

Poliomyelitis





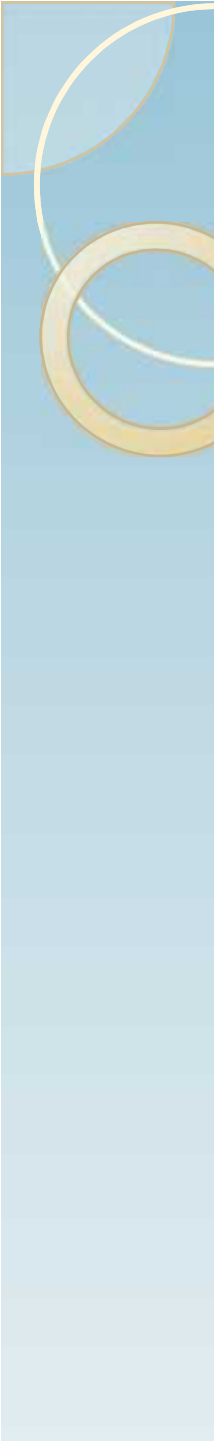
Session objectives

- Definition & Pathogenesis
- Symptoms (basic patterns of polio infection)
- Laboratory Diagnosis
- Epidemiology (Occurrence, Reservoir, Transmission, Temporal Pattern, Communicability)
- Prevention (Poliovirus Vaccines)
- Polio Eradication (because of)



Poliomyelitis

The words polio (grey) and myelon (marrow, indicating the spinal cord) are derived from the Greek. It is the effect of poliomyelitis virus on the spinal cord that leads to the classic manifestation of paralysis.

- 
- The virus enters through the mouth, and primary multiplication of the virus occurs at the site of implantation in the pharynx and gastrointestinal tract.
 - The virus invades local lymphoid tissue, enters the bloodstream, and then may infect cells of the central nervous system.
 - Replication of poliovirus in motor neurons of the anterior horn and brain stem results in cell destruction and causes the typical manifestations of poliomyelitis.

- 
- ▶ **Flaccid paralysis occurs in <1 % of polio virus infection**
 - ▶ **Aseptic meningitis occurs in about 1% of infections**

Outcomes of poliovirus infection

Outcome	proportion of cases
1. Asymptomatic	90–95%
2. Minor illness	4–8%
3. Non-paralytic aseptic meningitis	1–2%
4. Paralytic poliomyelitis	0.1-0.5%
— Spinal polio	79% of paralytic cases
— Bulbospinal poli	19% of paralytic cases
— Bulbar polio	2% of paralytic cases



➤ **Clinical responses are extremely varied:**

Inapparent: > 90 % of infections are either inapparent or result in non specific fever

Minor illness: 10%

low grade fever, malaise , headache , nausea & vomiting.




Major illness

Sever muscle spasm & pain +

**Neck & back stiffness with flaccid paralysis
may occur, characterized by:**

- Asymmetrical with fever at onset(reach max. extent within 3-4 days)**
- Site is depend on the location of nerve cell destruction in the spinal cord or brain stem**
- Legs are affected more than arms**
- Proximal parts more often than distal parts**

- 
- ❑ **Affected muscles are floppy, reflexes are diminished ,sense of pain & touch remain normal**
 - ❑ **Some improvement in paralysis may occur in convalescence but paralysis present after 60 days likely to be permanent.**
 - ❑ **Severe cases : quadriplegia , abdomen & thoracic muscles , bulbar polio**



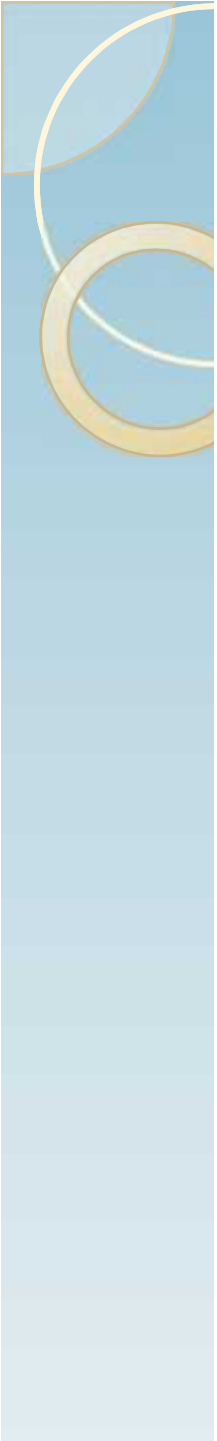
DDx: of Acute flaccid paralysis (AFP)

- paralytic polio ;**
- Guillian Barre syndrome**
- transverse myelitis,**
- traumatic neuritis**
- acute motor axonal neuropathy**
- myasthenia gravis**
- Non paralytic polio;**
- encephalitis , meningitis ,tumors, brain abscess.**



Laboratory diagnosis:

- **Routine CSF examination** (increased number of white blood cells 10–200 cells/mm³, primarily lymphocytes) and a mildly elevated protein (40–50 mg/100 mL)
- **Test for levels of antibodies** (Neutralizing antibodies appear early and may be at high levels by the time the patient is hospitalized; therefore, a fourfold rise in antibody titer may not be demonstrated)
- **Viral cultures** of throat washings, stools, or cerebrospinal fluid (CSF)



Causative agent : There are three poliovirus serotypes (P1, P2, and P3). There is minimal heterotypic immunity between the three serotypes. That is, immunity to one serotype does not produce significant immunity to the other serotypes.

Poliovirus(Enterovirus)

Type 1

☠ **Paralytogenic**

☠ **Most frequent**

Cause of outbreak

2 & 3

less commonly

frequent cause

of vaccine

associated.



Occurrence :

- **Prior to immunization it had a world wide distribution.**
- **It is eradicated from the western Hemispheres & industrialized countries**
- **The greatest risk of polio now occurs on the Indian sub continent 89% ,&to lesser extent , in the countries of west ¢ral Africa 10%.**
- **If cases appeared in industrialized countries they are either imported or vaccine associated**



Risks groups include:

- Lack of immunization against polio and then exposure to polio
- Travel to an area that has experienced a polio outbreak
- In areas where there is an outbreak, those most likely to get the disease include children, pregnant women, and the elderly. The disease is more common in the summer and fall



Age of distribution:

- **Remains primarily a disease of infants & young children ,in many polio endemic regions 70-80% of cases are < 3 years of age & 80-90% are <5 years of age.**
- **About half the vaccine-associated paralytic poliomyelitis among adult contacts of vaccinees.**



Seasonality :

- ☠ Poliovirus infection typically peaks in the summer months in temperate climates. There is no seasonal pattern in tropical climates.

Reservoir : Humans are the only known reservoir of poliovirus, **most frequently persons with inapparent infections esp. children .**

Long term carriers have not been found.



Mode of transmission:

- 1. Direct person –to- person principally through fecal –oral transmission**
 - bad standard of sanitation**
 - young children**
- 2. Pharyngeal droplets**
 - good sanitation**
 - older age groups**
- 3. Food , milk, & other materials contaminated with feces (rare)**
- 4. No reliable evidence of spread by insects exists**
- 5. Water and sewage , rarely implicated .**



Incubation period:

- ✿ **7- 14 days for paralytic cases**
- ✿ **Reported range of 3-35 days**

Period of communicability:

- ✿ **Not precisely defined**
- ✿ **Transmission is possible as long as the virus is excreted**
- ✿ **Virus appeared in throat secretion as early as 36 hrs & in feces 72 hrs after exposure to infection**
- ✿ **Virus persists in the throat for (1) week & in the feces for 3-6 weeks**



Susceptibility: Universal

- Type specific immunity of life long
- Rate of paralysis among infected non immune adults higher than those in infants & young children.
- Second attacks are rare & result from different type .
- IM injection, trauma, or surgery during I.P or prodromal illness may provoke paralysis in affected extremities.



Prevention:

1. **Education of public on the advantages of immunization in early childhood**
2. **Vaccination**
 - **trivalent (OPV) sabin**
 - **inactivated (IPV) salk**

OPV:

- **Recommended by WHO for polio eradication**
- **3 doses will protect at least 80-85 % of immunized children**
- **Induces both circulating antibody & intestinal and pharyngeal resistance to infection.**



Inactivated Polio Vaccine

- **Contains 3 serotypes of vaccine virus**
- **Grown on monkey kidney (Vero) cells**
- **Inactivated with formaldehyde**
- **Contains 2-phenoxyethanol, neomycin, streptomycin, polymyxin B**



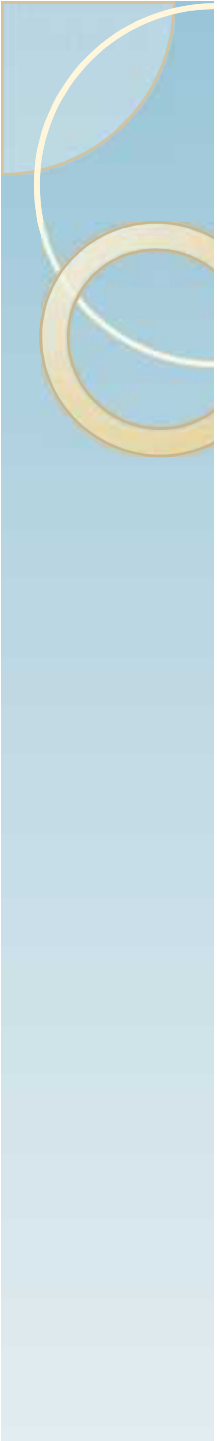
Inactivated Polio Vaccine

- **Highly effective in producing immunity to poliovirus**
- **90% or more immune after 2 doses**
- **At least 99% immune after 3 doses**
- **Duration of immunity not known with certainty**

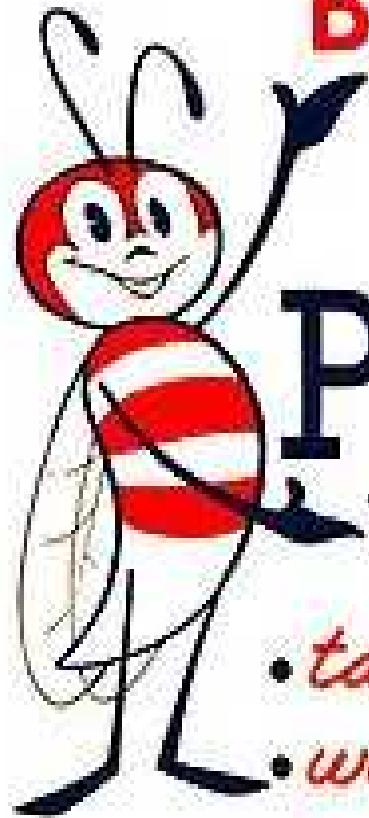


Oral Polio Vaccine

- **Highly effective in producing immunity to poliovirus**
- **Approximately 50% immune after 1 dose**
- **More than 95% immune after 3 doses**
- **Immunity probably lifelong**

- 
- **OPV Low cost, ease of administration & superior capacity to provide population immunity.**
 - **(however) Low rates of seroconversion and reduced vaccine efficacy in developing countries.**
 - **It is contra indicated in (acute infectious illness, fever, diarrhea ?, all immune deficient dis.)**

"Wellbee" says
BE WELL!



take
ORAL
POLIO
VACCINE

- *tastes good*
- *works fast*
- *prevents* polio





Complications

- Vaccine associated paralysis (VAPP)
1:2.5,000,000 doses
- Or Vaccine associated paralysis (1:800000
in 1st dose)



Vaccine-Associated Paralytic Polio

- **Increased risk in persons 18 years and older**
- **Increased risk in persons with immunodeficiency**
- **No procedure available for identifying persons at risk of paralytic disease**
- **5-10 cases per year with exclusive use of OPV**
- **Most cases in healthy children and their household contacts**



IPV:

- **Prevents paralytic polio by producing sufficient Ab. In the serum**
- **It has no risk of vaccine associated paralysis**
- **Lower level of int. immunity**
- **More expensive.**



Polio Vaccination Schedule

<u>Age</u>	<u>Vaccine</u>	<u>Minimum Interval</u>
2 months	IPV	---
4 months	IPV	4 weeks
6-18 months	IPV	4 weeks
4-6 years	IPV	6 months

A dose of IPV on or after age 4 years is recommended regardless of the number of previous doses.

Vaccine Schedule

- ☺ **Birth** **zero dose**
 - ☺ **6-8 wks** **1st dose**
 - ☺ **10-12 wks** **2nd dose**
 - ☺ **14-16 wks** **3rd dose**
 - ☺ **9 months for children not immunized at birth**
- 4 basic ds
of OPV**

If OPV is given to child with diarrhea the dose should be repeated

four doses of any combination of IPV or OPV by 4–6 years of age is considered a complete poliovirus vaccination series.

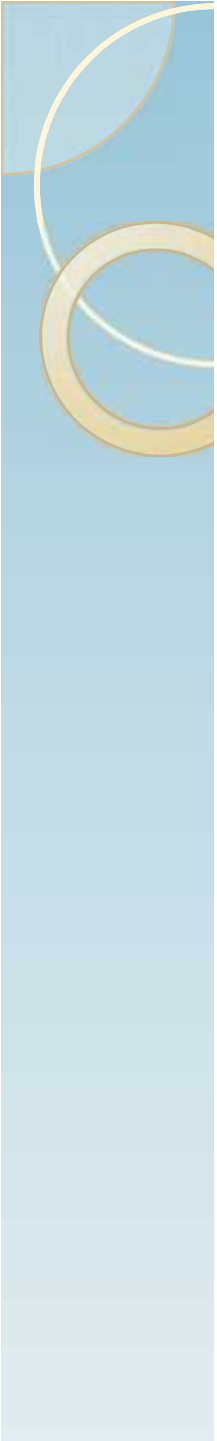
The recommended schedule of immunization in Iraq

age	vaccines	root
1 week	B.C.G+POLIO(0)+HB1	ID+ORAL+IM
2 Months	D.P.T(1)+POLIO(1)+HB2	IM+ORAL+IM
4 Months	D.P.T(2)+POLIO(2)	IM+ORAL
6 Months	D.P.T(3)+POLIO(3)+HB3	IM+ORAL+IM
9 Months	MEASLES+VIT A	SC+ORAL
15Months	M.M.R	SC
18-24 Months	FIRST.B00STER POLIO+D.P.T	ORAL+IM
4-6 Years	2 nd ..B00STER POLIO+D.P.T	ORAL+IM



Control;

- Reporting is obligatory any case of AFP under 15 y should be fully inv.(clin ,epidm,and stool culture)
- Isolation
- Concurrent disinfection
- Protection of contacts
- Investigation of source
- Sp Rx: none



Polio is one of a small limited number of diseases that can be eradicated, reasons are:

- polio only affects humans, and there is no animal reservoir
- an effective and inexpensive vaccine exists, called Oral Polio Virus (OPV)
- immunity against polio is life-long
- the virus can only survive for a very short time in the environment
- Long term carriers have not been found.



Strategy of Eradication:

- **High routine immunization coverage with OPV i.e giving the 4 basic doses during the 1st year of life**
- **Supplementary immunization in the form of mass campaigns or **NIDs****
- **Effective surveillance.**
- **Final stage when Very few or no cases are occurring ,door-to-door immunization campaigns (**mopping up**) in areas where the virus persists.**