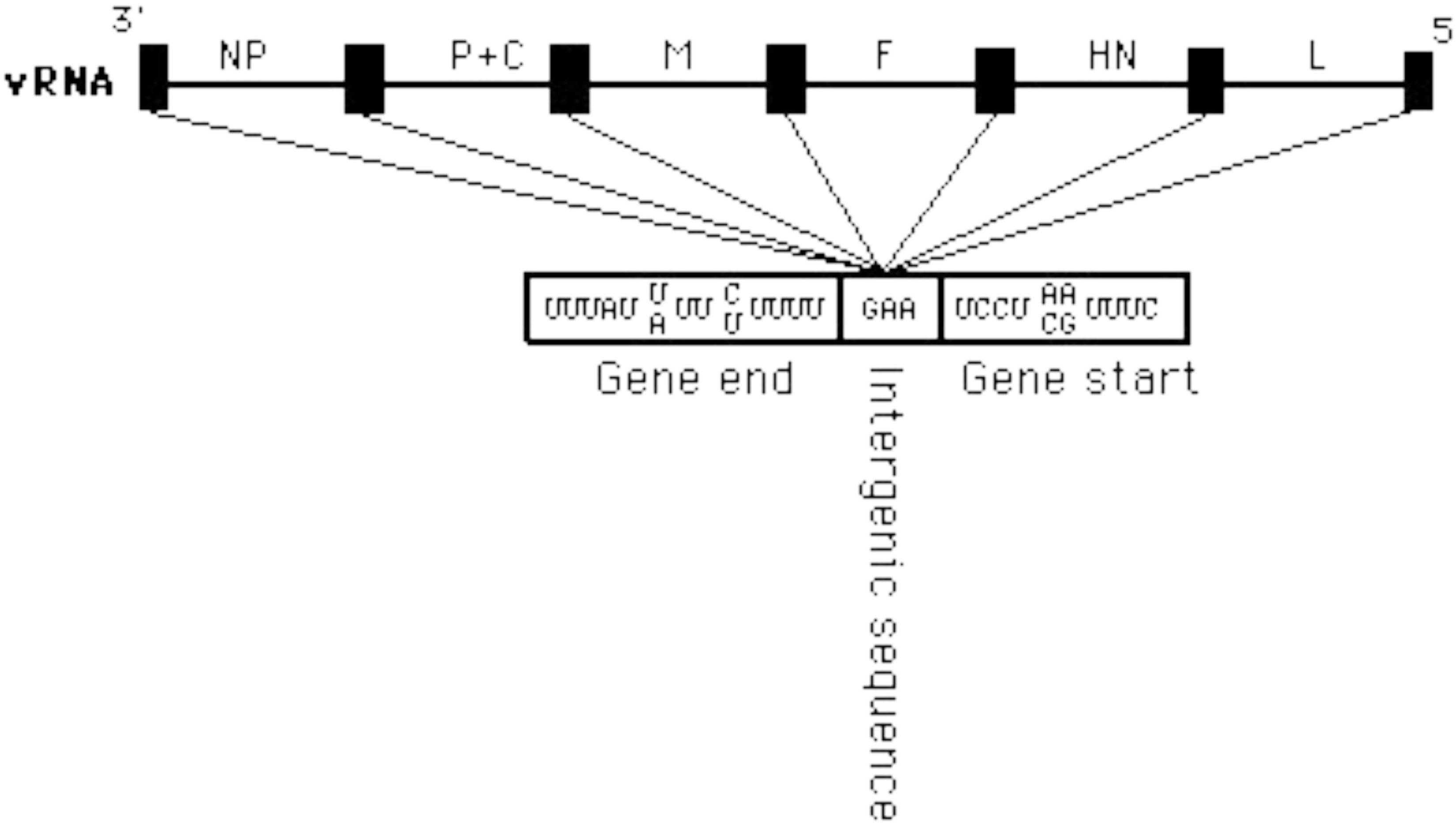
- Morbillivirus- canine & porcine distemper, rinderpest of cattle, peste des petits ruminants of goat and sheep- only one antigenic type

- Spherical virus- coiled helix of RNA, conical H-haemagglutinin,dumbbell shaped F-fusion protein

Structure of paramyxovirus



Linear ssRNA of Paramyxovirus



- Humans are the only natural hosts

- Transmitted through respiratory secretions, exposure to aerosol, direct contact with large droplets
- Patients are contagious for 1-2 days before the onset of symptoms until 4 days after the appearance of the rash
- RT-via blood to RES cells- viraemia & viriuria

- Major infected cell is the blood monocyte
- Warthin-Finkeldey cells- multinucleated giant cells with inclusion bodies in the nucleus and cytoplasm are found in respiratory and lymphoid tissues- pathognomonic for measles

- CMI- prominent in host defense with CTL and NK cells

- **Koplik's spots** - the pathognomonic enanthem and the characteristic erythematous, nonpruritic, maculopapular **rash** are immune reactions to the virus in the endothelial cells of dermal capillaries

- Complications in the RT, CNS & GIT
- RT- laryngitis, croup, bronchitis, viral Ppneumonia with secondary bacterial infection by strep, pneumo or staph
- most common complication in children is Otitis media
- Primary giant cell pneumonia- Hecht's pneumonia- immunocompromised/ malnourished patients

- CNS- post infectious Encephalomyelitis- focal haemorrhage, congestion, perivascular demyelination- drowsiness, seizures, coma

- 10% of patients do not survive acute measles encephalitis and survivors develop sequelae- mental retardation, epilepsy- due to immune-mediated response to myelin proteins

- SSPE- protracted chronic extremely rare form of measles encephalitis- children < 2 yrs- progressive dementia- due to complex interaction of host with defective measles virus, - associated with high levels of antibodies in blood & CSF

- GIT- GE, hepatitis, appendicitis, ileocolitis

- Clinical diagnosis based on rash is is relied upon.
  - -Secretions show MNG cells
  - -Virus isolation from RT secretions/urine
  - -Measles virus RNA by RT-PCR
  - -IgM ELISA after rash , IgG ELISA 10 days later
  - -Antibody titres high in Atypical measles and SSPE

- Foremost reason for resurgence of measles:
  - -primary vaccine failure in infants,young children
  - -secondary vaccine failure/ waning immunity

- Study by Peter Panum- of epidemic in Faroe islands in 1846 after being quiescent for 60 yrs: -only the elderly were spared as they were protected by exposure to the previous epidemic

- Mortality highest in infants < 2yrs and adult patients with impaired CME

- Live attenuated vaccine by Enders et al- seroconvesion in 95% and lifelong protection

- MMR at 12-15 mths
- MMR- maybe given in HIV but not if CD4< 15%
- Contraindicated in impaired CMI, pregnant females,history of anaphylaxis to egg protein/ neomycin

- IM immune globulin within 6 days of exposure exerts a protective or modifying effect

- **Mumps**
- acute systemic communicable viral infection- most distinctive feature is swelling of one or both parotid glands

- Pleomorphic virus, enveloped, nucleocapsid with RNA, NP protein and RNA polymerase protein; glycoprotiens are HN(haemagglutinin-neuraminindase), F (haemolysis- fusion), M (matrix envelope protein
- Only one antigenic type, one attack confers lifelong immunity

- Prodrome- parotitis- U/L or B/L within 24 hrs or a wk- rarely submaxillary or sublingual glands

- Complications include:

  Orchitis in 20%

  Aseptic meningitis- 10-15%- self-limited

  Mumps pancreatitis

  Gestational mumps- abortion in the first trimester- no premature birth or foetal malformations (not teratogenic)

- Clinical diagnosis is relied upon.

- Virus isolation from saliva, throat, urine in early phase and CSF in mumps meningitis
- Inoculated into rhesus monkey kidney cells/ human embryonic lung fibroblast and identified by cells grown in shell vial culture and of monoclonal antibodies

- Highly sensitive EIAs used for diagnosis and determining susceptibility to disease

- Live attenuated vaccine- Jeryl Lynn strain- protective antibodies in 95% cases- S/C dose

- MMR at 12-15 mths
- Contraindicated in pregnant & immunocompromised hosts- severe HIV

- Treatment is restricted to symptomatic management only with analgesics and warm/ cold compress to the parotid area