

Neuroscience II

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Enteroviruses

Enteroviruses

Main properties:

- Enteroviruses belongs to picornaviruses family
- +ssRNA, non-enveloped viruses with Icosahedral capsid symmetry
- Acid stability (ability to survive gastric acids following ingestion)
- Resist lipid solvents like ether and chloroform but inactivated by formaldehyde
- Mainly, Intestinal site of infection
- Optimum replication at 37 ° C

Genera of Picornaviruses

Enterovirus

- Polio
- Coxsackie A and B
- Echo
- Other enteroviruses

Diseases of the human (and other) alimentary tract
(e.g. polio virus)

Rhinovirus

Disease of the nasopharyngeal region (e.g. common cold virus)

Cardiovirus

Murine encephalomyocarditis, Theiler's murine encephalomyelitis virus

Aphthovirus

Foot and mouth disease in cloven footed animals

Hepatovirus

Human hepatitis virus A

Others

Drosophila C virus, equine rhinoviruses, cricket paralysis virus

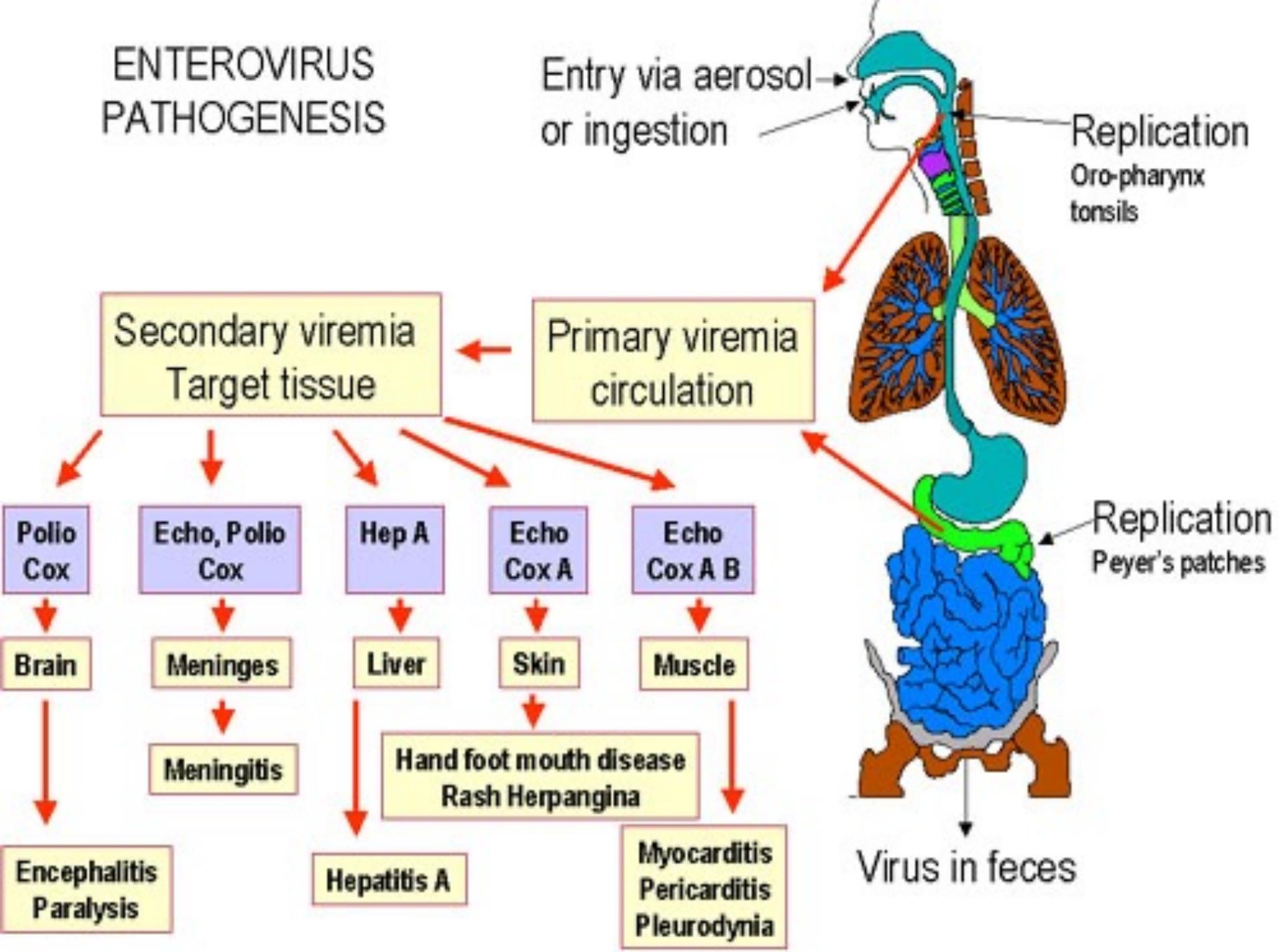
Categories of Enteroviruses

Virus	Serotypes	Clinical Diseases
Polioviruses	3 types	Asymptomatic infection, viral meningitis, paraalytic disease, poliomyelitis
Coxsackie A viruses	23 types (A1- A22, A24)	Viral meningitis plus, rash, ARD, myocarditis, orchitis
Coxsackie B viruses	6 types (B1-B6)	Viral meningitis, but no orchitis
Echioviruses	32 types	Viral meningitis, with orchitis
Other Enteroviruses	4 types(68-71)	Viral meningitis

Transmission

- Fecal - oral route: poor hygiene, dirty diapers(especially in day-care settings)
- Ingestion via contaminated food and water
- Contact with infected hands
- Inhalation of infectious aerosols

ENTEROVIRUS PATHOGENESIS



Pathogenicity (1)

- ASYMPTOMATIC
All enteroviruses
- PARALYSIS - permanent
Polio 1, 2, 3
Coxsackie A7
- PARALYSIS - temporary
Coxsackie B1-6
- MENINGITIS (aseptic)
Echo, Coxsackie A and B
Polio, Entero 71
- ENCEPHALITIS
Entero 71
Polio, Echo

Immunity

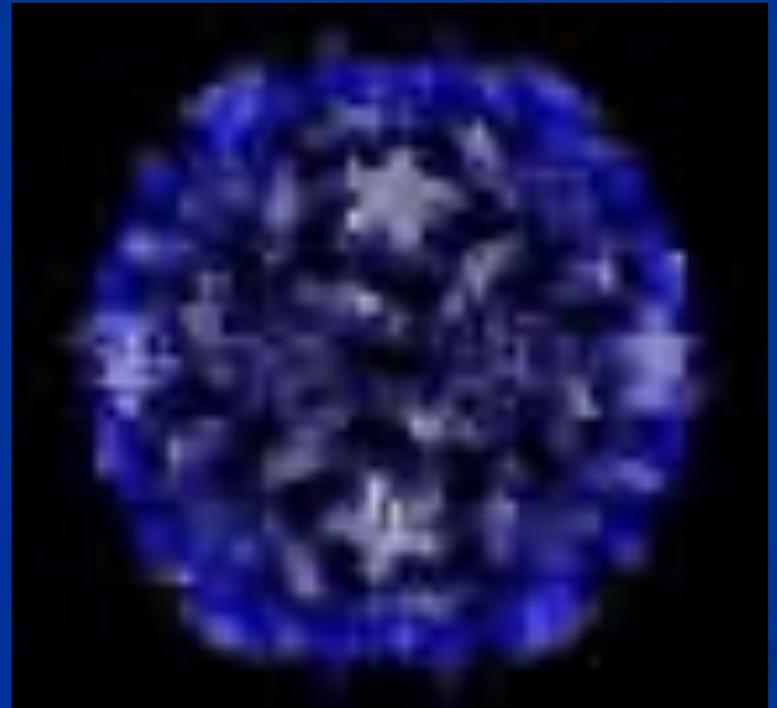
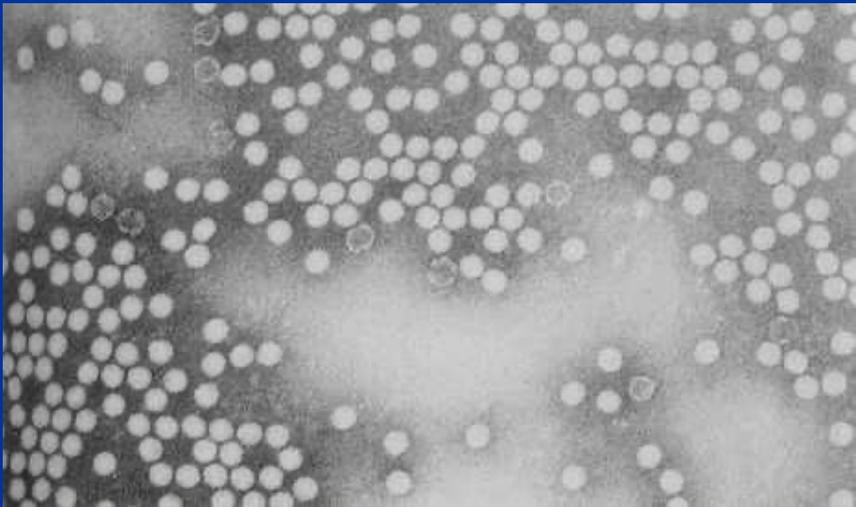
- Antibody is the major protective immune response to the enteroviruses . Secretory antibody can prevent the initial establishment of infection in the oropharynx and gastrointestinal tract, and serum antibody prevents viremic spread to the target tissue and therefore disease.
- Cell-mediated immunity is not usually involved in protection but may play a role in pathogenesis.

Laboratory Diagnosis

- Culture
- Serology
- Genome

Poliovirus

Important Characteristics



Pathogenesis

1. Source of infection: Apparent and subclinical patients
2. Incubation: 7-14 days
3. Pathogenesis: Only much less than 0.1% subjects exposed to polio virus form the flaccid paralysis

Pathogenesis

- Gastrointestinal replication
- In around 1% of infections, poliovirus spreads along certain nerve fiber pathways, replicating in and destroying motor neurons within the spinal cord, brain stem, or motor cortex. Paralytic poliomyelitis, (spinal, bulbar, and bulbospinal) vary only with the amount of neuronal damage and inflammation that occurs, and the region of the CNS affected.

Clinical Syndromes

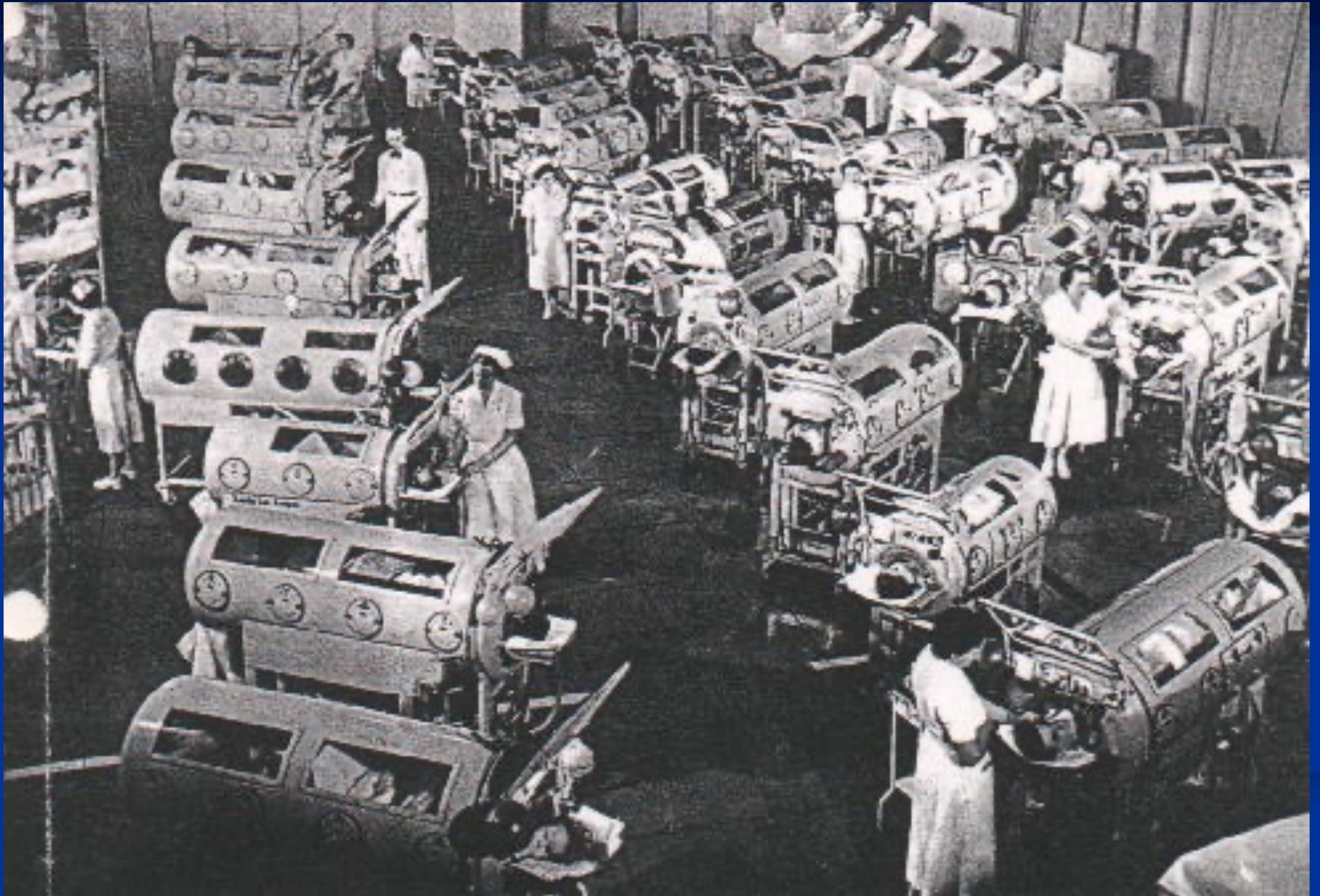
- Asymptomatic illness: 90%
- Abortive poliomyelitis, the minor illness: 5% infected people
- Nonparalytic poliomyelitis or aseptic meningitis: 1%-2% of patients with poliovirus infections.
- Paralytic polio, the major illness: 0.1% to 2% of persons with poliovirus



Child with polio sequelae



Paralyzed child in an iron lung



Iron lung ward in the 1950's



Lab Diagnosis

- Definitive diagnosis is made by isolation of the virus from stool, CSF, oropharyngeal secretions
- Cell culture involves fibroblastic MRC-5 cells
- ELISA
- IFA
- neutralizing Test
- CFT

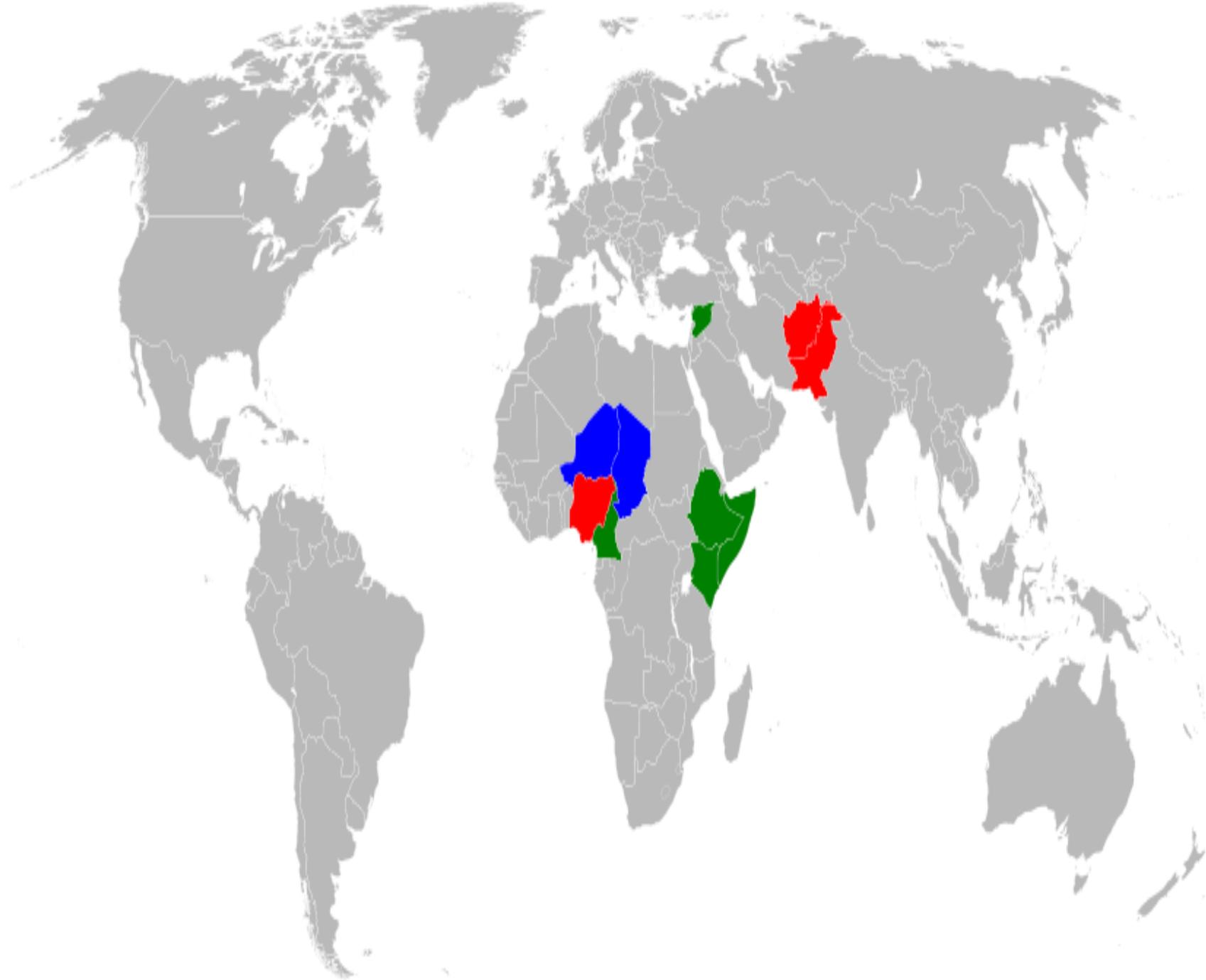
Prevention

- Both oral polio vaccine (OPV live, attenuated, Sabin, 1957)
- and inactivated poliovirus vaccine (IPV, Salk, 1954) are available

Poliovirus vaccine / MOH

<http://www.moh.gov.jo/MOH/arabic/generaldetails.php?generalid=112>

العمر	المطاعيم
أقرب وقت بعد الولادة	مطعوم ضد التدرن
الجرعة الاولى من: مطعوم الشلل (المقتول)	
شهران 61 يوم	المطعوم الخماسي و يتكون من: (الثلاثي البكتيري ضد الدفتيريا و الكزاز و السعال الديكي + مطعوم التهاب الكبد نوع ب + المستدمية النزلية نوع ب)
الجرعة الثانية من: مطعوم الشلل(المقتول) + المطعوم الخماسي + OPV مطعوم الشلل الفموي	
ثلاثة شهور 91 يوم	المطعوم الخماسي و يتكون من: (الثلاثي البكتيري + مطعوم التهاب الكبد نوع ب + المستدمية النزلية نوع ب)
الجرعة الثالثة من: مطعوم الشلل(الفموي)	
اربعة شهور 121 يوم	المطعوم الخماسي و يتكون من: (المطعوم الثلاثي البكتيري + مطعوم التهاب الكبد نوع ب + المستدمية النزلية نوع ب)
تسعة شهور	مطعوم الشلل الفموي + الحصبة
سنة و نصف (18 شهرا)	مطعوم الشلل الفموي + المطعوم الثلاثي البكتيري + مطعوم الثلاثي الفيروسي و يحمي من الحصبة و الحصبة الالمانية و النكاف





Polio-like paralysis

A rare manifestation of some viruses:

Enterovirus type 70:

- Acute haemorrhagic conjunctivitis
- Highly infectious
- Symptoms within 1-2 days
- Recovery in a week but may be complicated by polio-like paralysis

Enterovirus type 71:

Encephalitis

Myocarditis

Polio-like paralysis

Polio-like paralysis

Coxsackievirus B:

Aseptic meningitis, sometimes with rash and paralysis

Echo viruses:

Aseptic meningitis and paralysis