They are large, enveloped RNA viruses (single stranded, helical, negative sense) of 150-350nm in diameter.

**Difference from orthomyxoviridae family**

1. Their nucleic acid is non-segmented, unlike influenza which has 8 segments
2. Influenza has two glycoproteins (spikes): *hemagglutinin* *neuraminidase*. Paramyxoviridae also have two spikes but the HA and NA are located on a single spike, while the other spike is fusion F protein used for fusion.

- All of us have been infected with a paramyxovirus during childhood. So all children by age 5 or 6 have antibody against one of the paramyxoviruses since they have a worldwide distribution.

This family is divided into **two** subfamilies:

<table>
<thead>
<tr>
<th>Paramyxovirinae</th>
<th>Pneumovirinae</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paramyxovirus</strong> (now called Respirovirus)</td>
<td></td>
</tr>
<tr>
<td>- Parainfluenza type 1 &amp; 3</td>
<td></td>
</tr>
<tr>
<td>- Sendai virus (in mice)</td>
<td></td>
</tr>
<tr>
<td><strong>Rubulavirus</strong></td>
<td></td>
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<tr>
<td>- Parainfluenza type 2 &amp; 4</td>
<td></td>
</tr>
<tr>
<td>- Mumps</td>
<td></td>
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<tr>
<td><strong>Morbillivirus</strong></td>
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<tr>
<td>- Measles</td>
<td></td>
</tr>
<tr>
<td>- Canine distemper virus (in dogs)</td>
<td></td>
</tr>
<tr>
<td><strong>Pneumovirus</strong></td>
<td></td>
</tr>
<tr>
<td>- Respiratory Syncytial Virus: it is found in our community; it contains G-protein but it doesn't have hemagglutinin and neuraminidase (this is a difference between the pneumovirinae and paramyxovirinae subfamilies)</td>
<td></td>
</tr>
<tr>
<td>- Human metapneumovirus</td>
<td></td>
</tr>
<tr>
<td>- before 10 years there was only animal metapneumovirus but 10 or 11 years ago they isolated metapneumovirus in children with acute bronchiolitis and pneumonia in Holland</td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL PROPERTIES OF PARAMYXOVIRIDAE FAMILY**

- 150 – 350nm in diameter
- Spherical or pleomorphic in shape
- Enveloped
- Single stranded, negative sense, unsegmented, helical RNA nucleic acid; the RNA is associated with three important proteins (nucleoprotein, phosphoprotein, large protein). The proteins are associated with polymerase complex enzyme which is actually linked to nucleoprotein of the virus. These proteins are important for differentiation between the viruses
- Like influenza they have a lipid bilayer membrane which is associated with virus specific glycoprotein (**HA & NA** on one spike and **F protein** on another)
- Fusion protein promotes fusion of the viral envelope with the cell membrane of host cells and formation of syncytia ( multinucleated giant cells)
- They have the property of hemagglutination (inhibition of RBCs)

**Other properties:**

- All members are labile (sensitive to environmental factors), but can survive on surfaces for a few hours (6 – 10 hours)
- They are highly infectious by direct contact, contaminated fomite, sneezing and coughing
- They are susceptible to destruction by soaps
- They are hemadsorbing viruses since they have HA
- They are antigenically stable (in contrast to influenza) since they are unsegmented
Diagrammatic illustration of paramyxovirus

M-protein (matrix protein): is very important for maturation of the virus. It is a hydrophobic protein located inside the virus to give the shape of the virus, they are important in assembly of the virus in the cytoplasm of the infected cells.

PATHOGENESIS (similar to influenza)

- We get the virus by inhalation
- It gets into our system through the nasopharyngeal mucosa, then it will spread to the lower respiratory tract within 1-3 days
- Replication occurs in the cytoplasm
- RNA polymerase is very important for translation of mRNA

EPIDEMIOLOGY

- They are an important cause of respiratory disease
- Most people are infected by age 5
- They cause epidemic and sporadic infections
- Seasonality: fall and early winter
- Type 1 & 2 cause epidemics in fall and early winter
- Type 3 & 4 cause some sort of sporadic infection
- Stable on surfaces (up to 10 hours)
- Transmitted by large droplets during sneezing
- 90% of individuals are asymptomatic but they shed the virus by sneezing
- Shedding lasts 1 week after infection
- Infection is more severe in immunocompromised patients

ICEBERGE PHENOMENA

- Only small percentage show classical disease presentation
- Majority are asymptomatic but highly infectious
CLINICAL FEATURES

• Incubation period: short (6 days)
• Primary infection or reinfection may occur (due to presence of different types and subtypes)
• Reinfection is usually milder than the primary infection
• Fever
• Upper and Lower Respiratory infection characterized by:
  - **CROUP**: Acute laryngotracheobronchitis specially in children under 2 years then they will get allergic bronchitis due to formation of high titers of IgE
  - Narrowing of air passage due to inflammation of epithelial cells of upper respiratory tract
  - Bronchiolitis
  - Pneumonia
• Seasonal outbreak in fall & winter (mainly parainfluenza type 1 & 2)
• Type 3 & 4 cause milder, sporadic infections

TREATMENT

• Symptomatic treatment
• Humidification
• No antiviral agent or chemotherapy
• No vaccine

<table>
<thead>
<tr>
<th>Type 3</th>
<th>Type 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary infection occurs in children under 5 years of age</td>
<td>Even the primary infection is milder than that of type 1 &amp; 2</td>
</tr>
<tr>
<td>Less common cause of bronchiolitis &amp; pneumonia than RSV [RSV is prime cause of bronchiolitis &amp; pneumonia in infants under 4 years of age]</td>
<td>It causes upper respiratory tract infection more than lower</td>
</tr>
<tr>
<td>Less common cause of CROP than type 1 &amp; 2</td>
<td>Two subtypes 4A &amp; 4B according to protein associated with nucleocapsid. Some of them are differentiated by G-protein or attachment protein localized on the envelope of the virus.</td>
</tr>
<tr>
<td>Causes sporadic infection in non-winter seasons</td>
<td></td>
</tr>
</tbody>
</table>

DIAGNOSIS

• Signs and symptoms of all strains are similar
• Antigenic detection from nasopharyngeal secretion or swab. We look for Ag in epithelial cells sloughed by the nasopharyngeal swab by ELISA or direct fluorescent technique.
• **Virological Transport media**: are used for transporting the virus to the lab while preventing desiccation of the virus.
• Tissue culture (it takes weeks)
• **Serology**: we take two samples. The **first** is taken during appearance of the symptoms and the **second** is taken **two weeks** after the first one. Then we run the samples by ELISA or HA inhibition technique to demonstrate 4-fold difference

PREVENTION

• Personal hygiene
• Hand washing
• Sanitizer gels
• Prevention of surface contamination
• Avoidance of inoculation of eye and mouth

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**Disclaimer:**
This is merely a transcript of Dr. Tariq's lecture and the author may not be held responsible for any incorrect, inaccurate, or insufficient information provided herein.