VACCINE PREVENTABLE DISEASES

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INTRODUCTION

- Vaccination against childhood communicable diseases through the Expanded Program on Immunization (EPI) is one of the most cost-effective public health interventions available.
- By reducing mortality and morbidity, vaccination can contribute substantially to achieving the global health goals.
- The epidemiology and burden of vaccine-preventable diseases vary by country and region partly because of differences in vaccine uptake.

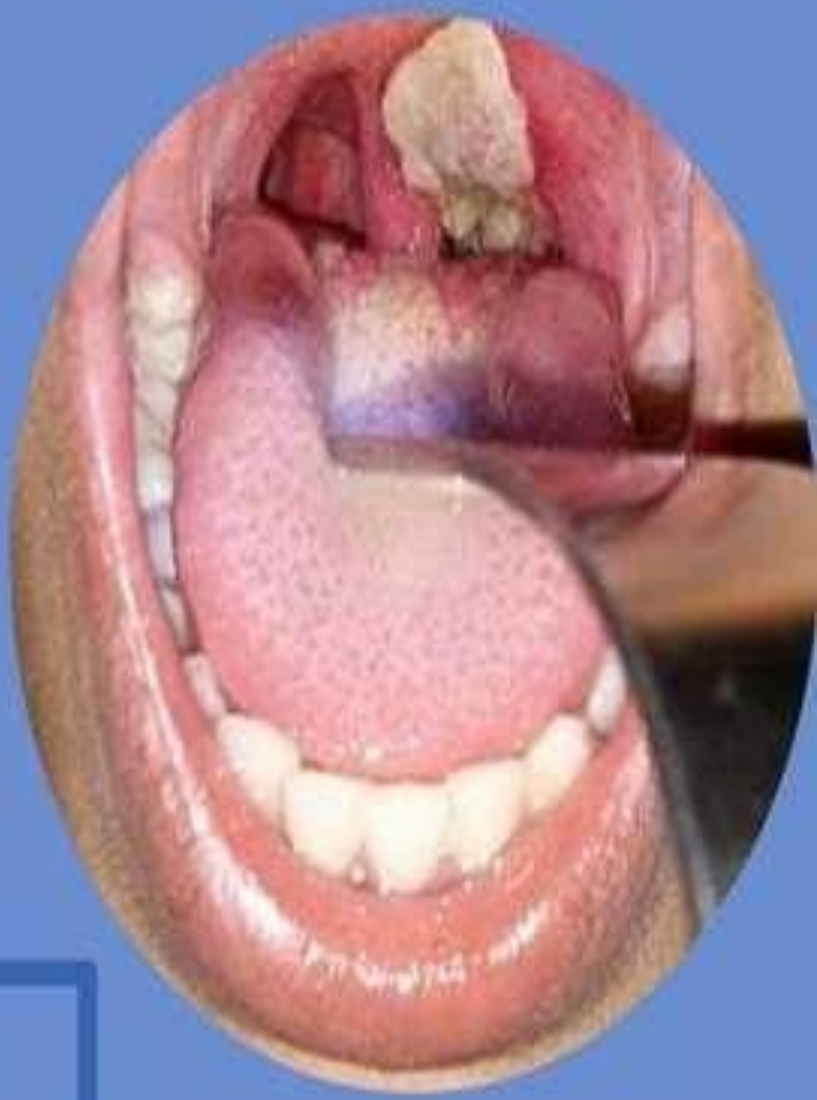
Some of the vaccine preventable diseases discussed in this presentation are as follows:

1. Diphtheria	8. Pertussis
2. HiB	9. Pneumococcal Disease
3. Hepatitis-B	10. Poliomyelitis
4. Japanese Encephalitis	11. Rotavirus Gastroenteritis
5. Measles	12. Rubella
6. Meningococcal Disease	13. Tetanus
7. Mumps	14. Tuberculosis

- Each VPD is covered under following subheadings:

  - Introduction
  - Transmission
  - Sign and symptoms
  - Complications
  - Diagnosis and Treatment
  - Prevention
  - AEFI

DIPHTHERIA



DIPHTHERIA

- Caused by the bacterium *Corynebacterium diphtheriae*.
- Bacterium produces a toxin that can harm or destroy human body tissues and organs.
- Commonly affects the throat and sometimes the tonsils.
- Diphtheria affects people of all ages, but most often it strikes unimmunized children.
- In temperate climates, diphtheria tends to occur during the colder months.

TRANSMISSION

- Person to person through close physical and respiratory contact.

SIGN AND SYMPTOMS

- The early symptoms are sore throat, loss of appetite and slight fever.
- Within two to three days, a bluish-white or grey membrane forms in the throat and on the tonsils.
- This membrane sticks to the soft palate of the throat and can bleed.
- If there is bleeding, the membrane may become greyish-green or black.
- The patient may either recover at this point or develop severe weakness and die within six to 10 days.
- Patients with severe diphtheria do not develop a high fever but may develop a swollen neck and obstructed airway.

COMPLICATIONS

- The most severe complication of diphtheria is respiratory obstruction followed by death.
- During the early phase of the illness, or even weeks later, patients may develop abnormal heartbeats that can result in heart failure.
- Some patients with diphtheria experience inflammation of the heart muscle and valves, and this may lead to chronic heart disease and heart failure.

DIAGNOSIS AND TREATMENT

- To confirm the diagnosis, health workers should obtain throat cultures from suspected cases.
- However, treatment should begin urgently without waiting for culture results.
- Children who develop diphtheria should be given diphtheria antitoxin and such antibiotics as erythromycin or penicillin.
- They should be isolated to avoid exposing others to the disease.
- About two days after starting antibiotic treatment, patients are no longer infectious.

PREVENTION

- **Maintain a high level of immunization in the community.**
- Pentavalent (DTP+HepB+Hib) vaccine or DPT vaccine can be given.
- Pentavalent vaccine with a freeze- dried (also called lyophilized) Hib component requires reconstitution.
- They must be stored between +2 °C and +8 °C without being frozen.
- Pentavalent vaccine is freeze-sensitive.
- If freezing is suspected, the "Shake Test" should be performed to determine whether a vial is safe to use.
- Diphtheria-containing vaccines are administered as 0.5 ml doses given intramuscularly in the anterolateral (outer) thigh in infants and in the deltoid muscle (upper arm) of older children and adults.

AEFI

- Diphtheria vaccine is usually used in combination with other vaccines, and severe adverse events due to it alone have not been reported.
- Mild events occur more frequently among people who have already received several booster doses, and usually improve without treatment.
- Among adults receiving boosters, local injection site reactions – redness and swelling in 38% and pain in 20% – have been reported.

HEMOPHILUS INFLUENZA TYPE B

HEMOPHILUS INFLUENZA TYPE B

- *Haemophilus influenzae* is a bacterium found commonly in the nose and throats of children.
- There are six types of *Haemophilus influenzae* that have an outer capsule. Of these six capsular types, type b is the largest public health concern.
- *Haemophilus influenzae* type b, or Hib, causes 90% of all serious *Haemophilus influenzae* infections.
- Hib is responsible for severe pneumonia, meningitis and other invasive diseases, almost exclusively in children aged less than 5 years.

TRANSMISSION

- Hib is spread from person to person in droplets released when sneezing and coughing.
- Children may carry Hib in their noses and throats without showing any symptoms or signs of illness (also known as healthy carriers), but they can still infect others.

SIGN AND SYMPTOMS

- The serious diseases caused most frequently by Hib are pneumonia and meningitis.
- Children with pneumonia can have fever, chills, cough, rapid breathing and chest wall retractions.
- Children with meningitis can have fever, headache, sensitivity to light, neck stiffness and sometimes confusion or altered consciousness.
- Hib disease can also cause other diseases like epiglottitis (inflammation of the flap at the entrance to the larynx) resulting in stridor (noisy breathing) and breathing difficulty; and septicaemia (bloodstream infection) resulting in fever, shaking or chills, and further spread of the bacteria.

COMPLICATIONS

- Children who survive Hib meningitis may develop permanent neurological disability, including brain damage, hearing loss and mental retardation, in up to 40% of cases.

TREATMENT

- Hib disease can be treated with antibiotics, such as ampicillin, cotrimoxazole, cephalosporins and chloramphenicol.
- Hib that is resistant to some of the commonly used antibiotics is now being seen in many parts of the world.

PREVENTION

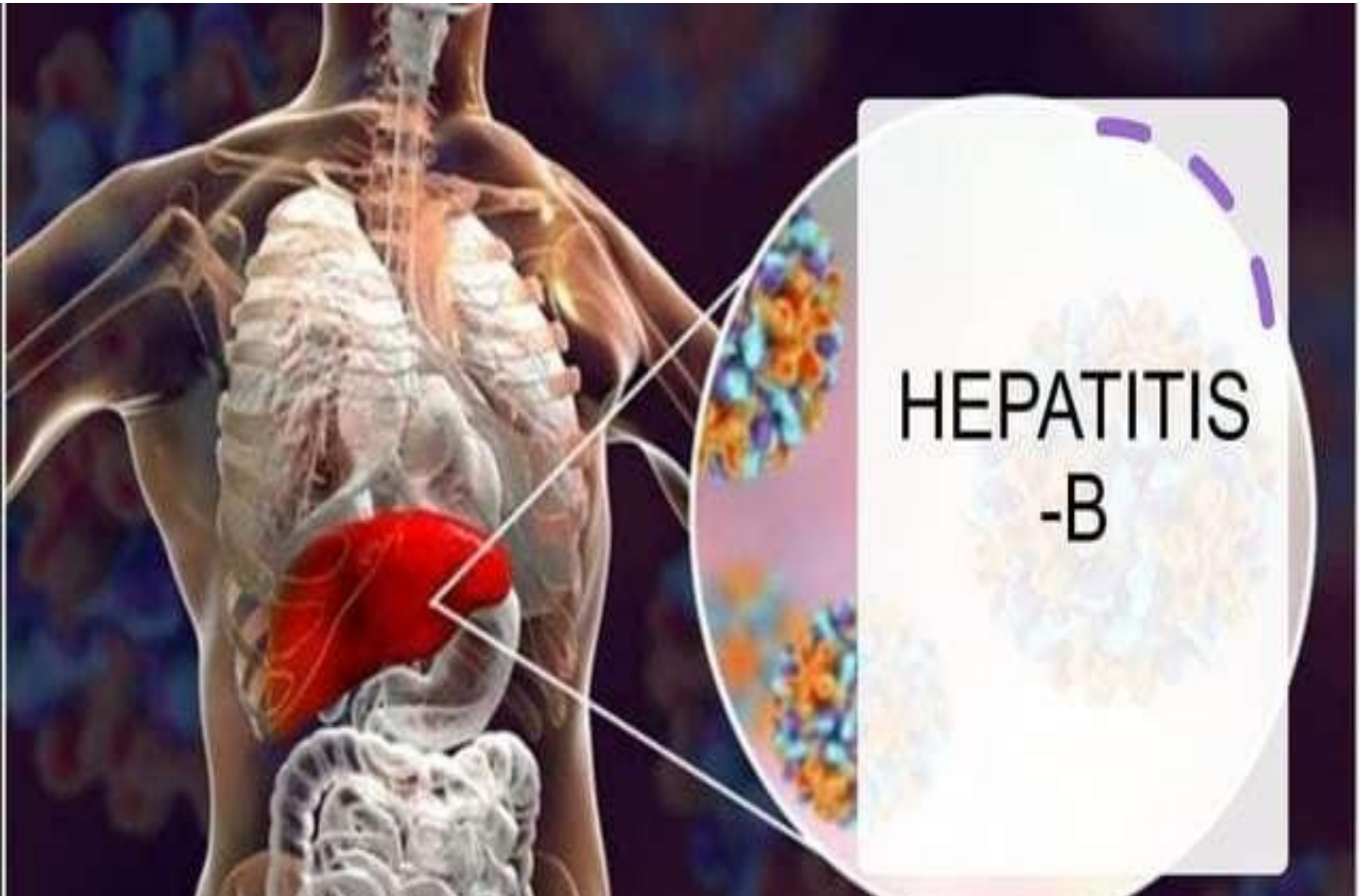
- Hib disease is best prevented by Hib-containing vaccine given in infancy or before 24 months of age.
- Vaccination is becoming increasingly important as Hib antibiotic resistance grows.
- Hib combined with DTP and HepB vaccines, or pentavalent vaccine (DTP+HepB+Hib), reduces the number of injections an infant has to receive while completing the recommended immunization schedule.
- Hib-containing vaccines must be stored between +2 °C and +8 °C without being frozen.
- Freezing does not damage stand-alone freeze-dried Hib vaccine but does damage liquid Hib and pentavalent vaccines.

PREVENTION

- For infants, Hib-containing vaccines are administered as 0.5 ml doses in the anterolateral (outer) thigh.
- For older children (12–24 months of age), they may be given in the deltoid muscle (upper arm).

AEFI

- Hib vaccine is one of the safest vaccines in current use.
- There are no known serious adverse events to date.
- Mild events include injection site pain, redness or swelling in approximately 10% of recipients and fever in 2%.


HEPATITIS
-B

HEPATITIS -B

- Hepatitis B is caused by a virus that infects the liver.
- Among adults who get hepatitis B, 90% recover completely.
- But among infants infected during birth or before one year of age, 90% develop chronic disease.
- Approximately 780,000 people die each year due to the consequences of hepatitis B such as cirrhosis or liver cancer.

TRANSMISSION

- The hepatitis B virus is spread by contact with infected blood and other body fluids in various situations:
  - a) from mother to child during birth;
  - b) during social interaction between children with cuts, scrapes, bites, and/or scratches;
  - c) from person to person during sexual intercourse; and
  - d) through unsafe injections and/or transfusions, or needle stick accidents with infected blood.

Overall, hepatitis B is 50 to 100 times more infectious than HIV.

SIGN AND SYMPTOMS

- Acute hepatitis B does not often cause symptoms and signs, but when it does, patients can have fatigue, nausea, vomiting, abdominal pain and jaundice (yellowing of the skin and eyes).

- Chronic hepatitis B patients have signs related to liver failure (such as swelling of the abdomen, abnormal bleeding and changing mental status) as the disease progresses.

COMPLICATIONS

- A small proportion of acute infections can be severe (fulminant hepatitis) and lead to death.
- Other serious complications that occur in people with chronic infection include cirrhosis and liver cancer.

TREATMENT

- There is no specific treatment for acute hepatitis B.
- Chronic hepatitis B can be treated with interferon and antiviral agents in some cases.

PREVENTION

- Hepatitis B can be prevented by immunization.
- Since perinatal (around the time of birth) or postnatal (during the early days of life) transmission is an important cause of chronic infections globally, all infants should receive their first dose of HepB as soon as possible (less than 24 hours) after birth even in low-endemicity countries.
- After the birth dose, HepB vaccine should be administered with DTP and Hib, preferably in the form of pentavalent (DTP+HepB+Hib) vaccine.

- People who recover completely from acute hepatitis B are protected from becoming infected again throughout their lives.

PREVENTION

- HepB-containing vaccines are administered as 0.5 ml doses given intramuscularly in the anterolateral (outer) thigh in infants and in the deltoid muscle (upper arm) of older children and adults.
- HepB vaccine may also be used for older age groups at risk of infection, including patients who require frequent transfusions, dialysis patients, injecting drug users, household members and sexual contacts of known chronic hepatitis B patients, and health care workers.

AEFI

- HepB vaccine has an excellent safety profile.
- Severe adverse events include anaphylaxis, which has been reported in about one per million vaccine doses administered.
- Mild events include injection site pain in 3–29% of those vaccinated, redness or swelling in about 3%, headache in about 3% and fever in 1–6%.

JAPANESE ENCEPHALITIS

JAPANESE ENCEPHALITIS

- Japanese encephalitis (JE) is an infection of the brain caused by a virus.
- Although traditionally considered a childhood disease, JE can occur in all ages, particularly when the virus is introduced into new areas where the population has no pre-existing immunity.

TRANSMISSION

- The JE virus is spread by mosquitoes.
- It normally infects birds and domestic animals, especially wading birds and pigs, which serve as its reservoirs.
- Humans may contract the disease when a mosquito that has bitten an infected animal then bites a person.
- The disease occurs at the highest rate during and shortly after the rainy season, although where irrigation permits mosquito breeding, transmission can occur all year.
- People living in rural areas, especially where rice is grown, are most at risk although patterns of the disease are changing.

SIGN AND SYMPTOMS

- The majority of infections result in mild symptoms or no symptoms at all.
- On average, only one of every 250 people infected with the virus develops symptoms.
- Symptoms, which usually appear four to 14 days after infection, are flu-like, with sudden onset of fever, chills, headache, tiredness, nausea and vomiting.
- In children, stomach or abdominal pain may be the most prominent symptom during the early stage of the illness.
- Signs of confusion or coma occur after three to four days.
- Children often have seizures.

COMPLICATIONS

- JE is fatal in about 20–30% of cases, with young children (less than 10 years of age) having a greater risk of severe disease and a higher case fatality rate.
- Of those who survive the disease, 30–50% will have brain damage and paralysis.

TREATMENT

- There is no specific treatment.
- Since JE is caused by a virus, antibiotics are not effective.
- Supportive treatment should be given to reduce symptoms.

PREVENTION

- Immunization is the single most important measure to control JE.
- No effective method of environmental control of JE transmission is known.
- Socioeconomic improvements and changes in agricultural practices may reduce viral transmission in some places, but large-scale vaccination of affected populations with effective and affordable vaccines appears to be the logical control measure, at least in the short term.
- Bed nets may help prevent JE in small children since mosquitoes carrying JE tend to bite in the twilight hours.

PREVENTION

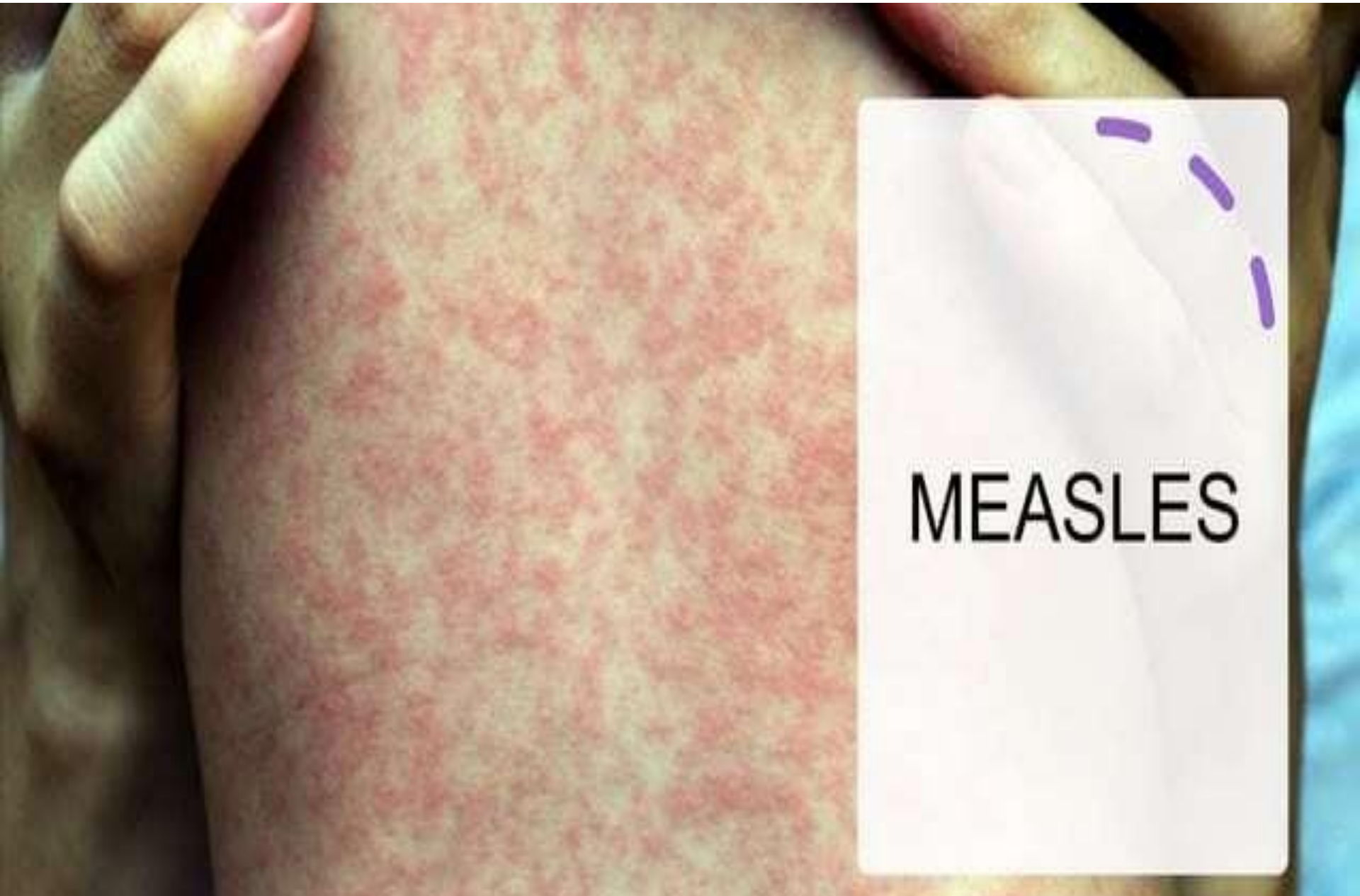
- There are now four types of vaccines that protect against JE:
  - Inactivated Vero cell-derived vaccine (so called since the virus is grown in Vero cells) – the vaccine with the brand name JEEV® has been WHO prequalified.
  - Live attenuated (weakened) vaccine – single- and multi-dose vials of the vaccine are WHO prequalified.
  - Live recombinant vaccine – this type of vaccine, which is also grown in Vero cells and is WHO prequalified, combines parts of an attenuated JE virus with an attenuated yellow fever vaccine virus (brand names include IMOJEV®, JE-CV® and ChimeriVax-JE®).
  - Inactivated mouse brain-derived vaccine (so called because the virus is grown in mouse brains) – this is an older type of vaccine that is slowly being replaced with the newer ones above. No inactivated mouse brain-derived vaccines are WHO prequalified. (Not recommended by WHO now)

PREVENTION

- Two doses at 4-week intervals, with the primary series starting at >6 months of age in endemic settings.
- Dosage: 0.5 ml
- Site: Upper arm
- Route: Subcutaneous
- Storage: Between +2 °C and +8 °C

AEFI

- High fever (5–7% of those vaccinated); injection site reactions (redness, swelling: in less than 1% with some types of vaccine); low-grade fever, irritability, nausea and dizziness (rare)


MEASLES

MEASLES

- Measles is a highly infectious disease caused by a virus.
- It remains an important cause of death among young children globally, despite the availability of a safe and effective vaccine.
- More than 95% of measles deaths occur in countries with low incomes and weak health infrastructures.
- Because the disease is so infectious, it tends to occur as an epidemic with high death rates in settings such as refugee camps.
- Severe measles is particularly likely to occur in poorly nourished children, especially those who do not receive sufficient vitamin A, who live in crowded conditions, and whose immune systems have been weakened by HIV/AIDS or other diseases.

TRANSMISSION

- Measles is spread through contact with nose and throat secretions of infected people and in airborne droplets released when an infected person sneezes or coughs.
- People with measles can infect others for several days before and after they develop symptoms.
- The disease spreads easily in places where infants and children gather, such as health centres and schools.

SIGN AND SYMPTOMS

- The first sign of infection is a high fever, which begins approximately 10 to 12 days after exposure to the measles virus and lasts several days.
- During this period, the patient may develop a runny nose, a cough, red and watery eyes, and small white spots (Koplik spots) inside their cheeks.
- About seven to 18 days after exposure, a slightly raised rash develops, usually on the face and upper neck.
- Over a period of about three days, the rash spreads to the body and then to the hands and feet.
- It lasts for five to six days and then fades.

COMPLICATIONS

- Infected infants may suffer from dehydration due to severe diarrhoea.
- Children may also develop malnutrition, inflammation of the middle ear, pneumonia and encephalitis (brain infection).
- Measles is a major cause of blindness among children in Africa and other areas of the world where it is endemic.
- It can also lead to death. Pneumonia is the most common cause of death associated with measles.
- The pneumonia may be caused by the measles virus itself or by a secondary bacterial infection.

TREATMENT

- There is no specific antiviral treatment for measles.
- Antibiotics should be prescribed only for bacterial ear infections and pneumonia.
- General nutritional support and the treatment of dehydration with oral rehydration solution are important.
- Children with measles should therefore be encouraged to eat and drink.
- All children in developing countries diagnosed with measles should receive two doses of vitamin A supplement given 24 hours apart to help prevent eye damage and blindness.
- Vitamin A supplementation reduces the number of deaths from measles by 50%.

PREVENTION

- a) achieving and maintaining high levels of population immunity by providing high vaccination coverage with two doses of measles-containing vaccine;
- b) monitoring disease and evaluating programmatic efforts to ensure progress;
- c) developing and maintaining outbreak response and case management capacities;
- d) communicating to build public confidence and demand for immunization; and
- e) performing research and development to support cost-effective operations and to improve vaccination and diagnostic tools.

PREVENTION

- Measles-containing vaccines (MCVs) include measles only (M) or a combination of measles with rubella (MR), mumps (MM, MMR) and varicella (MMRV) vaccines. MCVs can be used interchangeably in immunization programmes.
- MCVs are administered by subcutaneous injection.
- Vitamin A supplements are to be given at the same time as the vaccine.

PREVENTION

- The first dose (MCV1) should be given at nine or 12 months of age. Because many cases of measles occur in children over 12 months of age who have not been vaccinated, routine delivery of MCV1 should not be limited to infants ages nine to 12 months.
- All unvaccinated children over 12 months should be offered MCV1 using every opportunity when the child comes in contact with health services.

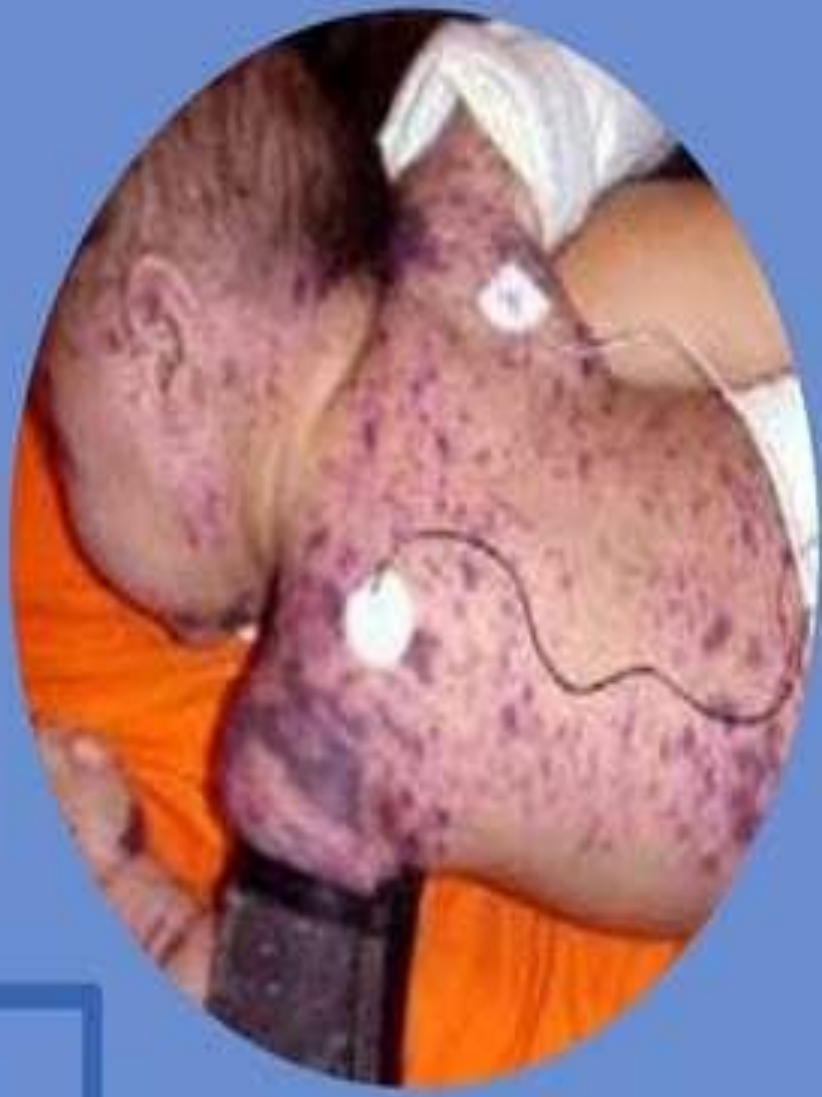
PREVENTION

- MCV2 should be given between 15–18 months of age.
- Vaccinating in the second year of life reduces the number of unprotected children.
- This may be linked to the timing of other routine immunizations (for example, a DTP booster). Screening for measles vaccination at school entry helps to ensure that all children receive both doses.
- Dosage: 0.5ml
- Site: Anterolateral thigh or upper arm.
- Route: Subcutaneous

AEFI

- Encephalitis (brain infection) has been reported rarely but there is no definite proof that the vaccine was the cause.
- Mild events are more common and include local injection site pain and tenderness, fever (in 5–15%) and rash (in about 5%), which can occur five to 12 days after vaccination.

MENINGOCOCCAL DISEASE



MENINGOCOCCAL DISEASE

- Meningococcal meningitis is an infection of the meninges (membranes covering the brain and spinal cord) caused by the bacterium *Neisseria meningitidis*.
- *Neisseria meningitidis* serogroups A, B, C, X, W135 and Y cause most cases of meningococcal meningitis.
- The meningococcus bacterium can also cause septicaemia (bloodstream infection), which is less common but more severe and often fatal.

TRANSMISSION

- The meningococcus is transmitted from person to person via airborne droplets emitted from the nose and throat of infected people.
- Meningococcal disease is most common in young children, but older children and young adults living in crowded conditions can also be at high risk.

SIGN AND SYMPTOMS

- The disease is characterized by sudden onset of intense headache, fever, nausea, vomiting, sensitivity to light and stiff neck.
- Other signs include lethargy, delirium, coma and convulsions.
- Infants may not have sudden-onset illness and a stiff neck; they may only appear to be slow, inactive, irritable or are feeding poorly and may be vomiting.
- A petechial rash (petechiae are small spots of bleeding into the skin) is the key sign of meningococcal septicaemia, which can be followed by rapid shock and death.

COMPLICATIONS

- Death occurs in almost all untreated cases.
- Even with early treatment, up to 10% of patients die.
- About 10–20% of meningococcal meningitis survivors suffer from complications, such as mental retardation, deafness, paralysis and seizures.

TREATMENT

- Antibiotics such as ceftriaxone, chloramphenicol and penicillin G are effective.
- Each case should be considered as a medical emergency and referred to a hospital to reduce the risk of death from rapidly progressing disease.

PREVENTION

- Several vaccines are available to protect against meningococcal serogroups A, C, W135 and Y.
- No vaccine protects against serogroup X at this time.
- A mass immunization campaign that reaches at least 80% of the entire population with vaccine against serogroups A and C can prevent an epidemic in areas where these serogroups are the cause of outbreaks.
- Good surveillance with early detection and treatment of cases as well as immunization.

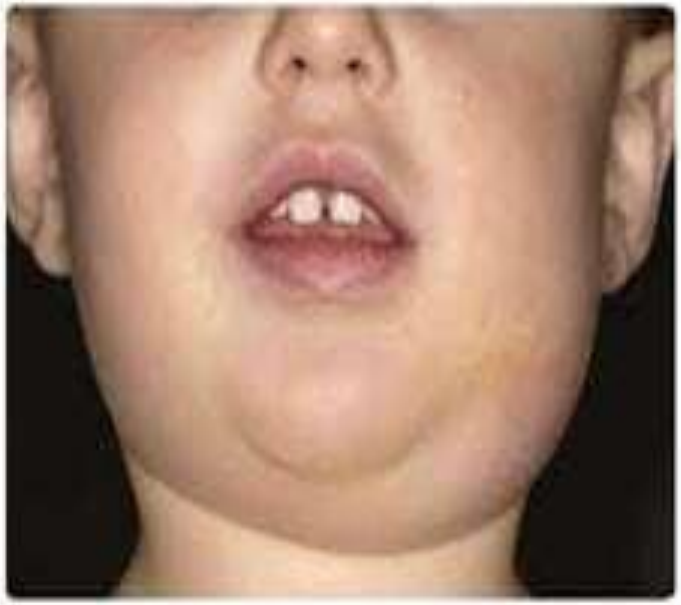
PREVENTION

- Meningococcal vaccines should be stored between +2 °C and +8 °C. Polysaccharide vaccines are generally given as a 0.5 ml dose subcutaneously. Conjugate vaccines are administered as a 0.5 ml dose intramuscularly.
- Conjugate vaccines are the preferred choice due to their better protection of children under two years of age and herd immunity

AEFI

- Conjugate vaccines have excellent safety profiles.
- No severe adverse events have been associated with them.
- Mild events include local injection site reactions, and fever and irritability in children.

MUMPS



MUMPS

- Mumps is an infection caused by a virus that is present throughout the world.
- It is also known as infectious parotitis since it most often involves the salivary glands.
- When the mumps virus infects the testicles, the disease is called mumps orchitis.
- Mumps most often affects children of between 5-9 years of age.
- The mumps virus can also infect adults, in which case the complications are more likely to be serious.

TRANSMISSION

- The mumps virus is spread by airborne droplets released when an infected person sneezes or coughs, and by direct contact with an infected person.
- A person who has mumps can infect others from about 6 days before to about 9 days after salivary gland infection.

SIGN AND SYMPTOMS

- About 33% of individuals infected with the mumps virus have no symptoms or signs.
- If they do appear, they usually begin 14–21 days after infection.
- Symptoms include pain on chewing or swallowing. Fever and weakness can occur.
- Swelling of the salivary glands, just below and in front of the ears, is the most prominent sign and may occur on one or both sides of the neck.
- If mumps orchitis develops, the testicles usually become tender and swollen.

COMPLICATIONS

- In men and teenage boys, mumps orchitis may cause sterility.

- Encephalitis (brain infection), meningitis (infection of the membranes covering the brain and spinal cord) and hearing loss are other rare complications that can occur with mumps at any age.

TREATMENT

- Since it is caused by virus, antibiotics are ineffective.
- Supportive treatment should be given to relieve symptoms.

PREVENTION

- Mumps is prevented by immunization with mumps-containing vaccine.
- MMR, the combination measles-, mumps- and rubella-containing vaccine, is recommended.
- People who recover from mumps are thought to have lifelong immunity against the virus.

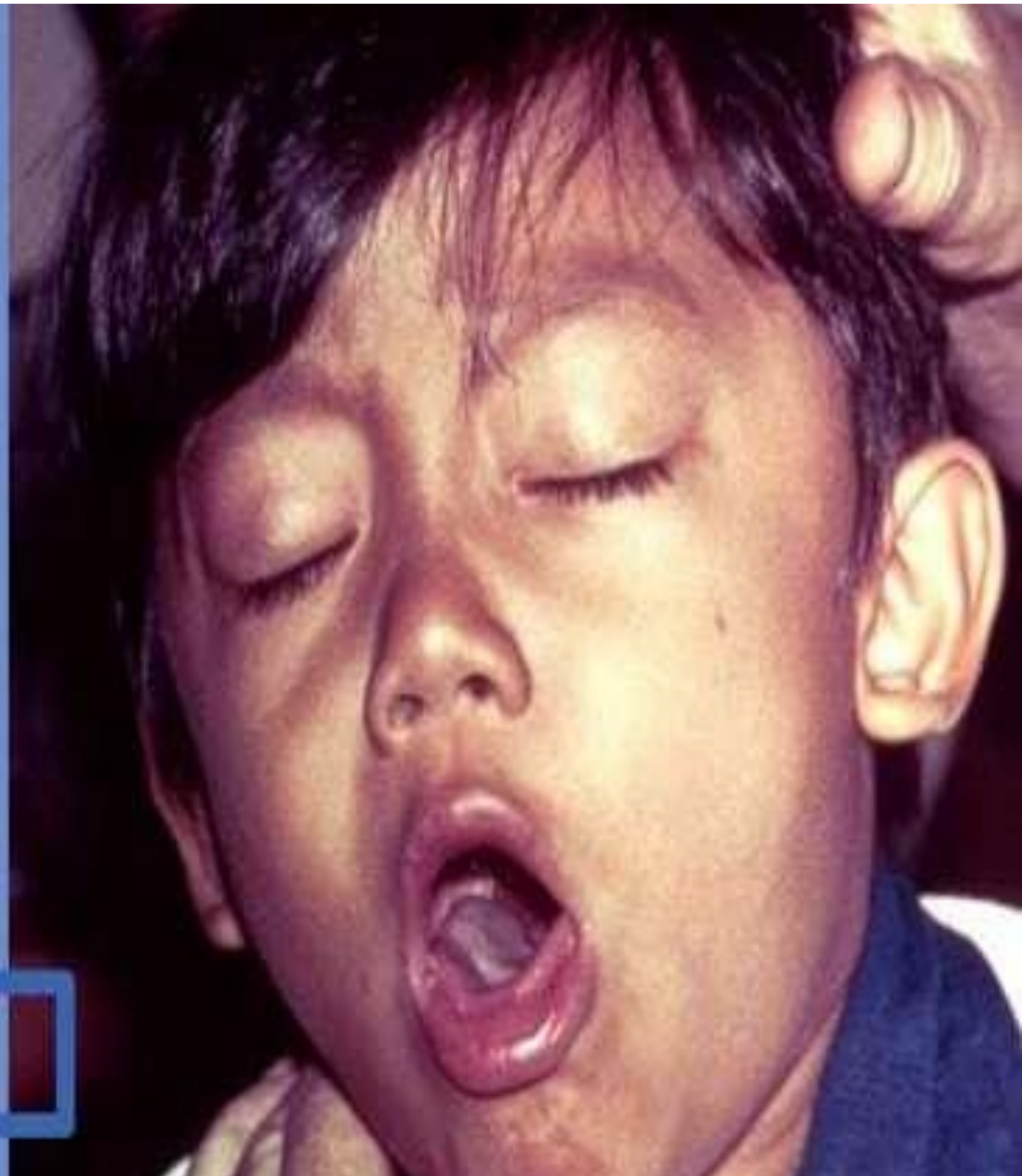
PREVENTION

- Mumps-containing vaccines such as MMR are supplied as freeze-dried (also called lyophilized) powders.
- They must be reconstituted before use.
- They should be kept at a temperature of between +2 °C and +8 °C.
- They are sensitive to heat but are not damaged by freezing.
- Opened multi-dose vials must be handled according to national multi-dose vial policy.
- Mumps-containing vaccines are administered by subcutaneous injection.

AEFI

- Mumps vaccine is very safe to use.
- Infrequently, depending on the vaccine virus strain used, aseptic meningitis (inflammation of the membranes covering the brain and spinal cord) has been reported at different rates.
- Children recover from it without long-term problems, although some may need to be hospitalized.
- Mild events include pain at the injection site (in 17–30% of those vaccinated) and parotid swelling (in 1–2%).
- There is no evidence to support an association between MMR and autism.

PERTUSSIS



PERTUSSIS

- Pertussis, or whooping cough, is a disease of the respiratory tract caused by *Bordetella pertussis* bacteria that live in the mouth, nose and throat. Because it is highly communicable and affects unimmunized infants in particular, pertussis remains a public health concern globally, including in countries where vaccination coverage is high.

TRANSMISSION

- Pertussis spreads very easily from person to person in droplets produced by coughing or sneezing.
- Untreated patients may be infectious and spread pertussis for up to 3 weeks after the typical cough starts.
- In many countries, the disease occurs in regular epidemic cycles of three to five years.

SIGN AND SYMPTOMS

- About 10 days after infection, symptoms similar to a common cold appear – runny nose, watery eyes, sneezing, fever and a mild cough.
- The cough worsens to many rapid bursts.
- At the end of these bursts, the typical patient takes in air with a high-pitched whoop.
- Children may turn blue because they do not get enough oxygen during a long burst of coughing.
- Vomiting and exhaustion often follow the coughing attacks, which are particularly frequent at night.

COMPLICATIONS

- Pneumonia is the main complication of pertussis – it has been found to occur in about 6% of cases.
- The risk of pneumonia in infants under six months of age can be up to four times higher than that in older children.
- Children may experience complications, such as convulsions and seizures, due to fever or reduced oxygen supply to the brain during bursts of coughing.

TREATMENT

- Treatment with an antibiotic, usually erythromycin, may reduce the severity of the illness.
- Because the medication kills bacteria in the nose and throat, antibiotics also reduce the ability of infected people to spread pertussis to others.

PREVENTION

- Prevention involves immunization with pertussis vaccine, which has been given in combination with diphtheria and tetanus vaccines (as DTP).
- It is now being given in pentavalent vaccine that covers hepatitis B and *Haemophilus influenzae* type b as well as DTP.
- Pentavalent vaccine reduces the number of injections needed for infant immunization.
- Pentavalent vaccine with a freeze-dried Hib component requires reconstitution

PREVENTION

- Pertussis-containing vaccines are administered as 0.5 ml doses given intramuscularly in the anterolateral (outer) thigh in infants and in the deltoid muscle (upper arm) of older children and adults.
- A three-dose primary series is recommended; first dose at six weeks of age with subsequent doses given four to eight weeks apart.
- Ideally, all three doses of pertussis vaccine should be given by six months of age.
- A booster is recommended at between one and six years of age, preferably between one to two years of age.
- The booster dose should be given at least six months after the last primary dose.

AEFI

- Safety information on pertussis vaccine is from studies on combination vaccines.
- Severe events include rare anaphylaxis with some types of vaccine
- Prolonged crying and febrile seizures have been noted in less than one in 100 doses and hypotonic–hyporesponsive episodes (loss of muscle tone and awareness or consciousness) in less than one in 1000–2000 doses.
- Mild events are common and include pain, redness and swelling at the injection site and fever and agitation (in one in 2–10 doses).


PNEUMOCOCC
AL DISEASE

PNEUMOCOCCAL DISEASE

- Pneumococcal disease is caused by infection with a bacterium called *Streptococcus pneumoniae* (also known as the pneumococcus) in different parts of the body.
- The pneumococcus is a common cause of serious diseases, such as pneumonia, meningitis (infection of the membranes covering the brain and spinal cord) and septicaemia (bloodstream infection) and milder ones, such as otitis media (middle ear infection) and sinusitis.

PNEUMOCOCCAL DISEASE

- For infants, risk factors for pneumococcal disease include lack of breastfeeding and exposure to indoor smoke. HIV infection, sickle cell disease, asplenia (lack of a functioning spleen), chronic kidney disease and previous influenza virus infection are risk factors for all ages.

TRANSMISSION

- Spread from person to person by coughing, sneezing or close contact. Pneumococcus is transmitted by direct contact with respiratory secretions from patients and from people who have pneumococcus in their noses and/or throats (healthy carriers). In some groups, up to 70% may be healthy carriers.

SIGN AND SYMPTOMS

- Fever and shaking or chills can occur with all types of pneumococcal disease.
- Children with pneumonia can present with cough, rapid breathing and chest wall retractions; older patients may complain of shortness of breath and pain when breathing in and on coughing.
- Patients with meningitis can present with headaches, sensitivity to light, neck stiffness, convulsions and sometimes confusion or altered consciousness.
- Patients with otitis or sinusitis may have pain, tenderness and/or discharge from the affected area.

COMPLICATIONS

- Pneumonia can be complicated by septicaemia (bloodstream infection) and/or empyema (pus in the pleural space, which is the space between the lung and the membrane covering it) and/or lung abscesses.
- Meningitis survivors may suffer complications, including hearing loss, mental retardation, motor abnormalities and seizures.

TREATMENT

- Pneumococcal disease can be treated with antibiotics, such as amoxicillin.
- Some of the commonly used antibiotics are no longer effective in some areas since the pneumococcus is developing resistance.

PREVENTION

- Pneumococcal disease can be prevented by vaccination. While improved living conditions (e.g. reduced crowding and indoor air pollutants) and nutrition can reduce the risk of pneumococcal disease and death, they are less effective than vaccines for prevention.
- Pneumococcal conjugate vaccines (PCV) overcome the limitations of polysaccharide vaccines by conjugating, or binding, the capsule with a protein; this results in longer-lasting protection and makes the vaccine more effective in children.

PREVENTION

- Three doses are required and can be given as a three-primary (3p+0) or, as an alternative, two-primary-plus-one booster (2p+1) schedule.
- The 3p+0 schedule can be started as early as six weeks of age, with a minimum interval of four weeks between doses.
- The vaccine is administered at anterolateral aspect of mid thigh through IM route. The dose is 0.5 ml.
- The vaccine is a freeze damage vaccine, therefore should be stored between +2 °C and +8 °C.

PREVENTION

- Once a series has been started, the same product should ideally be used for all three doses; for example, if PCV10 is used for the first dose, it should be used for the second and third doses also. If this is not possible, the schedule may be completed with the available PCV.
- Previously unvaccinated or incompletely vaccinated children, including those who recover from pneumococcal disease, should be vaccinated according to their age. Children 12–24 months require only two doses, with an interval of at least eight weeks.

AEFI

- No severe adverse events have been proven with use of these vaccines to date.
- Mild events include soreness at the injection site in about 10% of those vaccinated; fever has been reported in less than 1%.

POLIOMYELIT IS

POLIOMYELITIS

- Poliomyelitis, or polio, is a highly infectious disease caused by poliovirus types 1, 2 or 3. These are also called wild polioviruses (WPVs) since they are the naturally occurring types that circulate and infect people.

- Polio mainly affects children of less than five years of age. One in 200 infections causes irreversible

TRANSMISSION

- Poliovirus spreads by the faecal-to-oral route.
- In areas with poor sanitation, it is thought to more commonly enter the body through the mouth when people eat food or drink water that is contaminated with faeces.
- The majority of infected people do not show symptoms but can still spread the disease.

SIGN AND SYMPTOMS

- Approximately 25% of those infected develop a minor illness, usually with fever, headache and sore throat.
- Paralysis occurs in approximately 1% of those infected.
- Death occurs in approximately 5–10% of those paralysed.

TREATMENT

- There is no cure for polio.
- Treatment consists of supportive, symptomatic care.
- A ventilator can help patients who have difficulty breathing.
- Orthopedic treatment, regular physiotherapy and the use of braces can help reduce the long-term crippling effects.

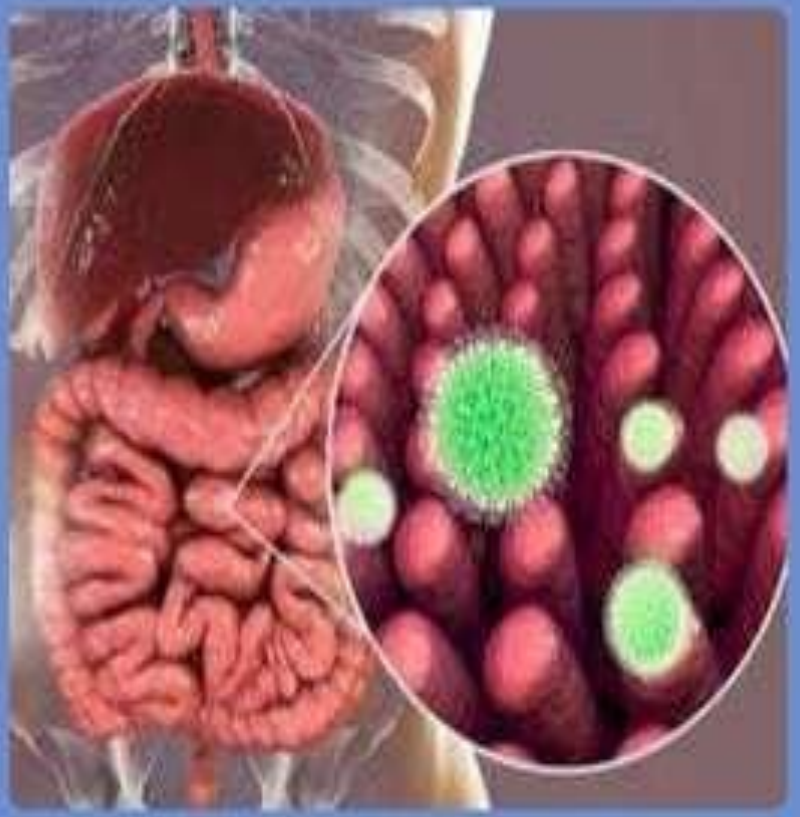
PREVENTION

- Polio can be prevented through immunization with oral polio vaccine (OPV) and/or inactivated polio vaccine (IPV).
- OPV is a live attenuated (weakened) poliovirus vaccine that contains types 1, 2 and 3 individually or in combination (types 1, 2 and 3, or 1 and 3). It is supplied in multi-dose vials.
- After thawing, it can be kept at a temperature of between +2 °C and +8 °C for a maximum of six months or can be refrozen.
- IPV is an inactivated poliovirus vaccine available as a stand-alone product or in combination with diphtheria, tetanus, pertussis, hepatitis B and/or Hib. It is stable outside the cold chain but should be stored between +2 °C and +8 °C. It must not be frozen.

AEFI

- Both OPV and IPV are extremely safe. With OPV, vaccine-associated paralytic polio (VAPP) can occur in approximately 1 in 2.7 million doses. VAPP usually occurs with the first dose of OPV, and this small risk declines further with subsequent doses.
- IPV is one of the safest vaccines in routine use. No serious adverse events have been linked to it. Mild events include injection site redness in less than 1% of those vaccinated, swelling in 3–11% and soreness in 14–29%.

ROTAVIRUS GASTROENTERITIS



ROTAVIRUS GASTROENTERITIS

- Rotavirus gastroenteritis is a highly infectious diarrhoeal disease caused by strains of rotavirus infecting the small intestine.
- Rotavirus gastroenteritis is the leading cause of severe diarrhoea in infants and young children worldwide. It occurs everywhere, including in countries where sanitation standards and access to safe water are good.
- Deaths occur mainly in infants of between three and 12 months of age when they develop severe gastroenteritis following their first infection and are very vulnerable to the effects of dehydration.

TRANSMISSION

- Rotavirus spreads by the faecal-to-oral route.
- Large quantities of virus can be shed in the faeces of an infected child.
- Shedding can occur from two days before to 10 days after the onset of symptoms.
- Rotavirus is stable in the environment and can spread via contaminated food, water and objects. (Vehicle and fomite-borne)

SIGN AND SYMPTOMS

- Rotavirus gastroenteritis can range from mild loose stools to severe watery diarrhoea and vomiting leading to dehydration.
- Symptoms usually begin one to three days after infection.
- Fever and vomiting can occur before diarrhoea.
- The diarrhoea lasts for three to seven days on average.

COMPLICATIONS

- Once vomiting and/or watery diarrhoea begins, infants can rapidly become severely dehydrated, leading to complications such as shock, kidney and liver failure, and death.

TREATMENT

- There is no specific antiviral treatment for rotavirus gastroenteritis.
- As with other causes of diarrhoea, key supportive measures are fluid replacement with oral rehydration solution (ORS) and treatment with zinc supplementation.
- Severe dehydration may require intravenous infusion in addition to ORS for the urgent replacement of fluid and electrolytes.

PREVENTION

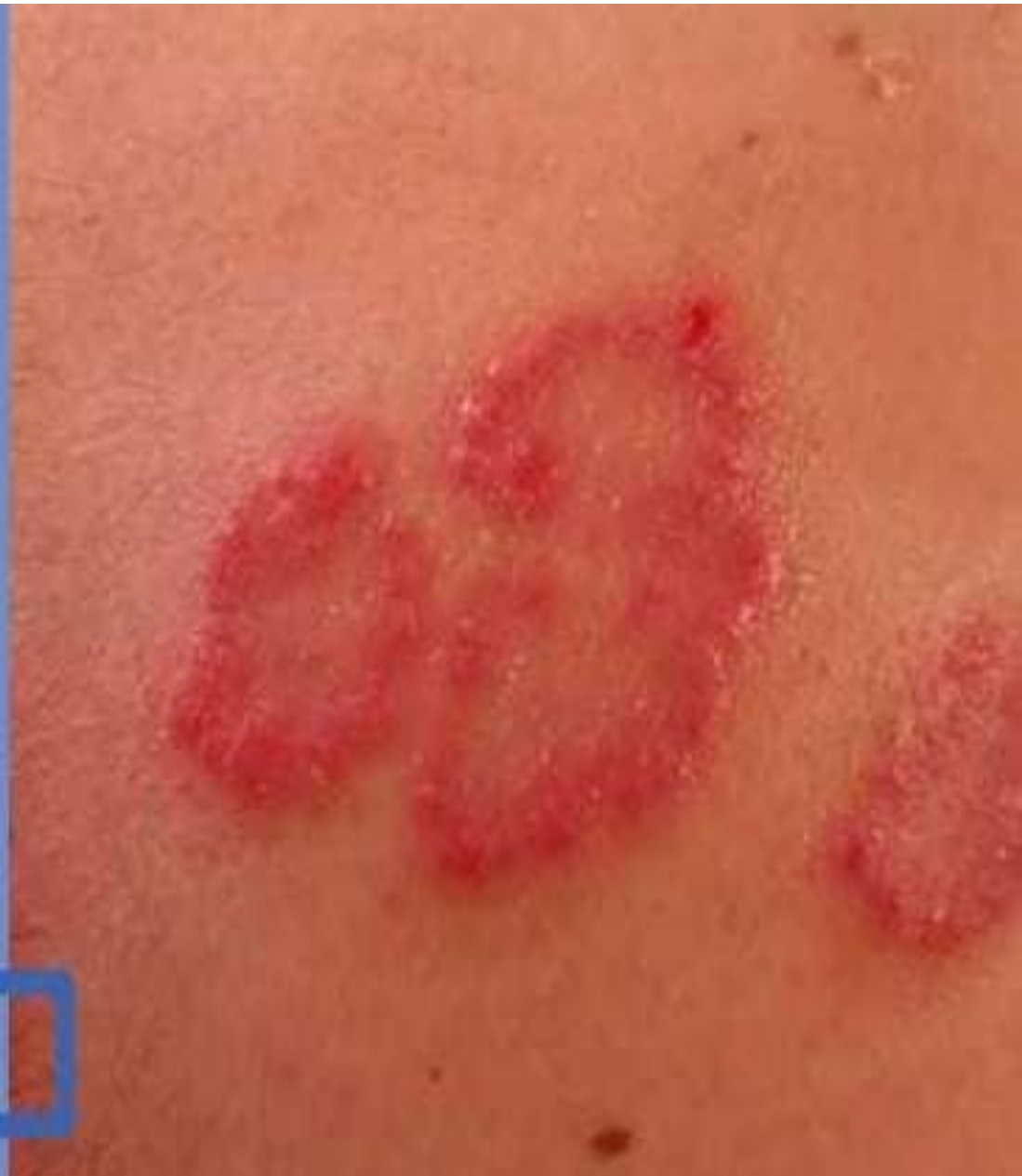
- Improvements in sanitation and access to safe water are less effective for reducing rotavirus infections, and vaccination has become important for prevention of severe rotavirus disease in particular.
- The use of rotavirus vaccines should be part of a comprehensive strategy to control diarrhoeal diseases with the scaling up of both prevention (exclusive breastfeeding for six months, vitamin A supplementation, safe drinking water, hygiene/handwashing with soap, and sanitation) and treatment (low-osmolarity ORS, zinc and continued feeding).

AEFI

- Mild adverse reactions include irritability, runny nose, ear infection, vomiting and diarrhoea (in 5% or more of children vaccinated).

- Note: Rotavirus vaccines are generally not recommended for infants with a history of intussusception, as it may aggravate the condition further.

RUBELLA



RUBELLA

- Rubella is an infection caused by a virus and is usually mild in children and adults.
- A woman infected with the rubella virus early in pregnancy has a 90% chance of passing the virus on to her fetus and this can lead to death of the fetus or to CRS.
- The most common birth defect is deafness, but CRS can also cause defects in the eyes, heart and brain.

TRANSMISSION

- Rubella is spread in airborne droplets released when infected people sneeze or cough.
- The virus spreads throughout the body and, in a pregnant woman, to the fetus, about five to seven days after infection.
- Infected individuals are most likely to spread virus on days one to five of the rubella rash, but they can spread it from seven days before to about 14 days after the rash appears.
- Infants with Congenital Rubella Syndrome can transmit the virus for a year or more.

SIGN AND SYMPTOMS

- About seven to 14 days after exposure to the virus, mild fever, conjunctivitis (more often in adults) and swollen neck lymph nodes may occur and then be followed by a rash five to 10 days later.
- The erythematous maculopapular rash most often begins on the face and spreads towards the feet. The rash typically lasts for one to three days.
- Up to 70% of adult women may have joint pain and stiffness.
- Children with CRS usually show birth defects, such as cataracts and loss of hearing in infancy, but some do not show signs for two to four years. Mental retardation can

COMPLICATIONS

- Encephalitis occurs in about one in 6000 cases and is most common in adult women.
- Problems with bleeding occur in about one in 3000 cases, usually among children.
- Guillain-Barré syndrome has been reported rarely.

TREATMENT

- There is no specific antiviral medication for rubella or for CRS. Supportive measures should be taken to alleviate symptoms.

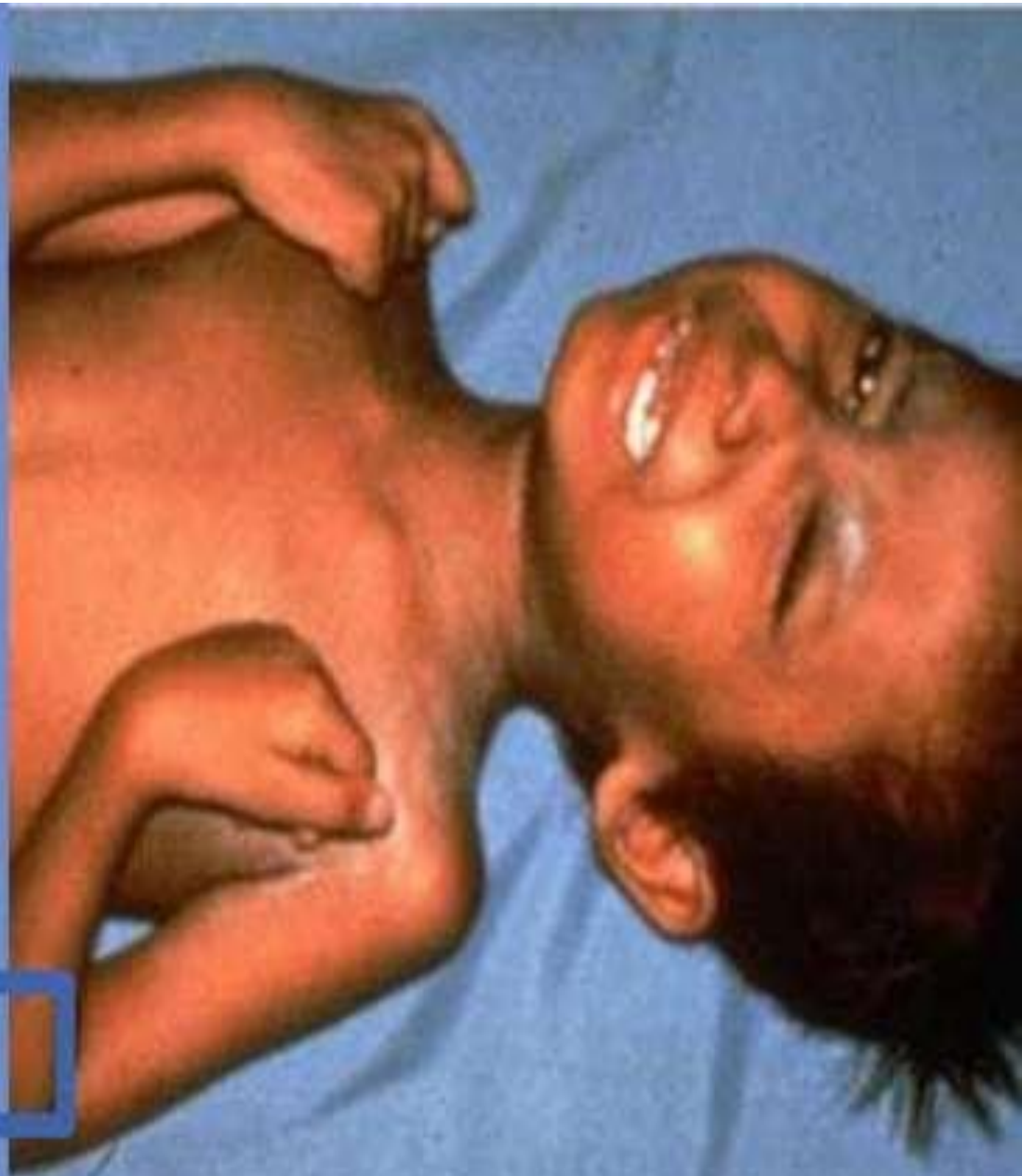
PREVENTION

- Rubella is prevented with safe, effective rubella vaccines.
- For infant immunization, rubella vaccine is usually given in combination with measles and mumps vaccine (MR or MMR).
- It is important to ensure that coverage in infants is sustained at over 80% to avoid shifting rubella transmission to older age groups.
- Rubella-containing vaccines are administered in 0.5 ml doses by subcutaneous injection.

AEFI

- Rubella vaccine may cause a temporary form of arthritis one to three weeks after vaccination in up to one in four postpubertal females
- AEFI with rubella-containing vaccines are mild in children.

TETANUS



TETANUS

- Tetanus is caused by the bacterium *Clostridium tetani*, which is present in soil everywhere.
- Infection with this bacterium occurs when soil enters a wound or cut.
- Toxin released by the bacterium causes severe, painful muscle spasms that can lead to death.

- Neonatal tetanus (in newborns) and maternal tetanus (in mothers) is a serious problem in areas where home deliveries without sterile procedures are common

TRANSMISSION

- The bacterium can enter a wound or cut from items such as dirty nails, knives, tools, wood splinters, dirty tools used during childbirth, or deep puncture wounds from animal bites. It grows well in deep wounds, burns and crush injuries.
- In newborn babies, infection can occur where unsafe and unsterile delivery practices are common.
- Infants and children may also contract tetanus when dirty tools are used for circumcision, scarification and skin piercing, and when dirt, charcoal or other unclean substances are rubbed into a wound.
- The disease does not transmit person to person.

SIGN AND SYMPTOMS

- In children and adults, muscular stiffness in the jaw (trismus or lock-jaw) is a common first sign of tetanus. This is followed by stiffness in the neck, abdomen and/or back, difficulty swallowing, muscle spasms, sweating and fever.

- Newborns with tetanus are normal at birth but stop feeding at three to 28 days of age. They then become stiff and severe muscle spasms occur.

COMPLICATIONS

- When muscles used in breathing are affected, respiratory failure and death can occur.
- Pneumonia is also common. Fractures of the spine or other bones may occur as a result of muscle spasms and convulsions.
- Long-term neurologic impairment has been described in survivors of neonatal tetanus

TREATMENT

- Tetanus at any age is a medical emergency best managed in a referral hospital. Anti-tetanus immunoglobulins, antibiotics, wound care and supportive measures are needed.

PREVENTION

- Tetanus toxoid-containing (TTCV) vaccine protects against tetanus. Infants and children may receive combination vaccines, such as DTP, pentavalent (DTP+HepB+Hib) or DT.
- Neonatal tetanus can be prevented by immunizing women of reproductive age with tetanus toxoid, either during or before pregnancy. Clean delivery procedures are needed even when the mother has been immunized. Clean umbilical cord care for the newborn is equally important.

AEFI

- Severe events are rare and include anaphylaxis and neurologic problems such as brachial neuritis
- Mild events include injection site pain, redness and/or swelling.
- Fever may develop in 10% of those vaccinated.

TUBERCUL OSIS

TUBERCULOSIS

- Tuberculosis is caused by the bacterium *Mycobacterium tuberculosis*, which usually attacks the lungs, but can also affect other parts of the body, including the bones, joints and brain.
- Not everyone who is infected with TB bacteria develops the disease.
- The infection can last for a lifetime, but the infected person may never develop the disease itself.
- People who are infected and who do not develop the disease do not spread the infection to others.

TRANSMISSION

- TB is spread from one person to another through the air, often when an infected person coughs or sneezes.
- Other factors like: living in crowded conditions, have poor access to health care, and/or are malnourished , also play role in transmission.
- People of all ages can develop TB, but the risk is highest in children younger than three years of age and in older people.
- People with TB infection who have weakened immune systems (for example, people with HIV/AIDS) are more likely to develop the disease.

SIGN AND SYMPTOMS

- The symptoms of TB include general weakness, weight loss, fever and night sweats.
- In TB of the lungs, which is called pulmonary tuberculosis, the symptoms include persistent cough, coughing up of blood and chest pain.
- In young children, however, the only sign of pulmonary TB may be stunted growth or failure to thrive.
- Other symptoms and signs depend on the part of the body that is affected. For example, in tuberculosis of the bones and joints, there may be swelling, pain and crippling effects on the hips, knees or spine.

COMPLICATIONS

- Untreated pulmonary TB results in debility and death. This may be more rapid in people infected with HIV/AIDS.

TREATMENT

- People with TB must complete a course of therapy, which usually includes taking two or more antituberculosis drugs for at least six months. This therapy is called Directly Observed Treatment Schedule (DOTS).

PREVENTION

- Vaccination before 12 months of age with bacille Calmette-Guérin vaccine (BCG) can protect against TB meningitis and other severe forms of TB in children of less than five years of age.
- BCG vaccine is supplied in freeze-dried powder form. It must be reconstituted with a diluent before use
- BCG vaccine must be stored between +2 °C and +8 °C after reconstitution. It must be used within 4hrs of its constitution.
- It is given intradermally (ID), 0.1ml.

AEFI

- Severe events following immunization with BCG include generalized infection primarily in HIV-infected persons or those with severe immune deficiencies
- Other severe events include swelling and abscesses

- A mild reaction at the site of injection occurs in almost all children. When BCG vaccine is injected, a small raised lump usually appears at the injection site and then disappears within 30 minutes. After about two weeks, a red sore (about the size of the end of an unsharpened pencil) forms. This sore usually lasts for another two weeks and then heals, leaving a small scar about 5 mm across – the scar is a sign that the child has been effectively immunized.