POLIOMYLITIS

WHAT IS POLIOMYELITIS?

- Polio= Gray matter
- Myelitis= Inflammation of the spinal cord
- This disease result in the destruction of **motor neurons** caused by the poliovirus.
- Polio causes by a virus that attacks the **nerve cells of the brain & spinal cord** although not all infections result in sever injuries and paralysis.

What are the symptoms?

- Many include fever, pharyngitis, headache, anorexia, nausea, and vomiting.
- Illness may progress to aseptic meningitis and menigoencephalitis in 1% to 4% of patients. These patients develop a higher fever, myalgia and sever headache with stiffness of the neck and back.

Epidemiology of Poliomyelitis

Poliomyelitis

- First described by Michael Underwood in 1789
- First outbreak described in U.S.
  in 1843
- 21,000 paralytic cases reported in the U. S. in 1952
- The cases that were reported in 1979 where mild and self-limited and do not result in paralysis
- Global eradication in near future

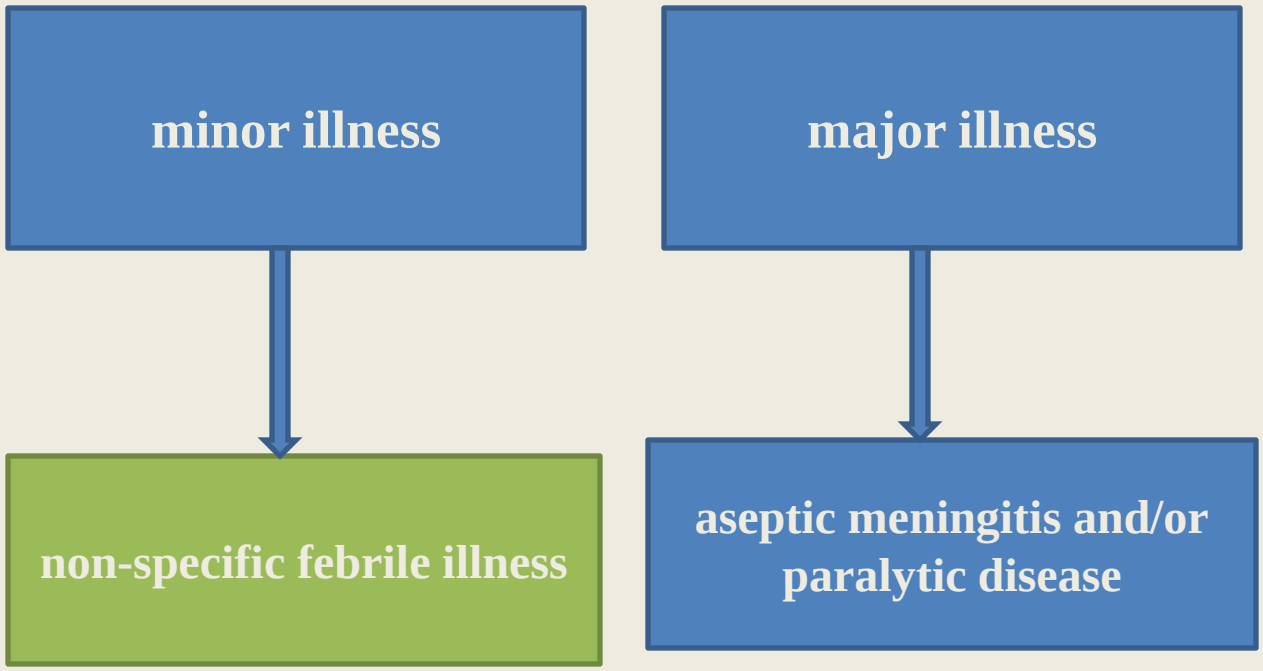
Introduction

- A viral infection most often recognized by **acute onset of flaccid paralysis.**

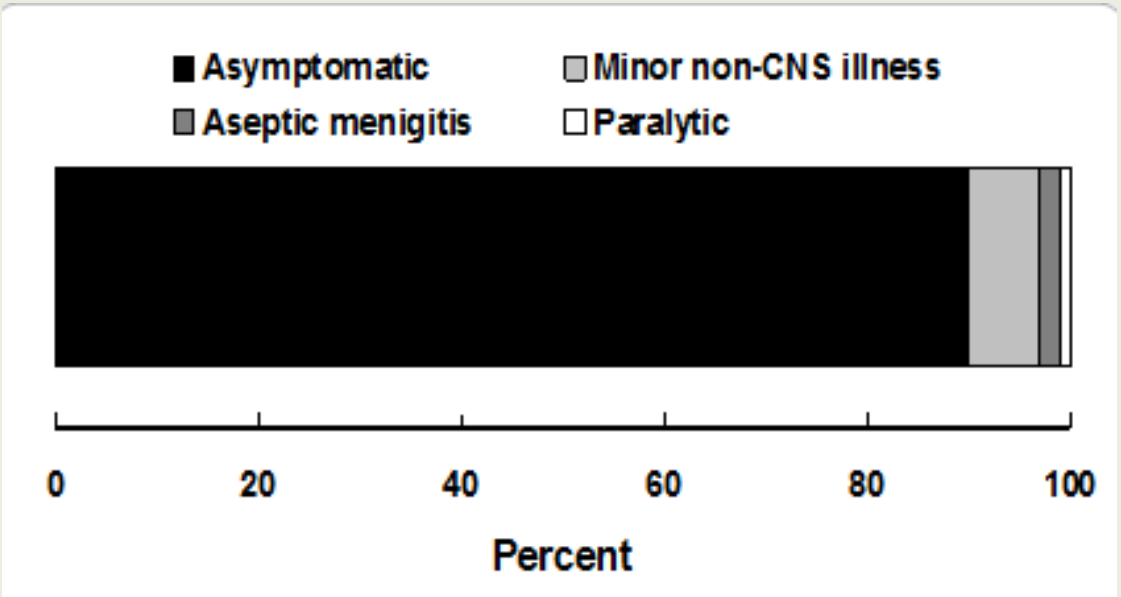
- Infection with poliovirus results in a spectrum of clinical manifestations from **inapparent infection to non-specific febrile illness, aseptic meningitis, paralytic disease, and death.**

- Poliomyelitis is a **highly infectious disease caused by three serotypes of poliovirus.**

- **Two phases of acute poliomyelitis can be** distinguished:
- **a non-specific febrile illness (minor illness)** followed, in a small proportion of patients, by **aseptic meningitis and/or paralytic disease (major illness).**


minor illness
major illness
non-specific febrile illness
aseptic meningitis and/or paralytic disease

Outcomes of poliovirus infection



Epidemiological pattern

- The epidemiological pattern of polio depends upon the degree of **the socioeconomic development and health care services of a country.**

- The pattern of the disease has been **considerably modified by widespread immunization.**

- According to the WHO; Three epidemiological patterns have now been delineated:

  - **Countries with no immunization**: the virus infects all children, and by age **5 years almost all children** develop antibodies to at least one of the 3 types of polio virus. **In that pattern paralytic polio cases are frequent in infants.**

  - **Countries with partial immunization**: In these countries, wild polio **virus is largely replaced by vaccine virus** in the environment.

  - **Countries with almost total immunization coverage**: in these countries polio is becoming rare, however, **sporadic cases do occur rarely.**

Causative organism

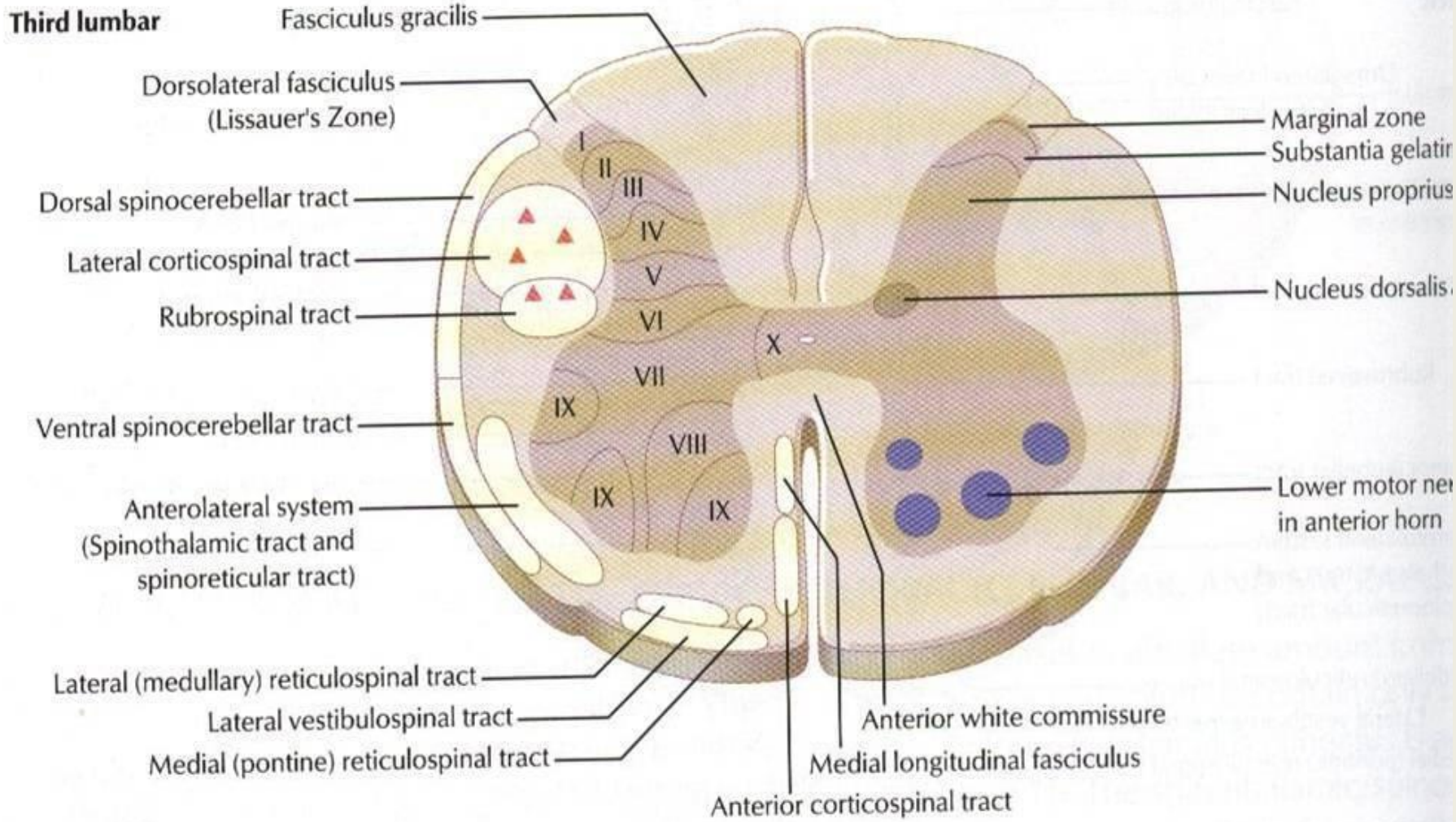
- Poliovirus: belongs to "**Picorna**" viruses which are small **RNA-containing viruses**.

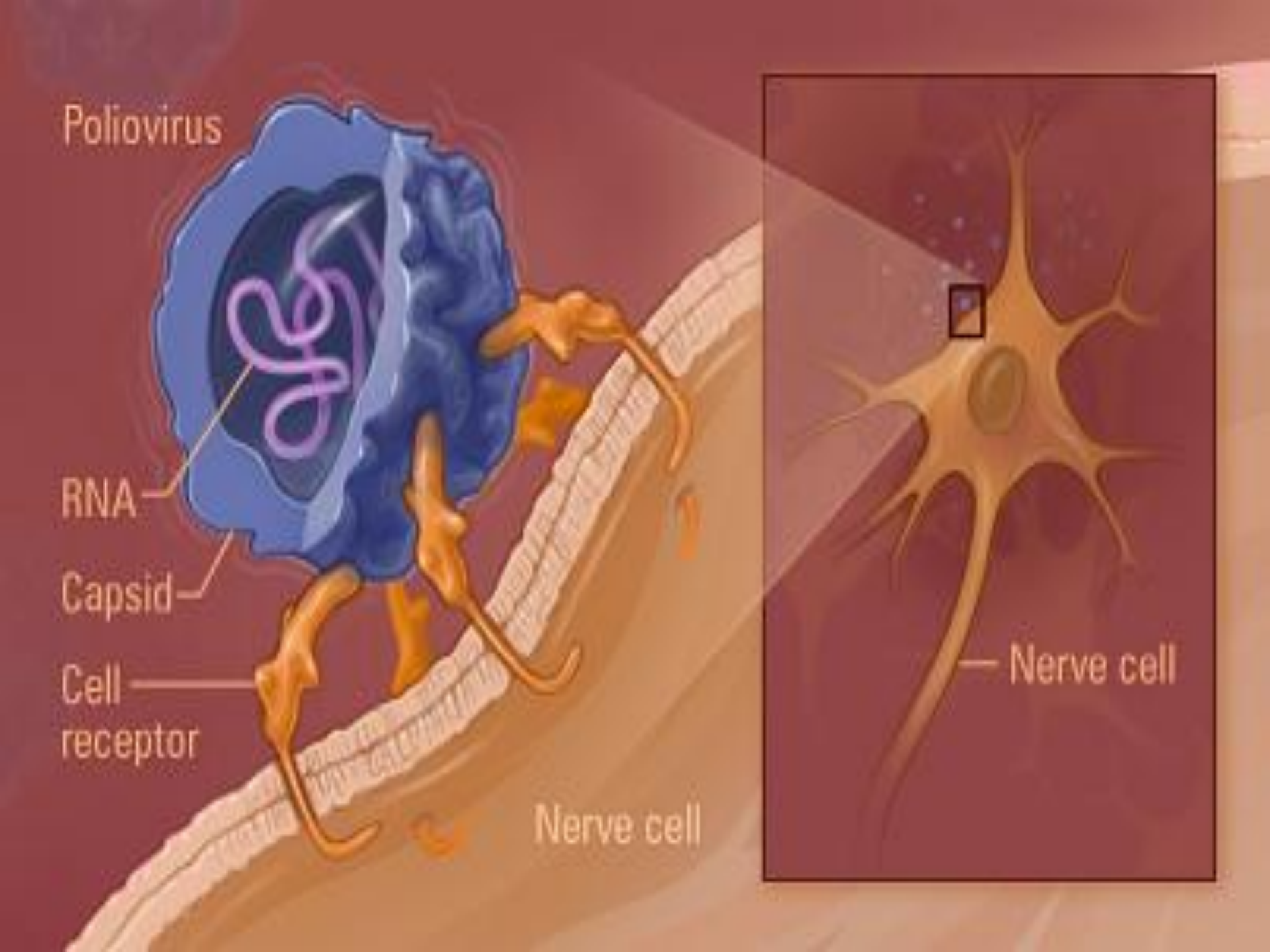
- Polioviruses have three distinct serotypes,
  - Type I
  - Type II
  - Type III

- Polioviruses are relatively **resistant and survive for a long time** under suitable environmental conditions, but are **readily destroyed by heat** (e.g. pasteurization of milk, and chlorination of water).

Localization of viruus

Virus **localized** in the **anterior horn** cells of the spinal cord and certain brain steam motor nuclei.


Third lumbar
Fasciculus gracilis
Dorsolateral fasciculus
(Lissauer's Zone)
Dorsal spinocerebellar tract
Lateral corticospinal tract
Rubrospinal tract
Ventral spinocerebellar tract
Anterolateral system
(Spinothalamic tract and
spinoreticular tract)
Lateral (medullary) reticulospinal tract
Lateral vestibulospinal tract
Medial (pontine) reticulospinal tract
I
II
III
IV
V
VI
VII
VIII
IX
IX
IX
X
Marginal zone
Substantia gelatin
Nucleus proprius
Nucleus dorsalis
Lower motor neu
in anterior horn
Anterior white commissure
Medial longitudinal fasciculus
Anterior corticospinal tract


Poliovirus
RNA
Capsid
Cell receptor
Nerve cell
Nerve cell

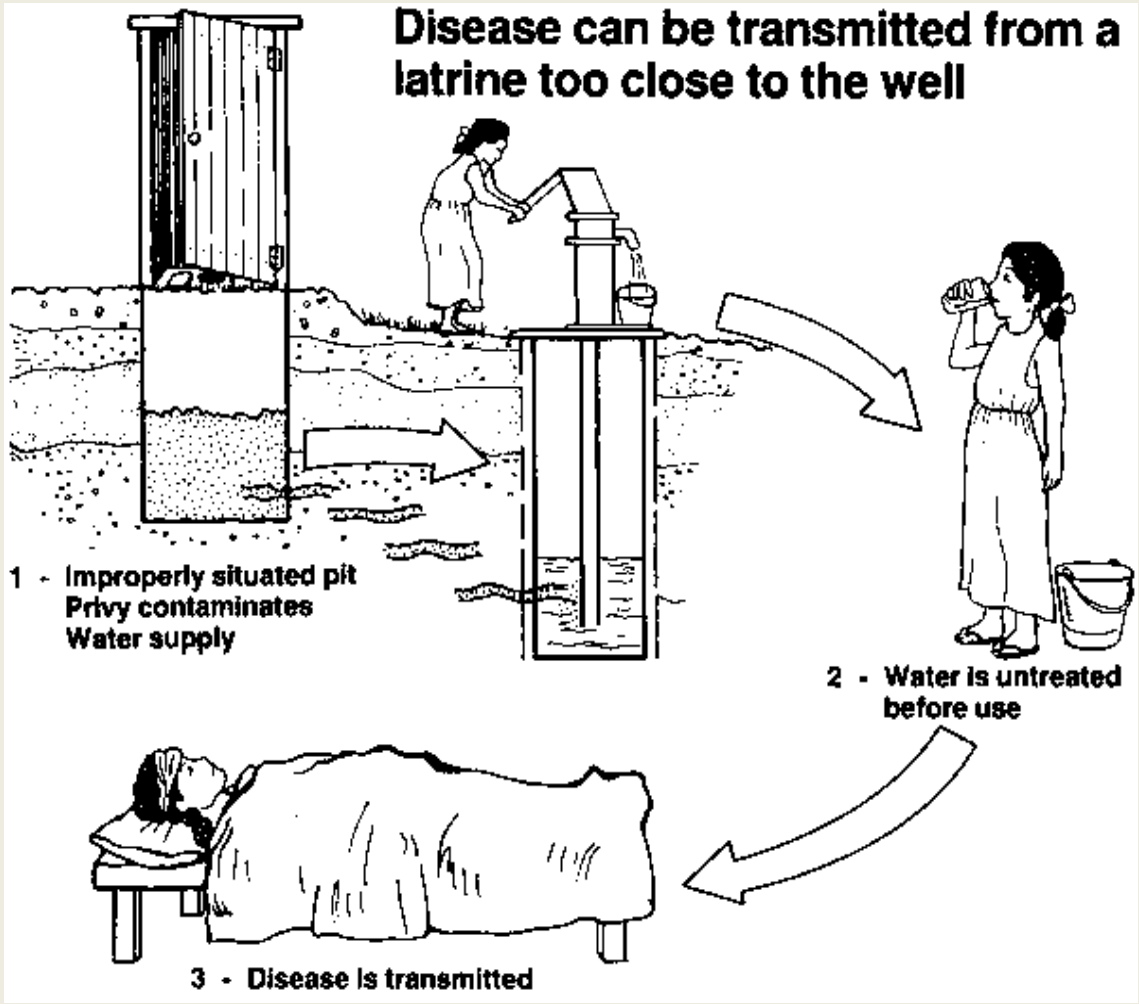
PATHOGENESIS

- Entry into mouth
- Replication in pharynx, GI tract, local lymphatics
- Hematologic spread to lymphatics **and central nervous system**
- Viral spread along nerve fibers
- Destruction of motor neurons

PATHOGENESIS cont..

- The ant. Horn motor cells may be damaged by viral multiplication or toxic byproducts of the virus or indirectly by ischemia, edema, and hemorrhage in the glial tissues.
- Destruction of the spinal cord occurs focally and within 3 days wallerian degeneration is evident.

Transmisión



The Life Cycle of Polio

FINDING A VICTIM

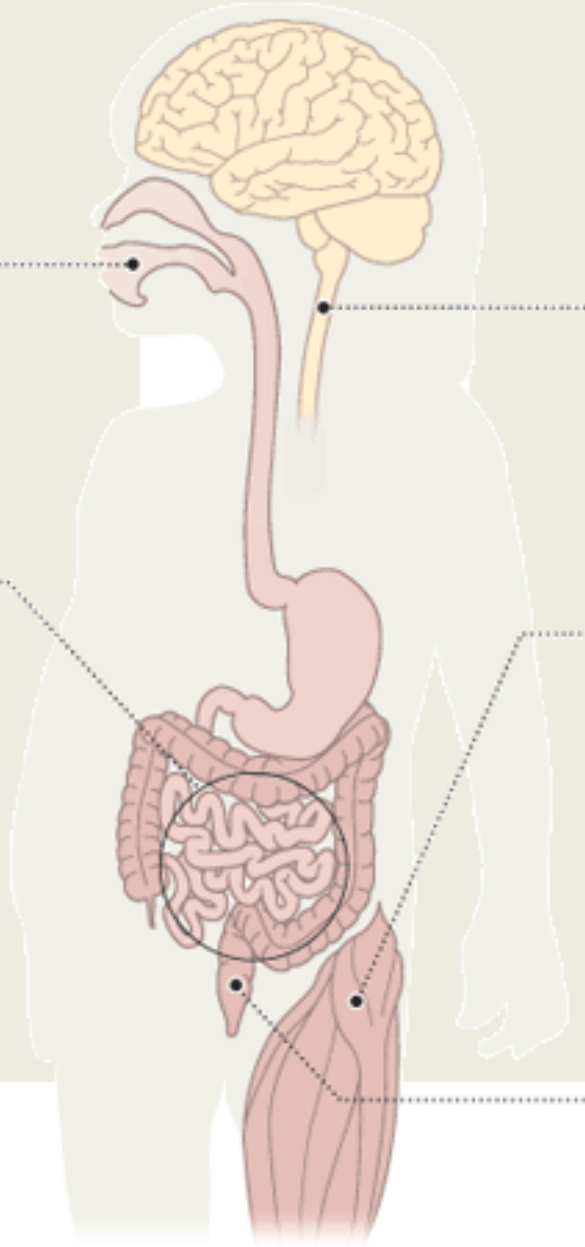
The virus enters the body through contaminated food, dirty fingers or water tainted with sewage.

SETTLING IN

The virus attaches to receptors on the intestinal walls. (Oral polio vaccine attaches to the same ones.) From there it can get into the bloodstream.

THE ATTACK

In 99.5% of cases, the virus causes no symptoms, or mild flulike illness.



In less than 0.5% of cases, the virus attacks the central nervous system, destroying cells in the spinal cord.

THE DAMAGE

Nerve cell death can cause muscle paralysis, mostly in the legs.

MOVING ON

Even in people with no symptoms, the virus is excreted in feces that can contaminate food and water.

Source: World Health Organization

The New York Times

Modes of transmission

Since foci of infection are the throat and small intestines, poliomyelitis spreads by two routes:

- Oral-oral infection: direct droplet infection

- Faeco-oral infection:
  - Food-borne (ingestion) infection through the ingestion of contaminated foods. Vehicles include milk, water, or any others that may be contaminated by handling, flies, dust….

  - Hand to mouth infection.

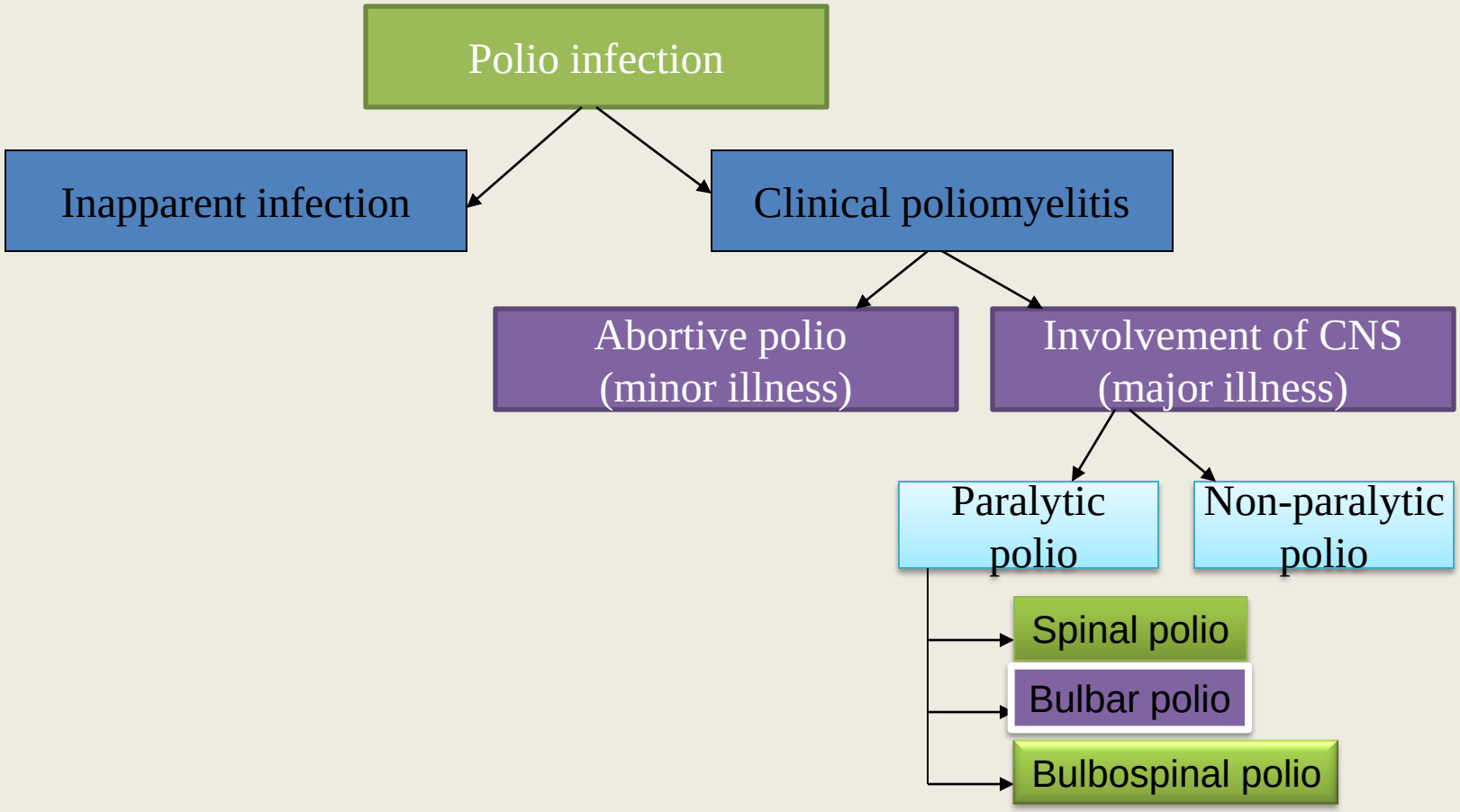
(polio virus has the ability to survive in cold environments. Overcrowding and poor sanitation provide opportunities for exposure to infection.)

- Man is the only reservoir of infection of poliomyelitis.

- Pharynx: the virus is found in the oropharyngeal secretions.

- Small intestine: the virus finds exit in stools.

Forms of polio infection



INAPPARENT INFECTION

- Incidence is more than 100 to 1000 times the clinical cases.

- No clinical manifestations, but infection is associated with acquired immunity, and carrier state.

CLINICAL POLIOMYELITIS

I. Abortive polio (minor illness):

- The majority of clinical cases are abortive, with mild systemic manifestations for one or two days only, then clears up giving immunity. **Some abortive cases may be so mild to pass unnoticed.**

- Manifestations:
  - Moderate fever
  - **Upper respiratory manifestations:** pharyngitis and sore throat
  - **Gastrointestinal manifestations**: vomiting, abdominal pain, and diarrhea.

CLINICAL POLIOMYELITIS (CONT.)

II. Involvement of the CNS (major illness):

- Affects a small proportion of the clinical cases, and appears few days after subsidence of the abortive stage. It takes two forms: **nonparalytic and paralytic polio**.

- **Nonparalytic polio** is manifested by fever, headache, nausea, vomiting, and abdominal pain. Signs of meningeal irritation (meningism), and aseptic meningitis (pain and stiffness in the neck back and limbs) may also occur.

- The case either recovers or passes to the paralytic stage, and here the nonpralytic form is considered as a "**preparalytic stage".**

CLINICAL POLIOMYELITIS (CONT.)

Paralytic poliomyelitis:

- **Paralysis usually appears within 4 days after the preparalytic stage (around 7-10 days from onset of disease).**

- The case shows fever, headache, irritability, and different paralytic manifestations according to the part of the CNS involved, with destruction of the motor nerve cells, **but not the sensory nerve cells.**

- Forms: spinal, bulbar, and bulbospinal.

Spinal polio

- Different spinal nerves are involved, due to injury of the anterior horn cells of the spinal cord, causing tenderness, weakness, and flaccid paralysis of the corresponding striated muscles.

- The lower limbs are the most commonly affected.

Bulbar polio

- Nuclei of the cranial nerves are involved, causing weakness of the supplied muscles, and maybe encephalitis.

- Bulbar manifestations include dysphagia, nasal voice, fluid regurgitation from the nose, difficult chewing, facial weakness and diplopia

- **Paralysis of the muscles of respiration is the most serious life-threatening manifestation.**

Bulb spinal polio

- Combination of both spinal and bulbar forms

Can it cause paralysis?
Some facts

- Paralytic disease occurs **0.1% to 1%** of those who become infected with the polio virus.
- Paralysis of the respiratory muscles or from cardiac arrest if the **neurons in the medulla oblongata** are destroyed.
- Patients have **some or full recovery from paralysis** usually apparent with **proximally 6 months**
- **Physical therapy** is recommended for full recovery.
- According to Sharrard, weakness is clinically detectable only when more than **60% of the nerve cells** supplying the muscle have been destroyed.
- Paralysis occurs twice as often in **the lower extremity as in upper extremity**.
- The **most commonly affected muscles** are the quadriceps, glutei, tibialis anterior, medial hamstrings, and hip flexors, deltoid, triceps, and pectoralis major.

Diagnosis and laboratory testing

Virus isolation

The likelihood of poliovirus isolation is highest from **stool specimens,**

intermediate from **pharyngeal swabs**, and very low from **blood or spinal fluid**.

Diagnosis and laboratory testing (cont.)

- ***Serologic testing***

  A four-fold titer rise between the acute and convalescent specimens suggests poliovirus infection.

- ***Cerebrospinal fluid (CSF) analysis***

  The cerebrospinal fluid usually contains an **increased number of leukocytes—from 10 to 200 cells/mm3** (primarily lymphocytes) and a mildly elevated protein, from 40 to 50 mg/100 ml.

Prevention

General prevention:

- Health promotion through environmental sanitation.

- Health education (modes of spread, protective value of vaccination).

Prevention

- **Active immunization**:
  - **Salk vaccine** (**intramuscular** polio trivalent **killed** vaccine).
  - **Sabin vaccine** (**oral polio** trivalent **live** attenuated vaccine).

RECOVERY

- Patients have some or full recovery from paralysis, most clinical recovery occurs during the **1 month** and almost complete within **6 months**. Limited recovery may occur for about **2 years.**
- In cases with paralysis superficial reflexes usually are absent first, and deep tendon reflexes disappear when the muscle group is paralyzed.

Treatment in the acute stage

- Bed rest,
- Analgesics,
- Hot packs,
- Positioning of the limbs
- Gentle passive rom exercises of all joints

Treatment in the acute stage

- Close monitoring of respiratory and cardiovascular functioning is essential during the acute stage of poliomyelitis along with fever control and pain relievers for muscle spasms.
- Mechanical ventilation, respiratory therapy may be needed depending of the severity of patients.

Convalescent stage

- From 2 days after the temperature return to normal and continues for 2 years
- Muscle power improves
- Physical therapy is recommended for full recovery.
- Passive stretching exercises and wedging casts can be used for mild to moderate contractures.

Chronic stage

24 months after the active illness:

The goals of treatment include correcting any significant muscle imbalance and preventing or correcting soft tissue or bony deformities.

Chronic stage

- Static joint instability can be controlled by Orthoses.
- Dynamic joint instability result in a fixed deformity that cannot be controlled by Orthoses.

Chronic stage

- Soft tissue surgery, such as tendon transfers, should be done in young children before the development of any fixed bony changes.
- Bony procedures for correcting a deformity can be delayed untill skeletal growth is near completion.

Treatment(conservative)

- Intensive physiotherapy

Treatment

Orthosis

Treatment(surgical)

- Tenotomy
- Osteotomy
- Tendon transfer
- Arthrodesis
- Soft tissue release

Thank you
Ask???