Paramyxoviruses (Paramyxoviridae)

Paramyxoviruses are the major respiratory pathogens in children under 5 years of age; this family is classified into 2 subfamilies.

Morphology:

- **Glycoproteins** - do not form such prominent spikes as on influenza virus:
  - **HN** - haemagglutinin + neuraminidase activities;
  - Measles - referred to as H protein - no neuraminidase activity;
RSV - G protein - neither activity.
F - consists of 2 disulphide-linked subunits (F1 + F2) - responsible for cell fusion + haemolytic function.
- Other proteins:
  The M (matrix) protein lines the inner surface of the envelope.
  NP - nucleoprotein.
  L and P - polymerase activity

Replication occurs in the cytoplasm, excess nucleocapsid formation (inclusion bodies), Syncytium formation is quite common (F- glycoprotein).

Differences between Orthomyxoviruses & Paramyxoviruses

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<td>Genome</td>
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<td>9 nm in dia.</td>
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<td>RNA in nucleocapsid</td>
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Pathogenesis:
Parainfluenzaviruses 1-4:

Transmitted by aerosols (respiratory droplets); world wide, Type 3 is endemic, with some increase during the spring, whereas types 1 and 2 tend to cause epidemics during the fall or winter, frequently on a 2-year cycle.

Virus is usually limited to U.R.T. (no viraemia). Little serological variation, therefore rare infection in adults. Reinfections with parainfluenza viruses are common.

Factors that determine the severity of parainfluenza virus disease are unclear but include both viral and host properties, such as:

1. Susceptibility of the protein to cleavage by different proteases,
2. Production of an appropriate protease by host cells,
3. Immune status of the patient, and
4. Airway hyper reactivity.

The production of virus-specific IgE antibodies during primary infections has been associated with disease severity. The mechanism may involve release of mediators of inflammation which alter airway function.

The infection is usually *subclinical*, or cause **acute respiratory infections**: ranging from mild influenza-like illness or "common cold" syndrome, pharyngitis, laryngitis to more serious otitis media, bronchitis, croup and pneumonia.

Croup (laryngotracheobronchitis) is characterized by respiratory obstruction due to swelling of the larynx and related structures. The incubation period appears to be 5–6 days.

**Parainfl. 1 & 2** → croup in children below 5 years of age. Duration of parainfluenza virus shedding is about 1 week after onset of illness; some children may excrete virus several days prior to illness.

**Parainfl. 3** → L.R.T. Infection (e.g. in very young children) lead to more serious symptoms. Type 3 may be excreted for up to 4 weeks after onset of primary illness. This persistent shedding from young children facilitates spread of infection. Prolonged viral shedding may occur in children with compromised immune function and in adults with chronic lung disease.
Parainfl. 4 → rare, common cold.

The most common complication of parainfluenza virus infection is otitis media.

Laboratory Diagnosis:

1. **Rapid diagnosis**: by antigen detection methods in exfoliated nasopharyngeal cells by direct or indirect immunofluorescence tests.

2. **Definitive diagnosis**: through
   a. Viral isolation from appropriate specimens or
   b. Detection of viral RNA by reverse transcription-polymerase chain reaction (RT-PCR).

Treatment & Prevention

1. Contact isolation precautions are necessary to manage nosocomial outbreaks of parainfluenza virus.

2. **Ribavirin** has been used with some benefit in treatment of immunocompromised patients

3. **No vaccine** is available.

**RSV (Respiratory Syncytial Virus)**

First isolated in 1956 and subsequently recognized as a major cause of L.R.T. disease in infants and young children. Infects man, monkeys and some rodents with disease production, but unapparent infections (resulting in spread of virus) may occur in many mammals. **I.P. 4-5 days** Viral shedding may persist for 1–3 weeks from infants and young children, whereas adults shed for only 1–2 days.

In culture, causes characteristic syncytial masses - hence the name. Highly infectious, transmission by respiratory secretions.

Primary multiplication occurs in epithelial cells of U.R.T. producing a mild illness.

In ~50% **children less than 8 months old**, virus subsequently spreads into the L.R.T. causing bronchitis, pneumonia (1/4 of cases) and croup (1/2 of cases). Has been suggested as a possible factor in cot death.

**In older children** → U.R.T. infection.
In adult → common cold.
In elderly or ICP → pneumonia

**Lab. Diagnosis**

**Spp.** Nasopharyngeal swab or Nasal swab.

**Culture:** Hela cell (giant cell or syncytia)

**Serology:** IF, ELISA, CF & NT.

**Prevention**

Currently **no vaccine**! Also, infection does not result in lasting protection therefore repeated infections ('colds') occur throughout life.

Ribavirin (aerosol) 3-6 days + hyperimmunoglobulin.

**Mumps**

Recognized by the ancient Greeks, virus first isolated in 1934. Humans are believed to be the only natural reservoir for the virus **Transmission** via saliva and respiratory secretions; less infectious than measles/chickenpox - more adult cases.

**I.P. 18 days (7-25 days).** Typically causes painful swelling of parotid glands 16-18 days after infection. This is preceded by primary replication of the virus in epithelial cells of the U.R.T. and local lymph nodes, spread to → distant L.N. & spleen → viraemia → generalized spread to salivary & other glands → other body sites.

**Clinical Findings:**

~1/3rd of cases (unapparent infection)

**In children** (usually at age of 5-9 years), mumps is usually self-limited

**In adults** (post-puberty) a proportion of cases have more serous sequelae:

**complications** orchitis (20-30% of males - rarely resulting in sterility); aseptic meningitis (10-15%), encephalitis, pancreatitis (10% of all cases), myocarditis, nephritis - <1% adult cases.
**Rare complications:**
1. Self limited polyartheritis
2. Pancreatitits (D.M.)
3. Thyroiditis
4. unilat. Nerve deafness (hearing loss)

**Lab. Diagnosis**
- **Spp.** Saliva, CSF, urine
- **Culture:** embryonated egg or MKC (monkey kidney cell)
- **Identifications:** hemadsorption inhibition, IF.
- **Serology:** CFT, HAI, ELISA, mumps specific IgM / IgG Abs.

**Prevention:** one invariant serotype therefore vaccines are viable
  - *formalin*-inactivated and
  - **Live attenuated (widely used) 95% effective with 10 years protection.**
  - Given to →over 1-year age in one dose S.C.
  - → Adult Who had no previous infection.

**Treatment:** none (passive immunization has been used).