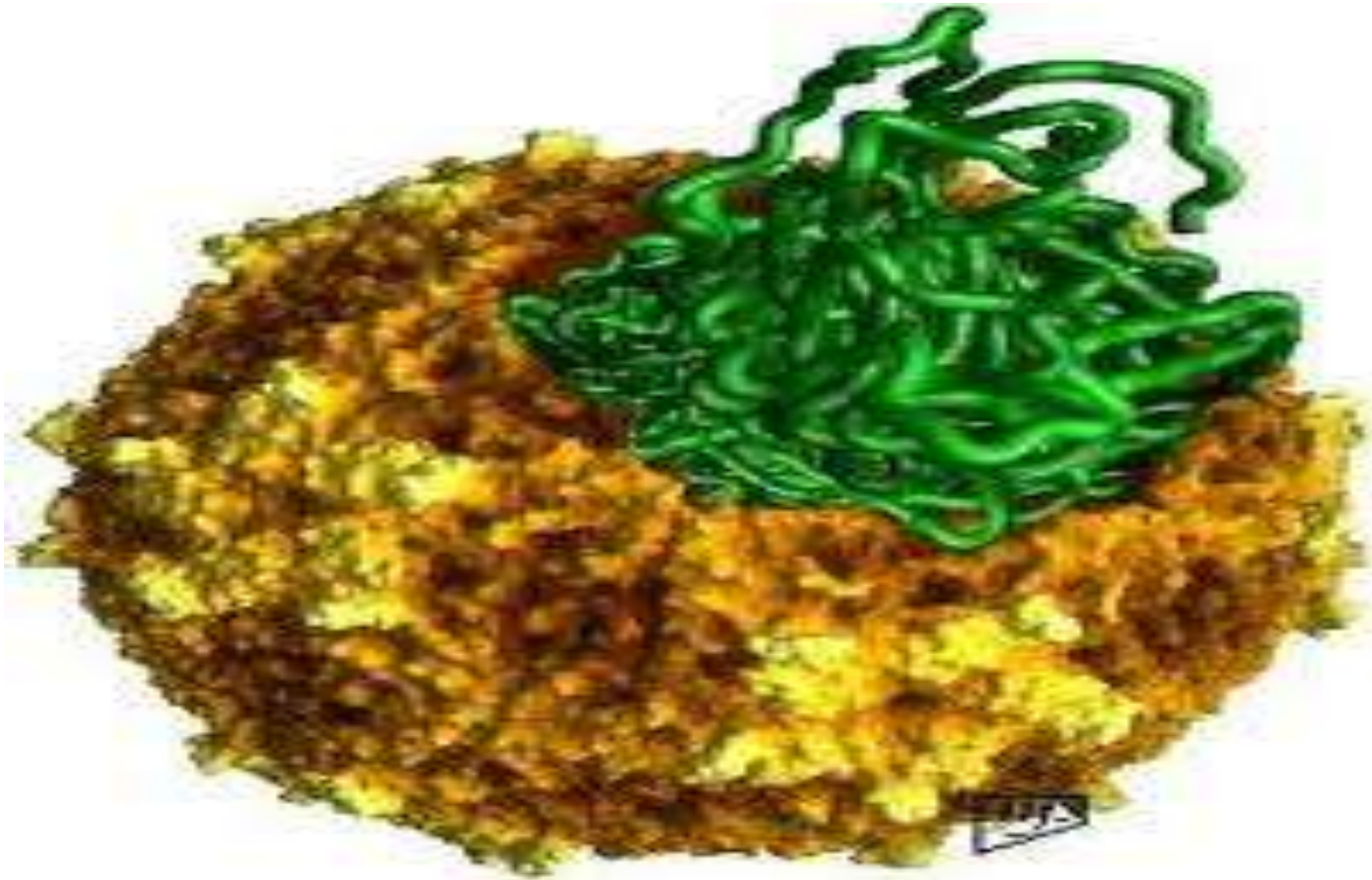


Picornavirus



Picornavirus

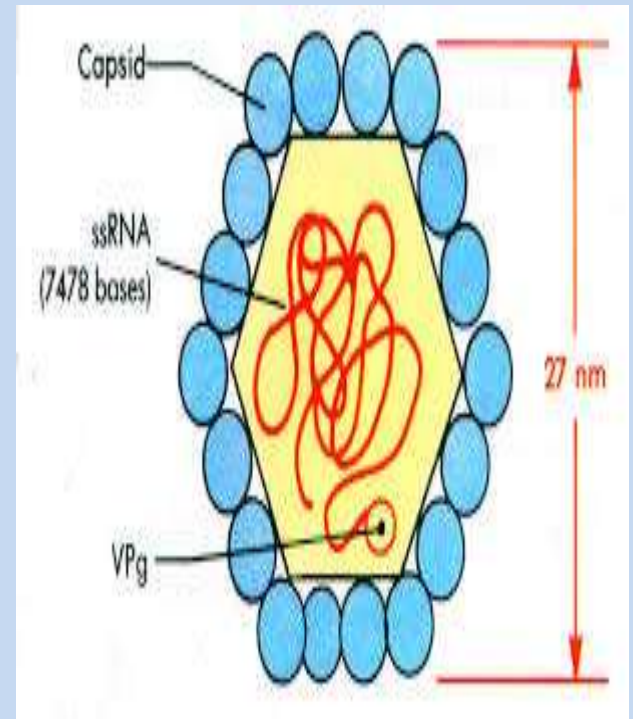
OBJECTIVES

To learn about

- Classification
- Structure
- Pathogenesis
- Immunization
- Lab diagnosis of polioviruses.

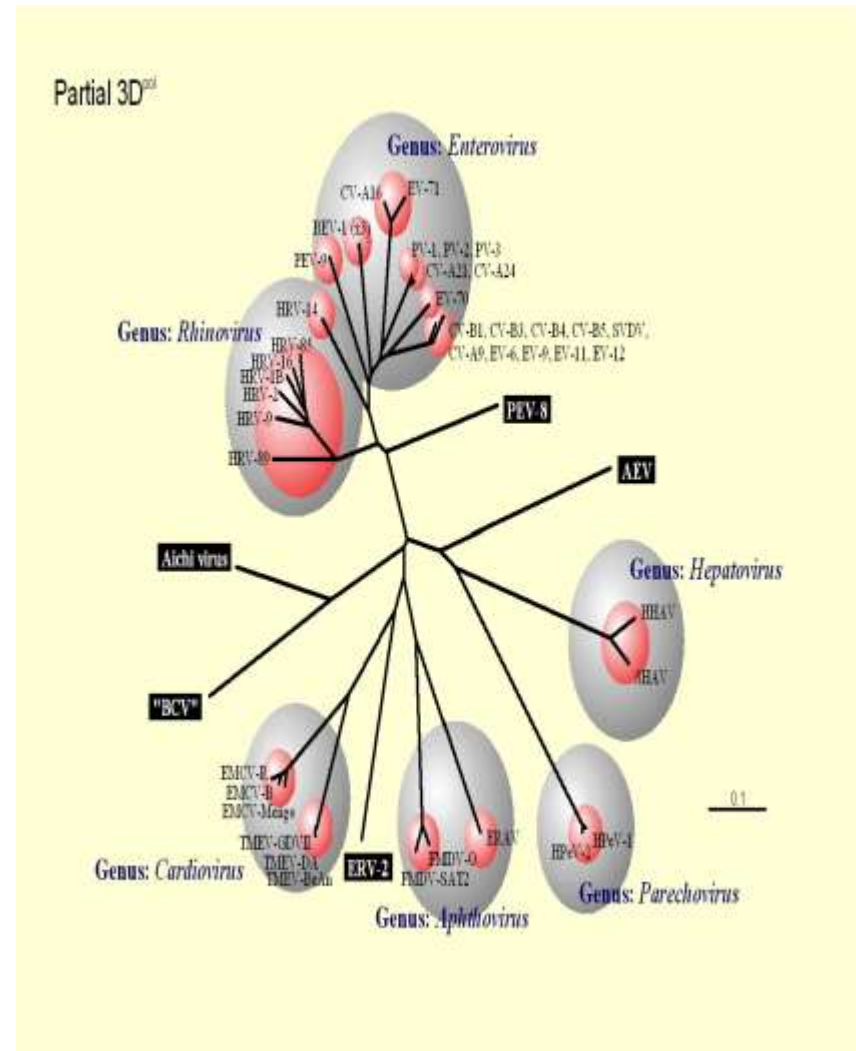
INTRODUCTION

- Viruses comprises of pico=small rna =RNA
- SS RNA
- NON ENVELOPED
- DIAMETER = 27-30 NM



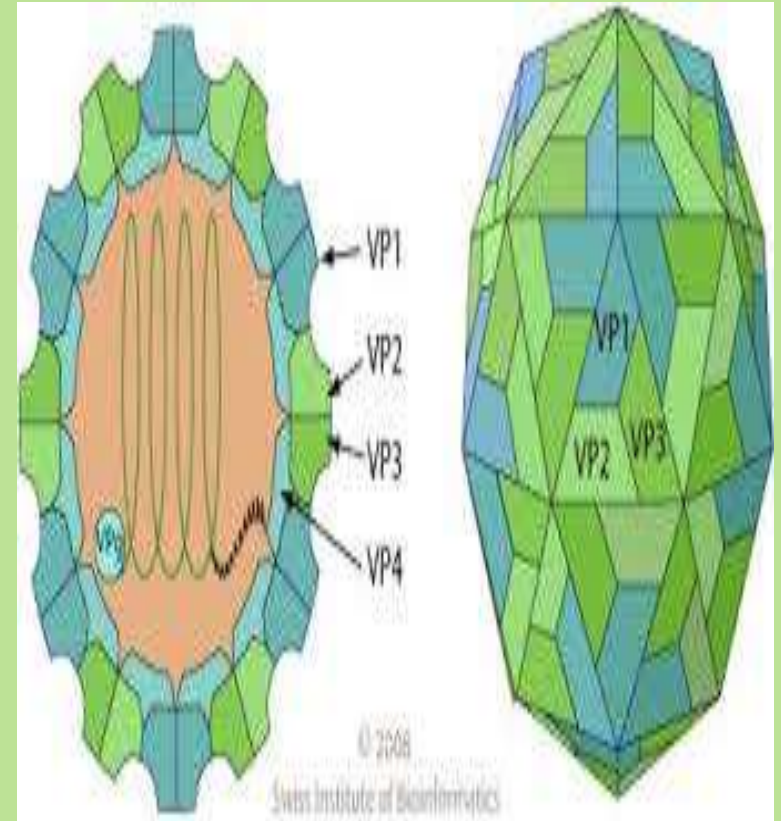
CLASSIFICATION

- Family- picornaviridae
- Divided - 6 genera
- **Enterovirus**
- **Rhinovirus**
- **Cardiovirus**
- **Aphthovirus**
- **Hepatovirus**
- **Parechovirus**



PROPERTIES

- **SIZE** 28- 30 NM
- **VIRION** ICOSAHEDRAL
- **SS RNA** LINEAR
- **PROTEINS** VP1 - VP3
antibody binding site
- **INTERNAL PROTEIN**
VP4
vpg associated with viral rna .



NONENVELOPE

REPLICATION - Cytoplasm .

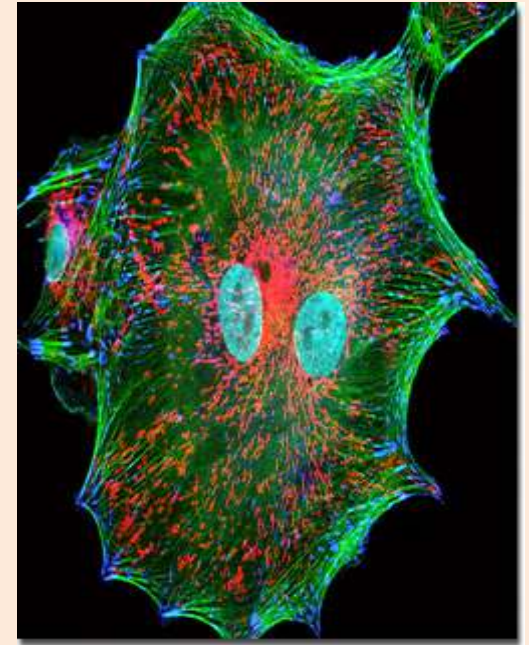
CULTURE –

Many **enterovirus** - 37 deg

Monkey/human cells .

RHINO - Only human – 33 deg

COXASACKIE – Newborn mice



The cells from which line was initiated were sampled from the renal tissue of an African green monkey (Cercopithecus aethiops)

ENTEROVIRUS

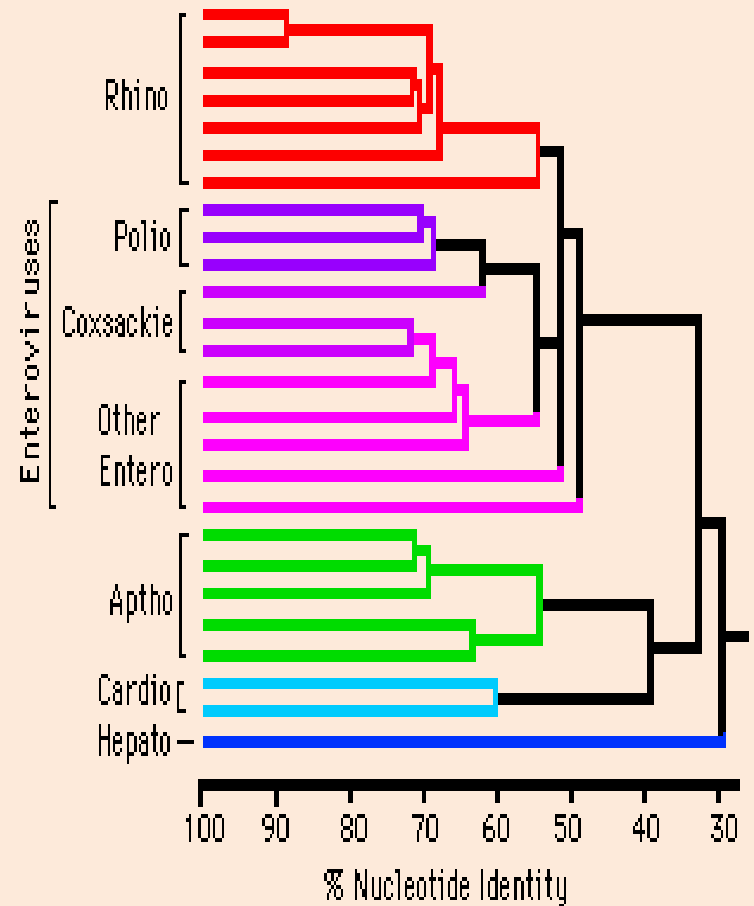
72 SEROTYPES

-poliovirus

-coxsackie virus

-echo virus

- they are all found in intestine and excreted in faeces.
- since 1969 classified as type numbers .



POLIOVIRUS

CAUSES POLIOMYELITIS

MORPHOLOGY

- spherical - 27 nm
- capsid has - **60 subunits**
- with proteins vp 1-4.
- ss rna of positive sense.



The Union Health Minister, Ghulam Nabi Azad received the official certificate at a function here. 28 march 2014



RESISTANCE

- Among most **stable virus**
- Resistant *to ether chloroform bile, intestinal proteolytic enzymes*
- In **faeces** survive for months **at 37 deg**
- Virus can survive for **months at -20**
- Room temp –several weeks
- Inactivated when **heated at 55 deg for 30 min/drying /oxidising agents/chlorination**
- Stable at **ph -3**

ANTIGENIC PROPERTIES

- **TWO ANTIGENS**

C ANTIGEN also called h or heated antigen
associated with empty noninfectious particle

D ANTIGEN

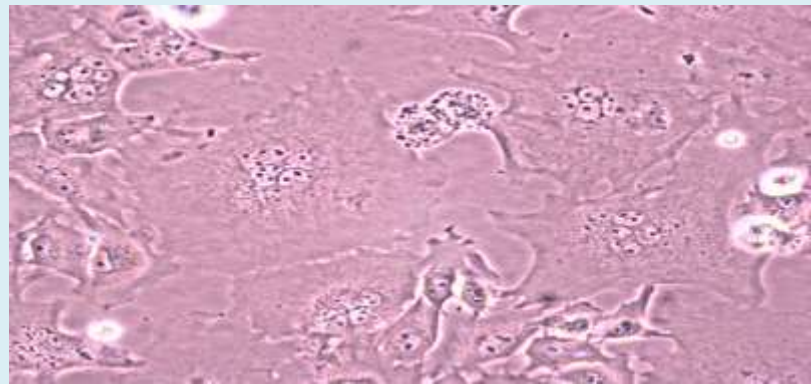
1. also called **naive or n antigen** associated with whole virion
2. anti – d is protective
3. potency of injectable poliovaccine – measured in d antigen units

TYPES

- TYPE 1 – 3
- IDENTIFIED BY NEUTRALISATION TEST
 - 1 common epidemic type
 - 2 usually endemic type
 - 3 involved in recent epidemics

HOST RANGE AND CULTIVATION

- PRIMARY MONKEY KIDNEY
 - cells round off
 - become refractile
 - eosinophilic intranuclear inclusion bodies



PATHOGENESIS

- Transmitted by **faeco oral route**
- Inhalation or entry through **conjunctiva** of droplets of **respiratory secretions**
- Ingested and multiplied in **tonsil** and small intestine . It then spreads to **regional lymph node** and **enter blood stream** .
- Spreads virus to **target cells**
- Where multiplication takes place
- Resulting in **symptoms and Secondary viremia**
- May ascend to brain tissues via infected nerves

ENTEROVIRUS PATHOGENESIS

Entry via aerosol or ingestion

Replication
Oro-pharynx
tonsils

Secondary viremia
Target tissue

Primary viremia
circulation

Polio
Cox

Echo, Polio
Cox

Hep A

Echo
Cox A

Echo
Cox A B

Replication
Peyer's patches

Brain

Meninges

Liver

Skin

Muscle

Virus in feces

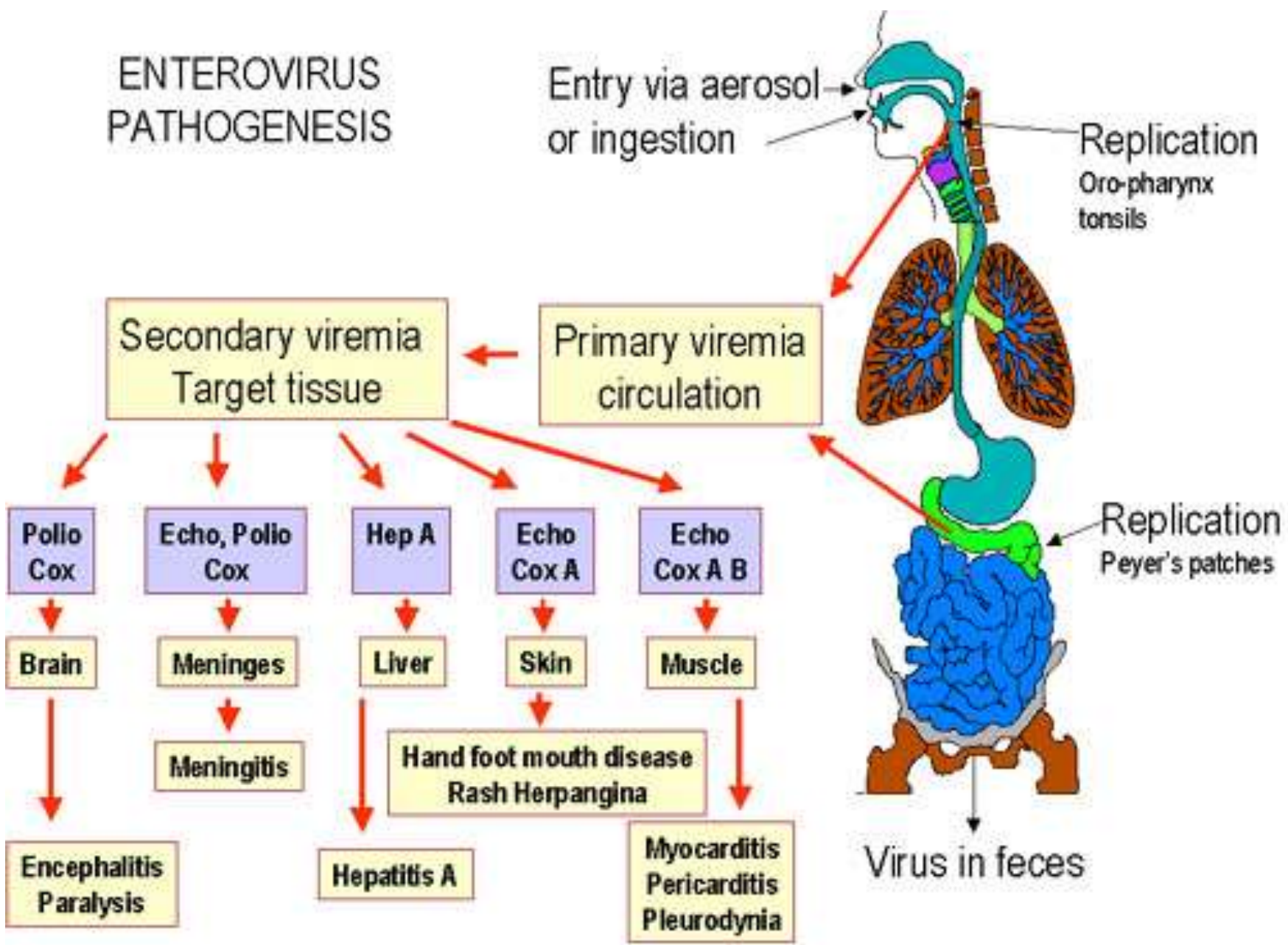
Encephalitis
Paralysis

Meningitis

Hepatitis A

Hand foot mouth disease
Rash Herpangina

Myocarditis
Pericarditis
Pleurodynia



Clinical features

- Incubation period **7-14 days**
- **90-95 %** presents with only seroconversion
- **5% PRESENTS**
- **Asymptomatic illness- no symptoms**
- **Abortive Poliomyelitis** The minor illness
fever/headache/sorethroat malaise , 1-5 days
- **Non paralytic - 3-4 d later, meningitis**
- **Paralytic - flaccid type**
- **Progressive postpoliomyelitis Muscle Atrophy**

Precipitating Factors

- Proactive factors
 - Fatigue
 - Trauma
 - Intramuscular injection
 - DPT
 - Operative procedures

Laboratory diagnosis

- **SPECIMEN**

- Blood
- CSF rare .
- Throat swabs first few days
- Faeces up to 30 days .

- **CULTURE**

- Primary monkey kidney cell
- Growth is indicated by cytopathic effect
- Isolated virus is identified and typed by antiserum

SEROLOGICAL TEST

Paired sera in CFT and neutralization .

IMMUNITY

- TYPE SPECIFIC

Humoral antibody protective

– IgM appears after one week and remain for 6 mths

– IgG persists for life

– IgA provides local – intestinal immunity

CMI not protective

PROPHYLAXIS

- IPV –SALK KILLED PV
- OPV – SABIN LIVE POLIO
- **As national immunization programme**
- 3 doses of opv ,month interval, 6,7,8 mth
- Booster dose is recommended 12 – 18 mths
- complete before 6 mths of age
- Between the age of 6mths – 3 years

KILLED/SALK

- Developed by Salk 1953
- Killed formalised
- Given s/c or i/m
- Induces antibody but no local immunity
- Not useful in epidemics
- Lifelong
- Costlier
- Strict storage and transport

SABIN/LIVE

- Developed by Sabin 1957
- Live attenuated
- Given orally
- Both humoral and intestinal
- Useful herd immunity
- Booster is required
- Cheaper
- At zero degree

- trivalent

- Monovalent/trivalent
- MgCl₂ or sucrose stabilise against heat inactivation

Criteria of attenuated strains

- Should not be **neurovirulent** . **Confirmed by intraspinal inoculation.**
- **Following feeding**—should be able to set up intestinal infection and induce immunity.
- Should possess stable markers .
- Monoclonal antibodies.
- Nucleic acid sequencing .

Markers for differentiating wild from the attenuated

	wild strain	attenuated
• D	grow well in low bicarbonate	don't grow
• Rct 40	at 40 deg	don't grow
• MS	monkey kidney	grow poorly

Global eradication

- By global immunisation with OPV
- Who made a campaign to eradicate by 2000
- America was declared –1994
- Western pacific region 2000
- Europe 2002
- India march 2014

Coxsackie viruses

- Two groups A (SEROTYPES 1- 24) and B (SEROTYPES 1- 6).
- Frequently found in faeces of healthy children.

Causes

- respiratory cold like illness
- illness resembling paralytic poliomyelitis.
- herpangina ,meningitis .

Can be cultured in cell culture and suckling mouse . PCR.

Rhinoviruses

- Worldwide distribution.
- More than 100 antigenic types.
- Common cold.
- Transmission – droplets ,aerosol ,direct or indirect.
- Can be isolated and typed. WI- 38, MRC- 5 .
- Prevention – washing of hands , virucidal soaps.
- Treatment – supportive.

References

- Essentials of medical microbiology. Apurba S Sastry.
- Textbook of Microbiology . Ananthannarayan and Paniker.

MCQs

1. Zero dose of OPV is given:
 - a. At one month
 - b. At birth
 - c. When child is having diarrhea
 - d. When child is having polio

2. Enterovirus 72 is:
 - a. Hepatitis A virus
 - b. Hepatitis E virus
 - c. Hepatitis B virus
 - d. Hepatitis C virus

3. Not true about salk vaccine:

- a. Expensive than OPV
- b. Not useful in epidemics
- c. Contraindicated in low immunity
- d. Booster doses are required

4. The most common viruses that can cause meningo encephalitis in children are:

- a. Arboviruses
- b. Herpesviruses
- c. Japanese encephalitis virus
- d. Enteroviruses.