Picorna viruses family
OBJECTIVES

1. To know the range of human diseases caused by **Picorna viruses** and their virological causative agents

2. To study the virology of **Poliomyelitis** as most serious disease and national medical problem in Iraq
Family Representations:

- The largest: In number of its viral members.
- The smallest: In virion size and complexity = (size 25-30 nm).
- 2 major groups of human pathogens:
  1. Enteroviruses
  2. Rhinoviruses
Picorna viruses family

- **Enteroviruses** are transient inhabitant in human alimentary tract and can be detected in the throat and lower intestine.

- **Rhinoviruses** are isolated chiefly from throat and nose.
Range of human disease caused by picorna vs.

- Severe paralysis
- Aseptic meningitis
- Pleurodynia
- Myocarditis
- Vesicular and exanthomatous skin lesion
- Mucocutaneous lesion
- Respiratory illness
- Undifferentiated febrile illness
- Conjunctivitis
- Myositis
However: **Sub clinical infections are more than clinical diseases**.

The **most serious disease caused by any enteroviruses** is: **poliomyelitis**
Some characteristics of picorna vs.

- Picorna vs. are naked, icosahedral (cubic), SS RNA, +ve sense.

<table>
<thead>
<tr>
<th>Property</th>
<th>Enteroviruses</th>
<th>Parecho Vs</th>
<th>Rhino Vs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serotype</td>
<td>Polio Vs. 1-3</td>
<td>Coxsaki A. 1-24</td>
<td>Coxsaki B 1-6</td>
</tr>
<tr>
<td>Stability at acidic (PH =3)</td>
<td>stable</td>
<td>stable</td>
<td>Stable</td>
</tr>
<tr>
<td>Optimal Temp. For growth</td>
<td>37°C</td>
<td>37°C</td>
<td>37°C</td>
</tr>
</tbody>
</table>
CLASSIFICATION

- **Note :1.** there is no coxsackie A23
- **Note :2.** There is no Echo vs 10 22 23 28
- **Note :3.** Entero v.72 is the causative agent of acute hepatitis (this virus called hepatitis A virus)
Poliomyelitis

- An acute infectious disease caused by poliovirus types 1-3 = Antigenically distinct.
- In its most severe form, it affects the CNS and may cause flaccid paralysis by destruction of motor neurons (anterior horn cell) in the spinal cord and/or brain stem.
- Most infections in children are asymptomatic (=90%)
- The majority of clinical attacks produce only a minor febrile illness.
Poliomyelitis

*occur world wide
* occur year –round in the tropics
*during summer in the temperate zone.
* Winter outbreaks are rare.
* All ages groups, but children are usually more susceptible than adults because of the acquired immunity results in the adult population.

*In isolated areas (Eskimos) the virus attacks all age groups equally.
Poliomyelitis

- **In the developing countries**: it is a disease of infancy (= infantile paralysis) because of widespread dissemination of virus in the population.

- **In developed countries**, and before the advent of vaccination, the age distribution shifted so that most of the patients were over age of 5 years and (25%) were over age of (15) years.

- **Humans** are the only known reservoir of polio. Infection.

- **Direct correlation** between poor hygiene, sanitation, and crowding and the acquisition of infection and the detection of Abs in the sera of population at early ages.
Pathogenesis

- **Mouth** = portal of entry

- Primary multiplication of virus occurs at: **oropharynx or intestinal wall**

- Virus is **excreted** and detected from **throat** and **feces** before onset of illness despite high Ab. Level is developed

- From local L.N via **lymphatic** → go to **blood** → grow in **viscera** → blood-brain and blood-CSF barriers
Pathogenesis

- Blood → blood-brain barrier → spread in CNS and attack neurons → paralysis & encephalitis.
- Blood → Blood-CSF barrier → CSF → meningitis.
- Replication: in the anterior horn cells = lysis → destruction of these important component of the motor pathway ----- loss of function and flaccid paralysis of the muscles.
Polio Viremia

1... Viremia is present in asymptomatic as well as diseased = Before onset of Abs. production.

2... Viremia is the phase responsible for invasion of CNS

3... Viremia is responsible for the febrile illness
Pathogenesis

- Neuronal damage is likely to be enhanced or triggered iatrogenically by intervention during the incubation period or prodromal illness like:

1. **Tonsillectomy**: respiratory failure due to invasion of motor neurons in the medulla oblongata and cervical spinal cord.

2. **Gluteal injection**: increase the risk of leg paralysis.
Clinical findings in polio v. inf.

- Exposure to polio v. the response to this virus range from inapparent infection without symptoms, to mild febrile illness, to severe & permanent paralysis.
- Most infections are subclinical and only 1% of infections result in clinical illness.
- Incubation period 7-14 days, range 3-35 days.
Clinical Types of Polioviral infections:

1. **Abortive poliomyelitis**: mild febrile illness with resp. or intestinal inf.

2. **Non paralytic poliomyelitis (aseptic meningitis)**

   Rapid recovery after 2-10 day of neck stiffness and symptoms and signs of a septic meningitis
Clinical finding in polio.v. inf.

3. Paralytic poliomyelitis:
   Flaccid paralysis and painful muscle spasm as result of permanent motor nerve damage.

4. Progressive post. Poliomyelitis muscle atrophy
   Rare specific syndrome due to physiological changes in those patients decades of loss of motor neurons functions.
Lab. diagnosis of poliomyelitis

**Specimens**: throat and rectal swab and feces.

1. **Virus isolation and identification**:
   - Rapid destructive cytopathic effect on tissue cultures. (human embryonic fibroblast or monkey kidney cells).
   - Identification = neutralization test.
Lab. diagnosis of poliomyelitis

2. Serology:

Neutralization test for acute and convalescent serum samples (that are mixed with known concentrations of lab strains of polio. Virus and then adsorbed on permissive monolayer)

A.....For confirming recent infection

B.....To assess level of protective immunity in individuals prior to active immunization.
Lab. diagnosis of poliomyelitis

3. CSF examination:
For cases with aseptic meningitis (viral meningitis) by observing:
1. ↑ cell count (10-200/μl) mainly lymphocytes.
2. ↑ prot. Content (40-50 mg/μl).
3. Normal glucose.
Prevention of polio. Vs. infection:

- Live attenuated and inactivated vaccines, containing respectively the 3 serotypes of the poliovirus and their antigens, are in routine use.
Prevention of polio. Vs. infection:

1. **Formaldehyde – inactivate vaccine (salk vaccine):**

   Salk vaccine → S.C. Injection → 4 doses (included in triple vaccine programme) in primary course (2/4/6/12-18 months)

   → protective immunity in >95% recipients.

   → need periodic boosting doses.

   → stimulate production of IgG Abs. and therefore protect CNS but **absence of local IgA** immunity in the intestine means that wild polio. V. could implant and replicate in intestine.
Prevention of polio. Vs. infection:

3. Live – attenuated vaccine:

Sabin vaccine

→ orally → production of IgA in gut (+IgM and IgG in the circulation) → intestine resist re-infection → viruses appear in feces in an infectious form

protective immunity to others

*paralytic poliomyelitis (occasionally by reverse of virulence of polio. 2 and 3)
Prevention of polio. Vs. infection:

→ >95% protective immunity.

→ Long-lasting immunity but need boosters also →(2 / 4 / 6 / 12-18 months) programme that is included with triple vaccination programme in the first year of life.

→ Not recommended for those with immuno-compromization→ because of non-production of humoral Abs and will lead to paralysis from dissemination of virus to CNS.
Prevention of polio. Vs. infection:

3. "chimeric" live poliovirus strains:

That are constructed by the use of recombinant DNA technology which uses type-1-poliovaccine (which is stable genetically so used as vector for type 2 and 3 nucleotide sequences encoding immunogenic regions of their VP1 proteins).

It is "live poliovaccine" that can not mutate ::::: WITHOUT increased Neurovirulence.
4. **Passive immunization**: By using "Ig" → provide protection for few weeks against paralytic disease (but not for subclinical infection prevention). It is effective only if given shortly before infection.
Coxsakie viruses:

- Group A: 1-24 types
- Group B: 1-6 types

Both have an incubation period = 2-9 days.
## Clinical Findings:

<table>
<thead>
<tr>
<th></th>
<th>A &amp; B</th>
<th>B</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Aseptic meningitis</td>
<td>1. Pleurodynia (epidemic myalgia)</td>
<td>1. Herpangina febrile pharyngitis → discrete vesicles in pharynx, tonsils and tongue of small children</td>
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<td></td>
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<td>fever + chest pain (2 days – 2 weeks).</td>
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<td>4.</td>
<td>Generalized infant dis.</td>
<td>4. Diarrhea in children</td>
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<tr>
<td>5.</td>
<td>Diabetes mellitus</td>
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<td>6.</td>
<td>Chronic fatigue syndrome</td>
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</tbody>
</table>
**ECHO viruses:**

- Enteric Cytopathogenic Human Orphan viruses (IP = 2-9 days)
- 33 serotypes.
Clinical presentations of ECHO vs.:

1. Skin rash (young children)
2. Conjunctivitis
3. Aseptic meningitis
4. Muscle (weakness & spasm)
5. Infantile diarrhea
6. Congenital and neonatal diseases
7. Cardiac diseases
Other types of Entero viruses

→ 68 → bronchiolitis and pneumonia

→ 70 → acute hemorrhagic conjunctivitis

→ 71 → meningitis, encephalitis and paralysis
Rhino viruses:

- > 100 serotypes
- (IP- 2-4 days)
- Direct correlation between the amount of virus in secretions and the severity of illness.
- Rhinoviruses rarely cause lower respiratory tract disease in healthy individuals, although they are associated with the majority of acute asthma exacerbations.
- Chilliness is an early symptom of the common cold.
- Symptoms last for 7 days → non productive cough may last 2-3 weeks
- The average adult has 1–2 attacks each year.
- Neutralizing antibody to the type of infecting virus develops in serum and secretions of most persons---- recovery from illness usually precedes appearance of antibodies------ However, antibody may accomplish final clearance of infection.
- → 5 days course of( IFN α ) for treatment
Thank you