picornaviridae

Pico = small RNA = RNA

Classification of picornaviruses

Genus

1- Enterovirus
   Acid stable
   Don't produce enteritis but multiply in Gut

2- Hepatovirus
   Acid stable

3- Rhinovirus
   Multiply in URT

4- Animal Viruses → Cause Food and mouth disease in animals

Group

Polioviruses
Coxsacki Viruses (A)
Coxsacki Viruses (B)
Echoviruses
Enteroviruses
Hepatitis A Virus (1972)

Serotypes

1 – 3
1 – 24 No 23
1 – 6
1 – 33 No 10, 22
68 – 71
General Properties

Nucleic acid:
- Single strand RNA (+) linear

Virion:
- Naked nucleocapside

Capsid symmetry:
- Icosahedral Capside Shell With 60 Subunits

Size:
- 25 - 30 nm (average 27 nm)

Virion Composed of 4 Proteins (VP1 - VP4):
- Structural Surface Proteins VP1 - VP3
  - (Ab-binding Sites)
- Internal Protein (VP4)
  - Associated with Viral Rnase
Poliovirus

Is responsible for an acute infectious disease that occasionally involves the (CNS) infection and destruction of the motor neurons in the Spinal Cord may lead to Flaccid Paralysis.

Pathogenesis

Most Poliovirus infection are Subclinical

Virus replicated in oropharynx

Small intestine also replicated especially in Lymph nodes (pyres patches of small intestine)

Blood stream

CNS

Page 4

Virus also spread along nerve axon of peripheral nerves to CNS

Continues to progress along the Fiber of Lower motor neuron to involve of Spinal Cord or Brain

In CNS

Virus replication in Lower motor neuron Located in anterior horn of Spinal Cord

Death of the Cell results in Paralysis of muscles innervated by these cell

Virus also affects brain stem

Leading to Bulbar Poliomyelitis with Respiratory Paralysis
Pathogenesis

Paralytic poliomyelitis, Flaccid paralysis is predominant resulting from Lower motor Neuron damage

- Muscle involvement is usually maximal within a few days after paralytic phase begins.
- Maximal recovery usually occurs within 6 months, with residual paralysis lasting much longer.

The probability of involvement of C.S.F depending on certain Factor.

- Age
- Pregnancy
- Tonsillitis
- Fatigue
- Absence of antibodies

Days

- Infections
  - Pharynx
  - Intestine
  - Local L.N.
  - Via Lymphocyte
  - Spleen
  - Liver
  - Viramia
  - Blood C.S.F Barrier
  - C.S.F
  - Febrile illness
  - Blood – Brain Barrier
  - Spread to CNS

Incubation period 7 - 14 days (Range of 3 - 35 days)

Virus shedding in Faeces

Encephalitis paralysis
Clinical Features

In apparent infection 90 – 95 %
- No clinical Features
- Virus in stool or throat or both

Abortive or minor illness 4 – 8 %
- Symptoms or respiratory or infection
- Virus present in stool

Non-paralytic poliomyelitis (Aseptic meningitis) 1 – 2 %
- Stiffness and pain in back and neck 2-10 days, rapid recovery

Paralytic poliomyelitis 0.1 – 2 %
- Flaccid paralysis (Lower motor neuron damage)

Progressive post poliomyelitis muscle atrophy
- Physiological and aging change; paralytic poliomyelitis (Loss of neuromuscular Functions)
**Lab. DX**

1. **Suitable specimen**
   - Stool and rectal Swab
     - Up to 4 weeks
   - Throat Swab
     - 15 days after infection
   - C.S.F
     - During manifestation 2 – 3 weeks

2. **Cell Culture**
   - Human embryonic Fibroblasts
   - Monkey kidney cell

3. **Identification**
   - Neutralization test (using specific antisera)

4. **Serology**
   - Paired serum sample
     - Neutralization test against 3 serotypes
Prevention

1. Live attenuated vaccine
   - Live polio vaccine (LPV) or Oral polio vaccine (OPV) or Sabin vaccine (monkey kidney or human diploid cell)

2. Killed vaccine or inactivated Virus Vaccine (KPV or IPV) or Salk vaccine (Monkey Kidney Culture)

Vaccination programs

- Trivalent 1, 2, 3
  - Programs
    - 2+4 month of age
    - 6-18 month of age

- Before school entry (4-6 years)

Make the OPV or LPV to be kept without losing potency for year at 4°C and for weeks at moderate room temp ≤ 25°C.

Whereas, non-stabilized vaccine must be kept frozen until used during vaccination policy using ice box.

2, 4 month
12, 18 month
Before school entry (4-6 years)
### Important Features of polio Virus Vaccine

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Killed (Salk)</th>
<th>Live (Sabin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rout of administration</td>
<td>Injection</td>
<td>oral</td>
</tr>
<tr>
<td>Prevents disease</td>
<td>Yes</td>
<td>yes</td>
</tr>
<tr>
<td>Interrupts transmission</td>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Induce humoral Ig G</td>
<td>Yes</td>
<td>yes</td>
</tr>
<tr>
<td>Induce intestinal Ig A</td>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Interferes with replication of a virulent virus in gut</td>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Can cause disease ICP in pregnancy</td>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Reverts to virulence</td>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Requires Refrigerator</td>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Duration of immunity</td>
<td>Shorter</td>
<td>Longer</td>
</tr>
<tr>
<td>Cost</td>
<td>high</td>
<td>Low</td>
</tr>
</tbody>
</table>

The table mentioned above refers to advantages and disadvantages of polio virus vaccines.
Coxsakie Viruses

Are divided into:

A (3 types)
- Fever
- Muscle weakness suggestive of paralytic poliomyelitis
- Severe febrile pharyngitis

B (6 types)
- Abdominal pain
- Malaise
- Headache
- Patient almost recovered

Incubation period: 2 – 9 days

Diseases include:

1. C.N.S. (Aseptic meningitis)
2. Skin and mucous membrane
   - Herpangina
   - Hand-Foot and mouth disease

Caused by:

A, B

Signs:

A
- Vesicles
- Vesicles and ulcer in the anterior part of mouth
- Vesicular rash on the hand and foot

9 page
Disease include: 

3 Heart 

- Group B 
  - Acute myocarditis 
  - Pericarditis 
    - In adult and children 

- 5% off all symptomatic coxsackie infection induce heart disease 

4 Skeletal muscle 

- (B) Chronic Fatigue syndrome (post Viral Fatigue syndrome) 
  - Characterized by 
  - Fever 
  - Severe pain in the chest last for 2 days – 2 weeks 

- Group B 

- (A) Epidemic pleurodynia (epidemic myalgia or Bornholm disease) 
  - Signs 
  - Fatigue of long duration (6 months or longer) without an identified physical cause
Disease include

5. G.I.T
   - Group A
     - Diarrhea in children
   - Signs

6. Resp.tract
   - Group B+A
     - Mild upper and lower respiratory tract infection
   - Signs

7. Conjunctiva
   - Acute hemorrhagic conjunctivitis
     - Subconjunctival hemorrhage
       - Keratitis
       - Photophobia
     - Incubation period 1-2 day
   - Sever pain in the eye

8. Perinatal infection
   - Associated with type 1 (insulin-dependent D.M) with post infection with coxsackie B3+ B4

9. Pancreas
   - Cause by B3 and B4

Group A
- Characterized by myocarditis and pericarditis
- Sever cases can occur with the first 8 days of life

It may be preceded by brief episodes of diarrhea and anorexia