Epidemiology and Control of Air Borne Diseases

Community Medicine Department

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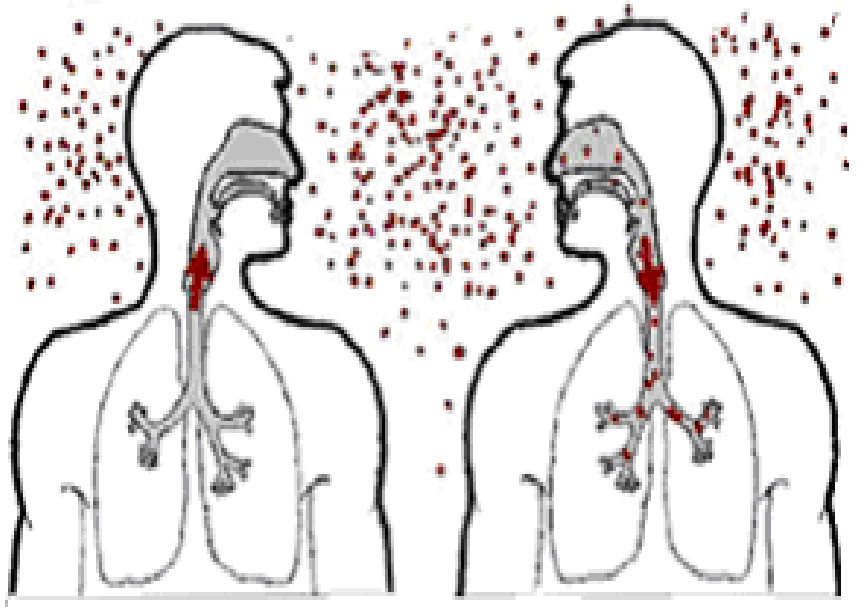
Learning Objectives

- Describe the epidemiological determinants, frequency & distribution of Measels, mumps, chicken pox, rubella, diphtheria, pertusis and Meningitis.
- Explain the preventive measure and control measures of Measels, mumps, chicken pox, rubella, diphtheria, pertusis and Meningitis with reference to Pakistani context.

Definition of Droplet Infections

- Droplet **infections** transmitted from one individual to another by **droplets** of moisture.
- Expelled from the upper respiratory tract through sneezing or coughing.



Common infections spread by droplet transmission are:

1. Diphtheria
2. Mumps
3. Pertussis (whooping cough)
4. Measles
5. Rubella
6. Common cold
7. Influenza / Bird Flu / Swine Flu
8. Meningitis
9. Plague
10. Strep (strep throat, scarlet fever, pneumonia)
11. Tuberculosis

Measles

- A highly contagious disease, affects susceptible individuals of all ages and remains one of the leading causes of death among young children globally, despite the availability of safe and effective measles-containing vaccines.
- **Causative Agent:** Rubeola virus of paramyxovirus family
- Measles is a human disease and is not known to occur in animals.
- The virus remains active and contagious in the air or on infected surfaces for up to 2 hours.

- **Incubation Period:** 10 – 12 days
- **Infectivity period:** The infected person can transmit the disease 4 days prior to the onset of the rash to 4 days after the rash erupts. Most people recover within 2–3 weeks.
- **Transmission:** Virus is normally passed through direct contact and air.
- Spreads by coughing, sneezing, close personal contact c direct contact with infected nasal or throat secretions.
- The virus infects the respiratory tract, then spreads throughout the body

- **Initial symptoms:** High fever, runny nose, conjunctivitis, cough and tiny white spots on the inside of the mouth Kolpik spots.
- After few days, a rash appears, starting on the face and upper neck and gradually spreads downwards to trunk, hands and feet.

Kolpik Spots.

Case Definitions

- **Alert threshold:** One suspected case is an alert
- **Outbreak threshold:** 5 or more clinical cases in a single location over a 30 days time period with at least 1 lab confirmed case is an outbreak . Requires an immediate investigation and prompt response
- **Suspected case:** any person in whom a clinician suspects measles infection, OR any person with fever, maculopapular rash and 3c's;(Cough, Coryza, Conjunctivitis
- **Probable case:** any person with history of fever, rash and linked epidemiologically to a laboratory confirmed case of measles
- **Confirmed case:** A suspected case, which is laboratory confirmed (positive IgM antibodies 3 days after appearance of rash).

Diagnosis

- WHO recommends **ELISA as the gold standard for Measles diagnosis.**
- Anti - measles IgM is detectable in 3 - 30 days after the appearance of the rashes. Anti-measles IgG is undetectable up to 7 days after rash onset and subsequently peaks about 14 days after the appearance of skin rashes
- **Clinical diagnosis:** Observation of Koplik's spots.
- Isolation of virus RNA from throat, nasal or urine specimen by using the polymerase chain reaction method (PCR).
- Saliva can be collected for salivary measles-specific IgA testing.

Treatment

- No specific antiviral treatment.
- Maintain good hydration with adequate fluids.
- Give ibuprofen / paracetamol for fever and pain ***(do not give aspirin as in cause Reye syndrome in children.***
- Give vasodilators to dilate the airways
- Antibiotics should be prescribed to treat eye and ear infections, and pneumonia.

- All children diagnosed with measles should receive two doses of vitamin A supplements, given 24 hours apart.
- This treatment restores low vitamin A levels during measles that occur even in well-nourished children and can help prevent eye damage and blindness. Vitamin A supplements have also been shown to reduce the number of measles deaths.

Specimen Collection & Transportation:

- Collect throat /nasal/nasopharyngeal swabs for virus isolation as early as possible
- Preserve in sterile, leak proof container containing Viral Transport Medium (VTM).
- Keep and transport the specimens in triple packaged with complete request form by maintaining cold chain at 4-8℃.
- Transportation should not exceed 48 hours.

Ministry of Health and Family Welfare
Government of India

NATIONAL HEALTH PORTAL
Gateway to authentic health information
www.nhp.gov.in
NHP Voice Web (Toll Free): 1800-180-1104

NHP INDIA

Complications of Measles

- Pneumonia
- Severe diarrhea
- Encephalitis
- Blindness
- Ear infection

Website: http://www.nhp.gov.in/

Toll Free no.: 1800-180-1104

Measles in Pakistan

- Measles outbreaks are occurring in every region of the world. Despite considerable progress in reducing the global burden of measles infection over the last decades, measles remains a leading cause of childhood mortality in many low-income countries with survivors often left with life-long disabilities such as blindness, deafness or brain damage.

- Failure of the Pakistani immunization program to control epidemics of measles may be attributed to:

1. Corrupt practices
2. Refusal of vaccination by the parents
3. Influx of unvaccinated refugees
4. Low quality vaccine
5. Political insurgency
6. Security issues
7. Inadequate awareness of health-care professionals regarding vaccination schedule
8. Poor training regarding vaccine administration
9. Failure of the vaccine itself.

Mumps

- Mumps is a contagious disease.
- **Causative agent:** Paramyxovirus, a member of the Rubulavirus family.
- **Incubation Period:** 16-18 days (range 12–25).
- An infected person can likely spread mumps from a few days before their salivary glands begin to swell to up to 5 days after the swelling begins.

Mumps: Symptoms and what to look for

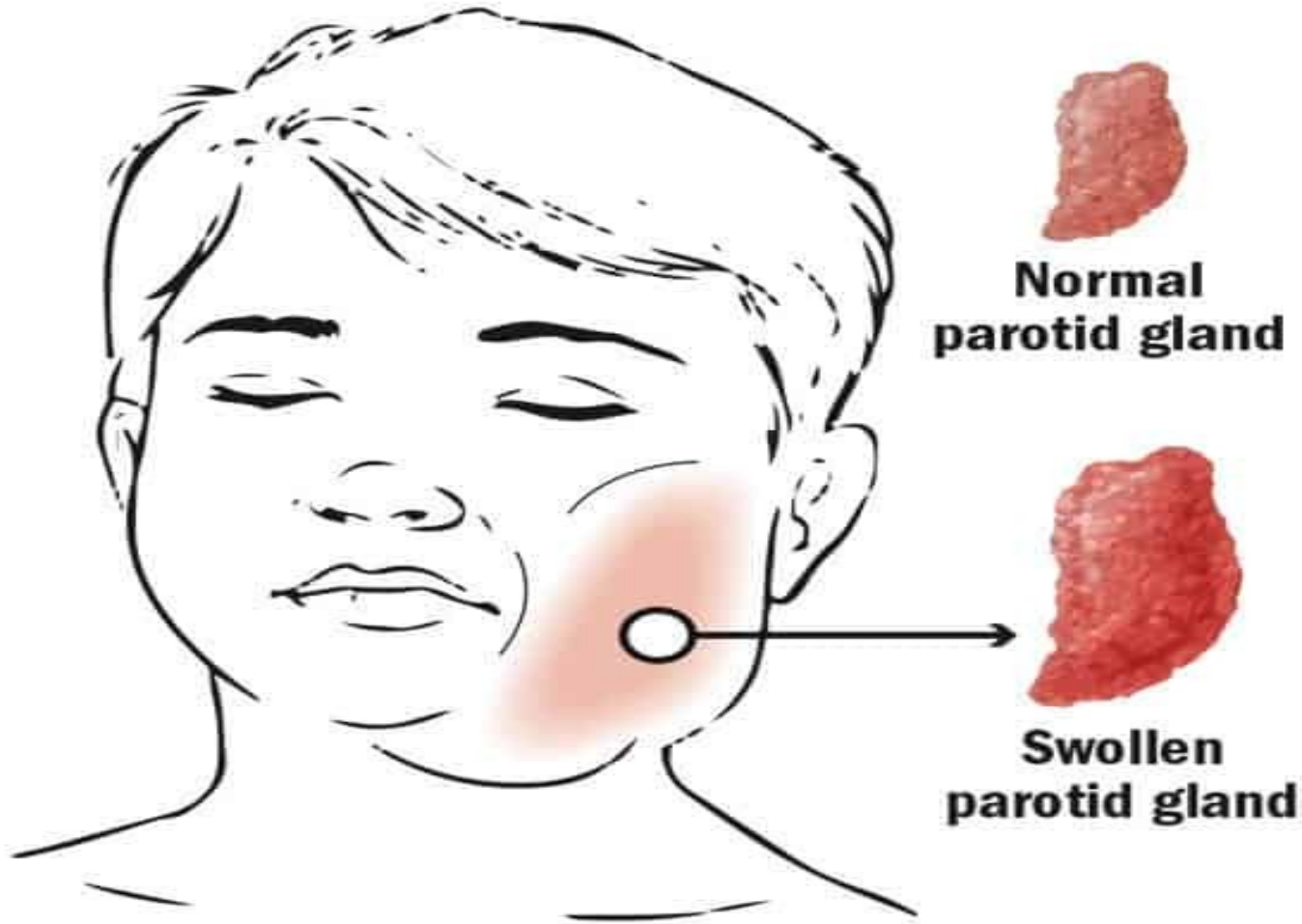
SYMPTOMS:

1. Fever
2. Loss of appettite
3. Headache
4. Muscle pain
5. Pain when eating
6. Pain in the ears, jaw, chin
7. Pain on both sides of face
8. Swollen cheeks, jaw

HOW IT SPREADS:

1. Airborne (coughing, sneezing)
2. Saliva (kissing, sharing drinks)
3. Touching contaminated surface

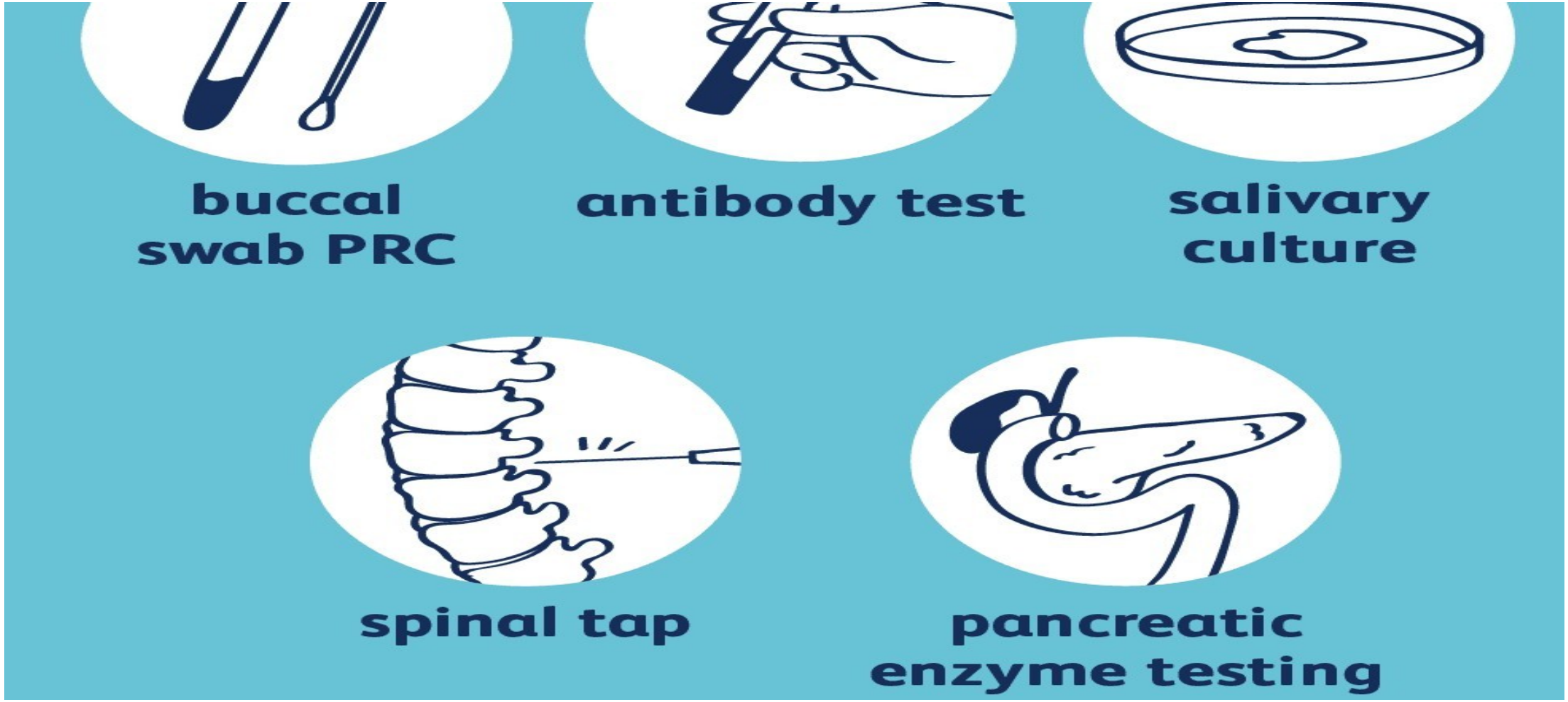
WHAT MUMPS LOOKS LIKE:



Source: St. Thomas Community Health Center, staff research

Advocate graphic

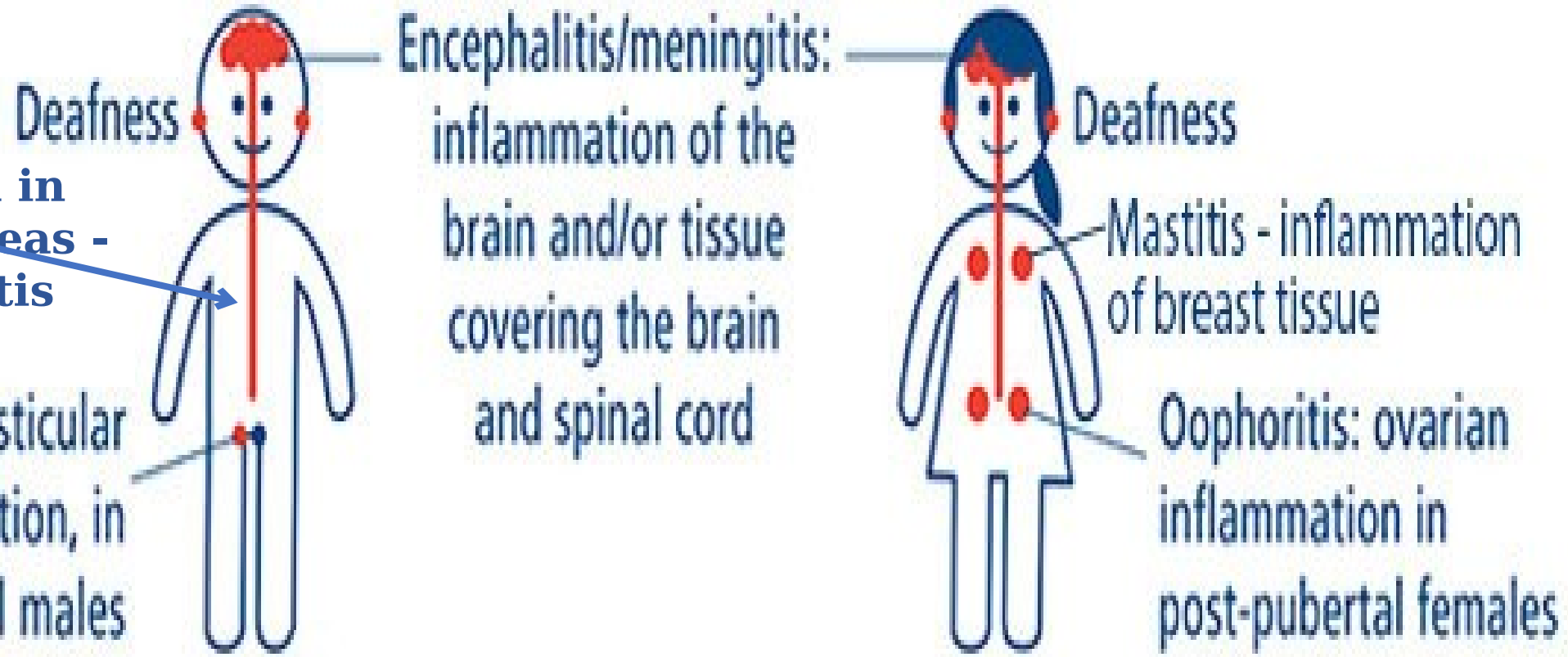
Diagnosis PCR



Treatment

- Complete rest.
- Take over-the-counter pain relievers, such as acetaminophen and ibuprofen, to bring down fever.
- Soothe swollen glands by applying ice packs.
- Drink plenty of fluids to avoid dehydration due to fever.

Mumps complications include:



Inflammation in the pancreas - pancreatitis

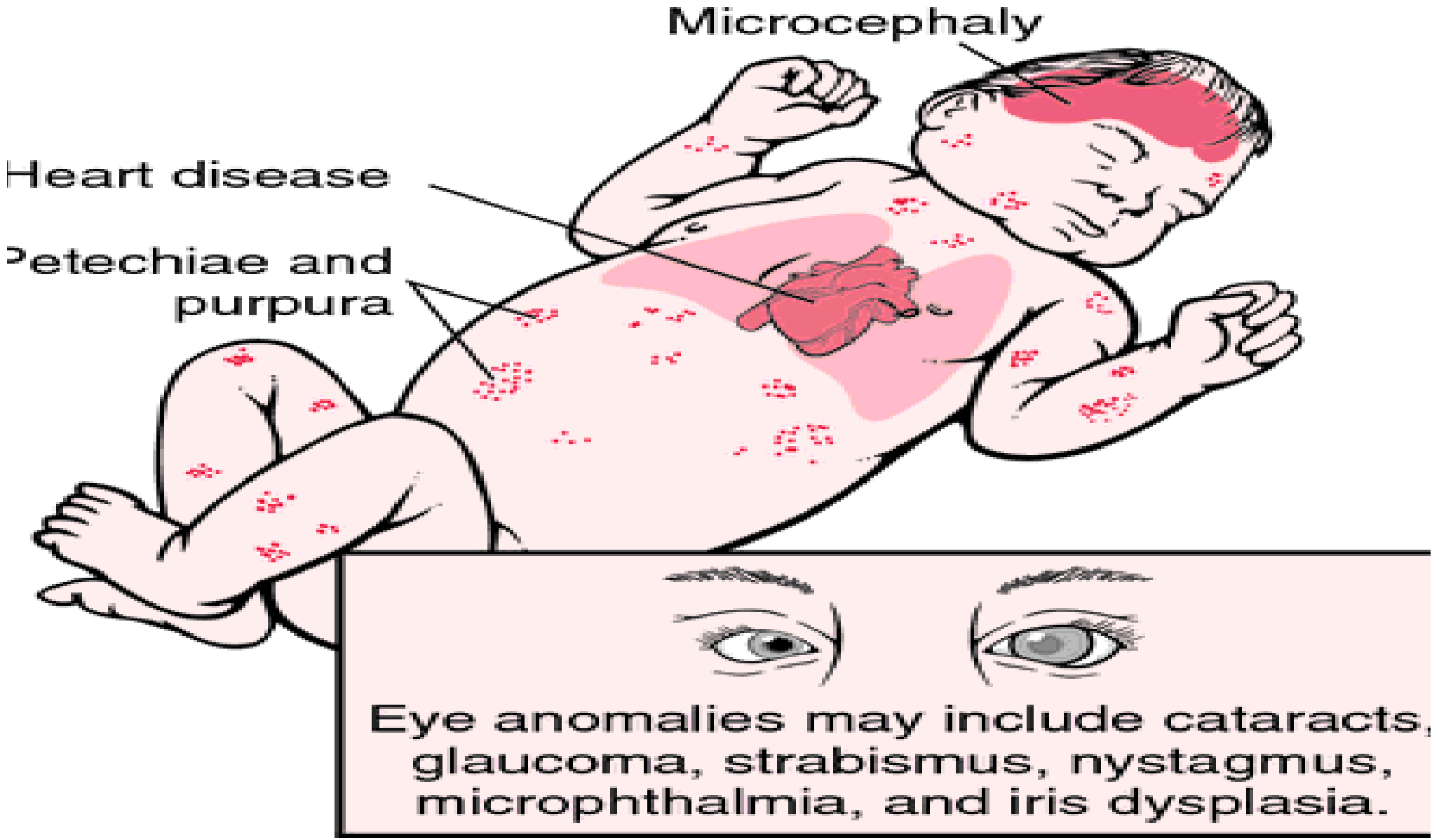
Rubella or German Measles

- Rubella is a contagious disease
- **Causative Agent:** Rubella virus
- **Signs and Symptoms:** In children, symptoms are mild and include a low-grade fever, headache, mild pink eye, swollen and enlarged lymph nodes, cough, runny nose
- The symptoms lies for 1 - 5 days before a red rash first appears on the face and then spreads to the rest of the body, and lasts about 3 days.
- Most adults who get rubella usually have a mild illness, with low-grade fever, sore throat, and a rash that starts on the face and spreads to the rest of the body.
- About 25 to 50% of people infected with rubella will not experience any symptoms. Up to 70% of women who get rubella may experience arthritis.

Congenital rubella syndrome (CRS)

- A condition that occurs in a developing baby in the womb whose mother is infected with the rubella virus.
- Pregnant women who contract rubella are at risk for miscarriage or stillbirth, and their developing babies are at risk for severe birth defects with devastating, lifelong consequences.
- CRS can affect almost everything in the developing baby’s body.

- The most common birth defects from CRS can include:
- Deafness, cataracts, heart defects, liver and spleen damage, low birth weight, brain damage, skin rash at birth.
- Although specific symptoms can be treated, there is no cure for CRS. Since there is no cure, it is important for women to get vaccinated before they get pregnant.

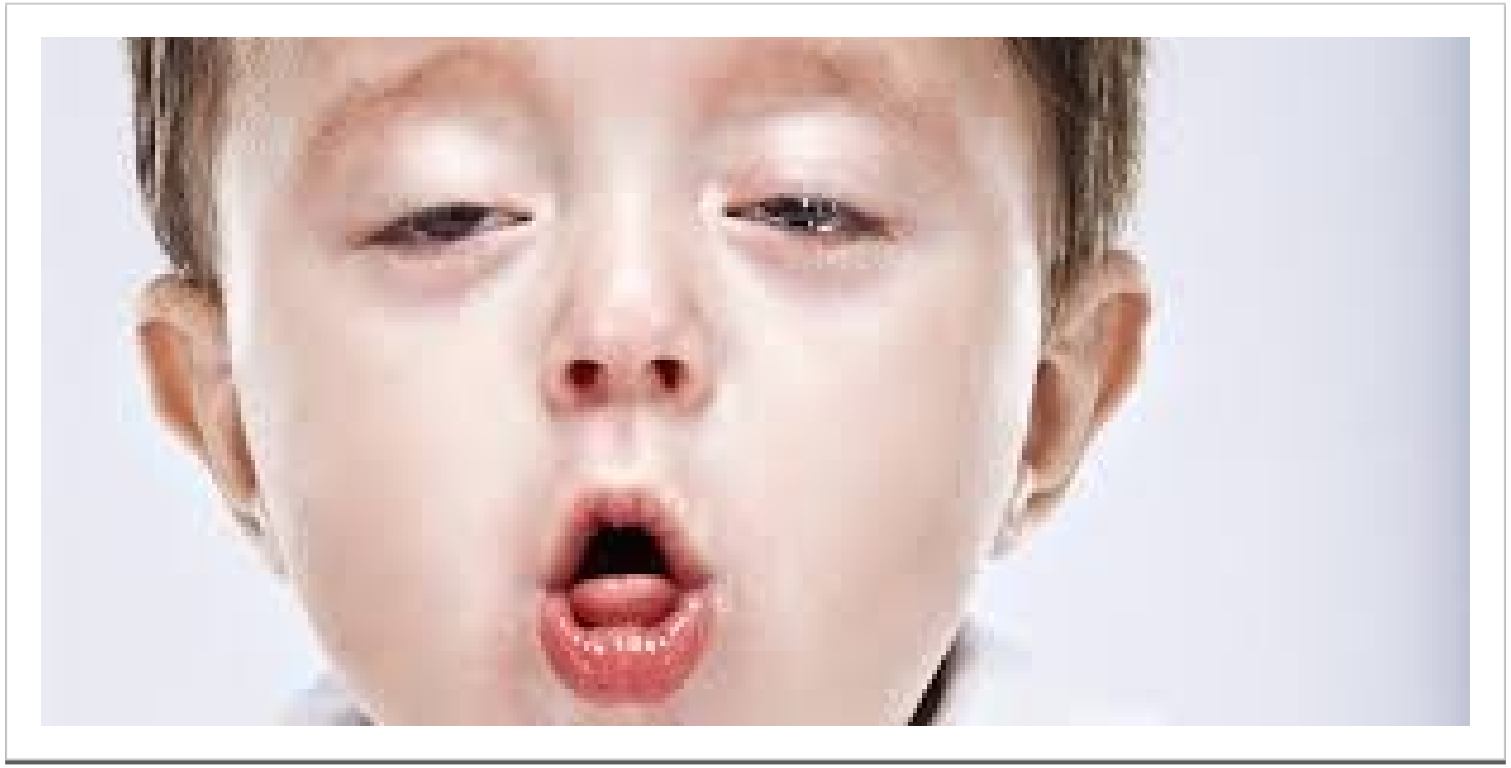

Microcephaly
Heart disease
Petechiae and purpura
Eye anomalies may include cataracts, glaucoma, strabismus, nystagmus, microphthalmia, and iris dysplasia.

Prevention

- Mass immunization campaigns are key public health strategies to reduce global measles deaths.
- **Measles vaccine** is a live, attenuated (or weakened) strain of the measles virus grown in chick embryo tissue culture.
- It became available in 1963. An improved form of vaccine became available in 1968.
- The measles vaccine has been in use for nearly 60 years. It is safe, effective and inexpensive.

- EPI schedule - Routine measles vaccination is given to all children:
- **Dosage** - e during the second yea

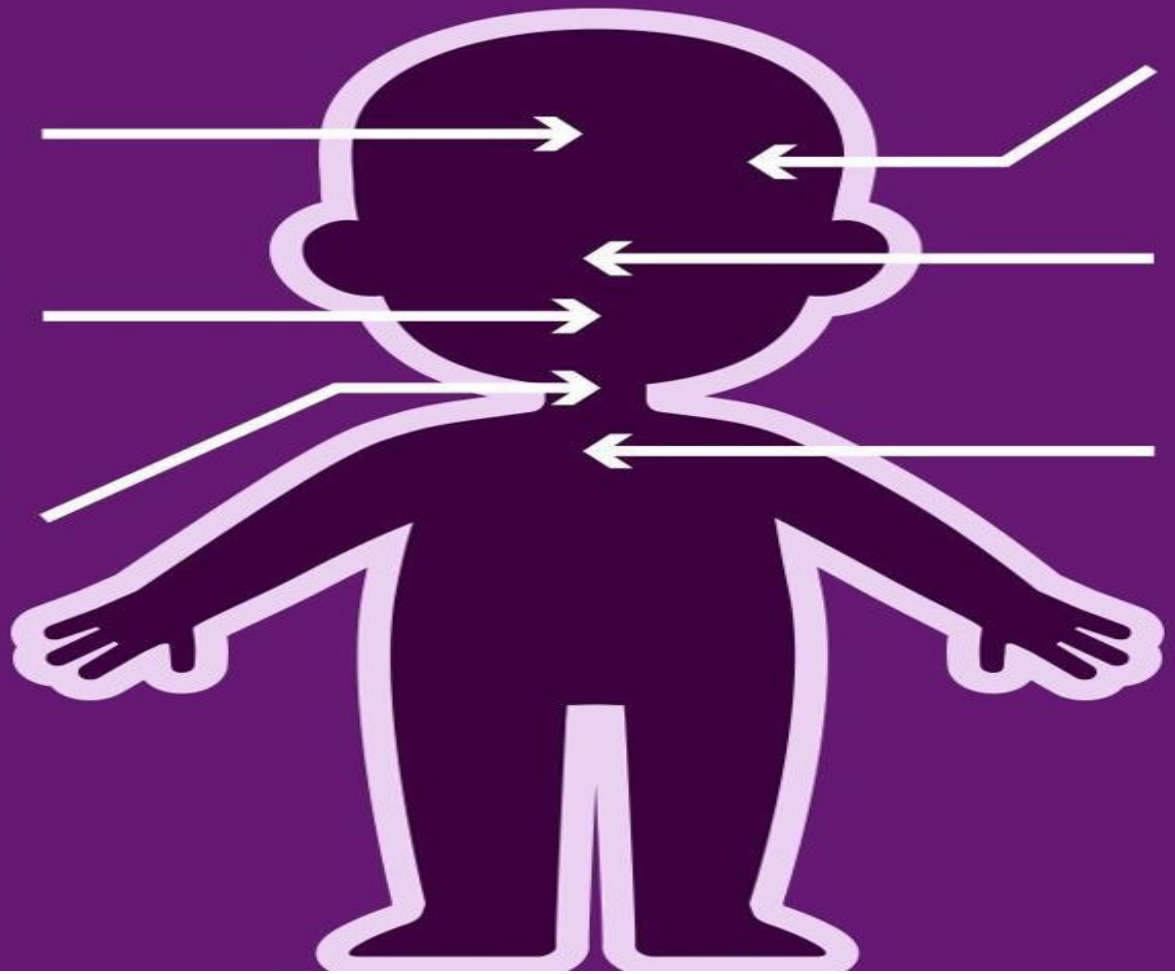
- **MMR vaccine:** Combination measles-mumps-rubella vaccine became available in 1971.
- The first dose of MMR vaccine produces immunity to measles in 95-98% of children vaccinated.
- The reason for the second dose is to protect those persons who did not become immune after one dose.
- **Measles, Mumps, Rubella -** Given at 9 and 15 months (booster 4 – 6 years)
- And to women of Childbearing Age



Pertussis (whooping cough)

- Pertussis / **whooping cough**, is a highly contagious respiratory disease.
- **Causative Agent**: Bacteria *Bordetella pertussis*.
- The bacteria attach to the cilia (tiny, hair-like extensions) that line part of the upper respiratory system.
- Here they release toxins (poisons), which damage the cilia and cause airways to swell.

SYMPTOMS OF WHOOPING COUGH



LOW-GRADE FEVER

VOMITING
DURING OR AFTER COUGHING FITS

APNEA
BABIES MAY HAVE A PAUSE IN BREATHING

EXHAUSTION
AFTER COUGHING FITS

RUNNY NOSE

PAROXYSMS
COUGHING FITS FOLLOWED BY A HIGH-PITCHED "WHOOP"

BABIES MAY HAVE LITTLE OR NO COUGH

Transmission

- **Incubation Period:** 5 to 10 days after you are exposed.
- Pertussis is usually spread by coughing, sneezing or spending a lot of time near patient.
- Many babies who get pertussis are infected by older siblings, parents, or caregivers who might not even know they have the disease.
- Infected people are most contagious up to about 2 weeks after the cough begins.

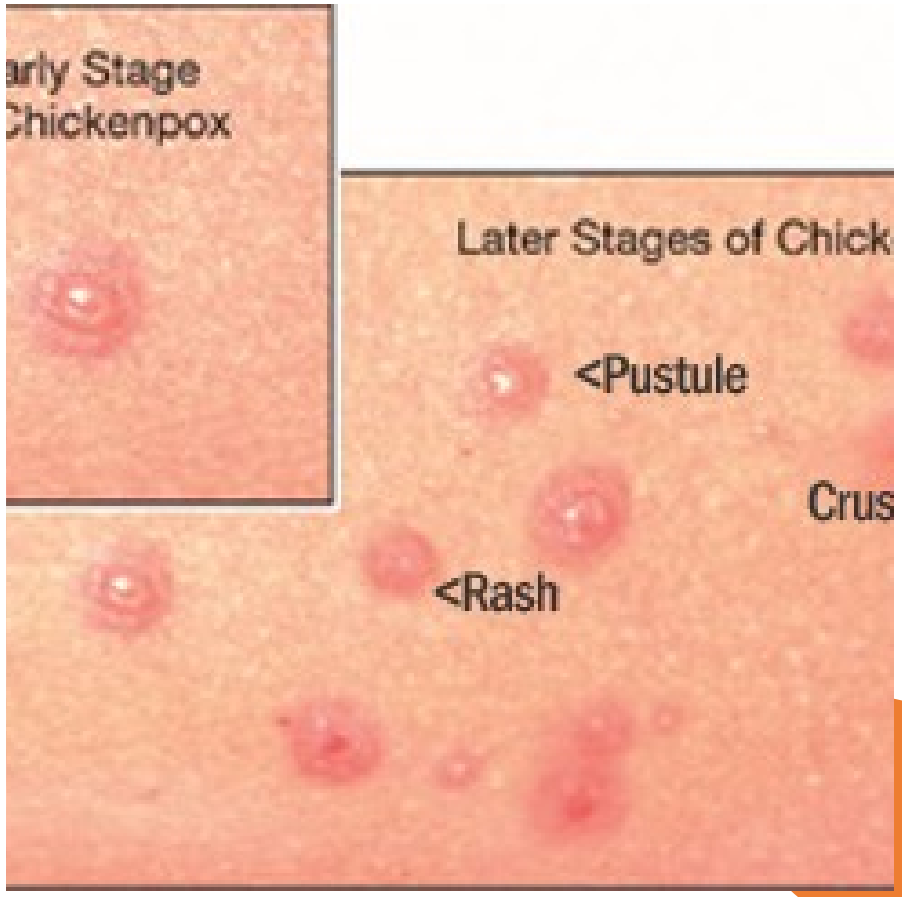
Complications

- Pneumonia
- Seizure disorder
- Bleeding from nose
- Ear infections
- Damage to the brain due to reduced oxygen flow to the brain
- Cerebral haemorrhage
- Apnoeic spells
- Death

Chicken pox

- Chickenpox is a highly contagious disease
- Causative Agent: Varicella-zoster virus (VZV)
- **Signs and Symptoms**
- Incubation Period: 14 days (from 10 to 21 days).
- Illness usually lasts about 4 to 7 days.
- Symptoms like fever, tiredness, loss of appetite, headache appear 1-2 days before rash.
- Then itchy rash appears which is fluid-filled form blisters that eventually turn into scabs.

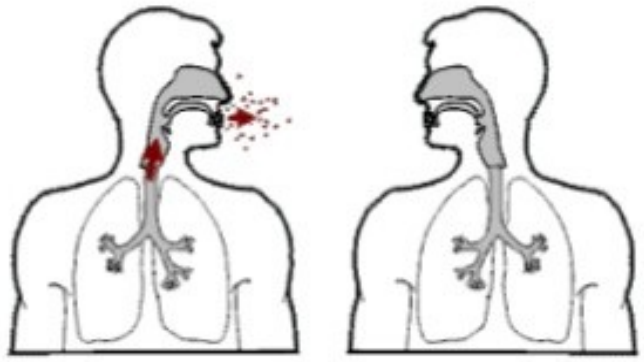
- The rash first appear on chest, back, face, and then over the entire body, including inside the mouth, eyelids, or genital area.
- It usually takes about one week for all of the blisters to become scabs.
- Some people who have been vaccinated against chickenpox can still get the disease with fewer or no blisters (or just red spots), mild or no fever, and shorter duration of illness.



Transmission

MODE OF TRANSMISSION

- Chicken pox is very contagious.
- It spreads from person to person by sneezing, coughing, contaminated clothing and direct contact with open blisters.



- Vaccinated people who get chickenpox may develop lesions that do not crust. But can still spread disease to others.

Complications:

1. Secondary bacterial infections of skin
2. pneumonia
3. encephalitis, cerebellar ataxia
4. haemorrhagic complications
5. sepsis
6. Dehydration
7. Chickenpox can also cause death.

Treatment

- Take bath with cool or lukewarm water, (3 – 4 times daily)
- Pat the itchy areas instead of rubbing.
- Apply calamine lotion on itchy areas but not anywhere on face.
- Serve cold and soft food.
- Take plenty of fluids.
- Drugs used are antivirals, antihistamines and antipyretics (aspirin is contraindicated)

Chicken Pox and Pregnancy

- **Severe Congenital Varicella Syndrome** is fatal to the unborn foetus or to the new-born child.
- Serious complications, like retarded development, skin abnormalities in the arms and legs, defects affecting the eyes, brain, nervous system or any other body part, low birth weight and poor intellectual abilities.

Figure 1: Female neonate with hemangiomatous skin lesions compromis
right scalp and forehead, hemifacial microsomia, homolateral micropht

1. Diphtheria

- **Causative Agent:** Bacteria *Corynebacterium diphtheriae.*
- **Transmission:** from person to person, usually through respiratory droplets, by coughing or sneezing. By touching objects like toys, doorknobs etc. and rarely through open sores.

Symptoms:

- Fever, sore throat, swollen glands in the neck
- Bacteria attach to the lining of the respiratory system produce a poison (toxin) that destroys healthy tissues of the respiratory tract.
- Within 2 - 3 days, the dead tissue forms a thick, grey membrane - “pseudo membrane ”

- The membrane cover nose, tonsils, voice box, and throat, making it very difficult to breathe and swallow.
- The poison (diphtheria toxin) may enter the blood and cause damage to the heart, nerves, and kidneys.

Complications from diphtheria may include:

- Blocking of the airway
- Damage to the heart muscle (myocarditis)
- Nerve damage (polyneuropathy)
- Loss of the ability to move (paralysis)
- Lung infection (respiratory failure or pneumonia)
- Diphtheria can lead to death. Even with treatment, about 1 in 10 diphtheria patients die. Without treatment, up to half of patients can die from the disease.

Diagnosis

- Microscopy: Take swab from the back of the throat and test it for the bacteria
- Bacterial culture

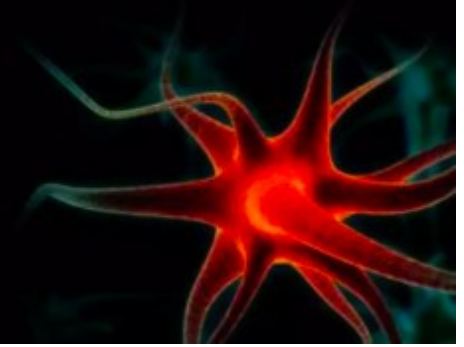
Treatment

- Treatment aimed at countering the bacterial effects has two components:
- **An antitoxin.** If diphtheria is suspected , give the child or adult an antitoxin.
- Injected into a vein or muscle it neutralizes the toxin circulating in the body.
- **Antibiotics.** Antibiotics, like penicillin or erythromycin. Antibiotics help kill bacteria in the body, clearing up infections. Antibiotics reduce to just a few days the length of time that a person with diphtheria is contagious.
- **Supportive treatment**: keep air way open. Ventilators etc

MENINGITIS

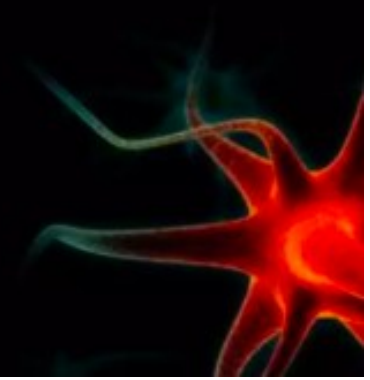
Clinical description

- **Meningitis** is the inflammation of the protective membranes covering the brain and spinal cord known as the meninges.
- The inflammation is usually caused by an infection of the fluid surrounding the brain and spinal cord.
- Meningitis can be life-threatening because of the inflammation's proximity to the brain and spinal cord; therefore the condition is classified as a medical emergency.



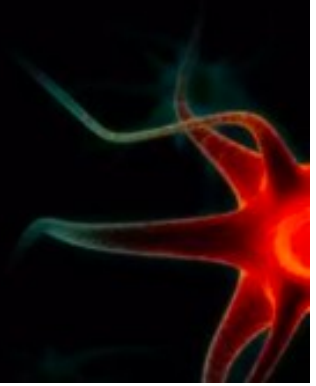
Causes of Meningitis

- Bacterial
- Viral
- Fungal
- Parasitic/ protozoal
- Physical injury
- Cancer
- Certain drugs (mainly, NSAID'S)
- Head injury
- Cerebral abscess
- Middle ear infection



Risk factors

- Age- children younger than 5 years
- Use of immunosuppressive drugs
- Chronic malnutrition
- AIDS
- CSF Shunt
- Chronic alcoholism
- Diabetes
- Pneumonia



Sign and symptoms

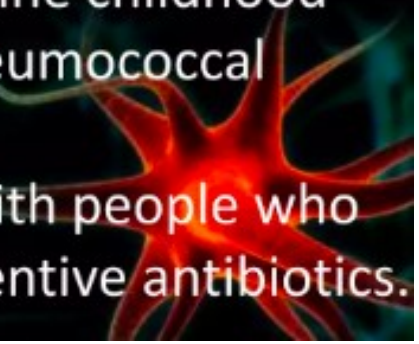
- Severe headache
- Irritability
- Restlessness
- Stiffness of neck
- Malaise
- Nausea/vomiting
- High grade fever
- Tachypnea
- Seizures
- Disorientation
- Tachycardia
- Coma
- Sleeplessness
- Phonophopia
- Photophobia
- Altered mental status(confusion)

Treatment

- Antibiotics for bacterial meningitis :Type vary depending on the bacteria causing the infection.
- Antibiotics are not effective in viral meningitis.
- Other medications and intravenous fluids will be used to treat symptoms such as brain swelling, shock, and seizures.

Prevention

- Haemophilus vaccine (HiB vaccine) in children.
- The pneumococcal conjugate vaccine is now a routine childhood immunization and is very effective at preventing pneumococcal meningitis.
- Household members and others in close contact with people who have meningococcal meningitis should receive preventive antibiotics.



Prevention of droplet infections

Standard precautions

- Hand hygiene
- Use of gloves, masks
- Separate utensils and other items.
- Proper disinfection of infected items
- Respiratory hygiene/cough etiquette.
- **Isolation precautions** are used to help stop the spread of germs from one person to another. Limit visiters

Cover your mouth and nose with a tissue when coughing and sneezing

Dispose of the tissue afterwards

After coughing or sneezing, wash your hands with soap and water

Wear a mask if you are coughing or sneezing

- **Pentavalent vaccine** provides protection to a child from 5 life-threatening diseases – Diphtheria, Pertussis, Tetanus, Hepatitis B and Hib. Given as a part of routine immunization schedule of EPI. Three doses are given 6, 10, 14 weeks
- **Measles Vaccine:** Given at 9 and 15 month (booster 4 – 6 years)
- **Varicella vaccine:** Given in 2 doses. A child should have the 1st shot at ages 12-18 months. The 2nd shot should be given at ages 4-6 years.