UNIT 5 UNIVERSAL IMMUNISATION PROGRAMME

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5.0 INTRODUCTION

Immunisation as you are aware is the process whereby a child is made immune or resistant to an infectious disease by the administration of a vaccine. Immunisation helps to protect the child from life threatening disease. It also helps to reduce the spread of disease to others. Full immunisation against preventable childhood diseases is the right of every child. With a view to provide this right to every child, the Government of India launched the Universal Immunisation Programme (UIP) in 1985, one of the largest health programs of its kind in the world. The National Vaccine Policy was revised in 2011 with a goal to guide decision making in order to develop a long term plan to strengthen the UIP.
To ensure informed decision making for any modification in UIP schedule or inclusion of new vaccines, there is a National Technical Advisory Group on Immunisation (NTAGI) which comprises of a number of technical experts, national programme leaders and managers, representatives from development partners and professional bodies.

In this unit we shall discuss and review Universal Immunisation Programme, Open Vial Policy, Mission Indradhanush, Cold chain, vaccines and frequently asked questions, adverse effects of immunisation and at the end we shall discuss the reasons of low coverage.

### 5.1 OBJECTIVES

After completing this unit, you should be able to:

- explain evolution of immunisation programme;
- describe National immunisation schedule;
- explain open vial policy and its rationale;
- discuss Mission Indradhanush and its relevance;
- enlist various vaccines under UIP;
- explain cold chain;
- discuss and recognise various adverse effects following immunisation; and
- explain the reasons of the low coverage.

### 5.2 UNIVERSAL IMMUNISATION PROGRAMME

We shall focus on Objectives, scope and achievements under Universal Immunisation Programme (UIP) as given below.

#### 5.2.1 Objectives, Scope and Achievements

Let us begin with objectives of UIP.

**Objectives**

- To rapidly increase immunisation coverage.
- To improve the quality of services.
- To establish a reliable cold chain system to the health facility level.
- Monitoring of performance.
- To achieve self sufficiency in vaccine production.

**Scope and eligibility**

- India has one of the largest Universal Immunisation Programs (UIP) in the world in terms of the quantities of vaccines used, number of beneficiaries covered, geographical spread and human resources involved.
- Under UIP, all the vaccines are given free of cost to the beneficiaries as per the National Immunisation Schedule.
• All beneficiaries’ namely pregnant women and children can get themselves vaccinated at the nearest Government/Private health facility or at an immunisation post (Anganwadi centres/ other identified sites) near to their village/urban locality on fixed days.

• The UIP covers all sections of the society across the country with the same high quality vaccines.

Achievements

The biggest achievement of the immunisation programme is the eradication of small pox.

One more significant milestone is that India is free of Poliomyelitis caused by Wild Polio Virus (WPV) for more than 33 months.

Besides, vaccination has contributed significantly to the decline in the cases and deaths due to the Vaccine Preventable Diseases (VPDs).

5.2.2 Evolution of the Immunisation Programme in India

Let us briefly discuss evolution of immunisation programme

1978: Expanded Programme of immunisation (EPI).

It had limited reach and it was mostly in urban areas.

1985: Universal Immunisation Programme (UIP).

For reduction of mortality and morbidity due to 6 VPD’s.

Indigenous vaccine production capacity enhanced.

Cold chain established.

Phased implementation - all districts covered by 1989-90.

Monitoring and evaluation system implemented.

1986: Technology Mission on Immunisation Monitoring under PMO’s 20 point programme.

Coverage in infants (0–12 months) monitored.

1992: Child Survival and Safe Motherhood (CSSM)

Included both UIP and Safe motherhood programme.

1997: Reproductive Child Health (RCH 1)

2005: National Rural Health Mission (NRHM)

2013: National Health Mission(NHM)

2014: Mission Indradhanush

5.2.3 Vaccines under Universal Immunisation Programme

Under Universal Immunisation Program, following vaccines are provided:

• BCG (Bacillus Calmette Guerin).
• DPT (Diphtheria, Pertussis and Tetanus Toxoid)
• OPV (Oral Polio Vaccine)
• Measles
• Hepatitis B
• TT (Tetanus Toxoid)
• JE vaccination in selected high disease burden Districts).
• Hib containing Pentavalent vaccine (DPT+HepB+Hib) (In selected States)

5.2.4 Diseases Protected by Vaccination under Universal Immunisation Programme

New born and child is protected from following disease under UIP

• Diphtheria
• Pertussis
• Tetanus
• Polio
• Tuberculosis
• Measles
• Hepatitis B
• Japanese Encephalitis (commonly known as brain fever)
• Meningitis and Pneumonia caused by Haemophilus Influenzae type b

5.2.5 National Immunisation Schedule

Under UIP, Government of India is providing vaccination as given in Table 5.1.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Vaccine &amp; its Presentation</th>
<th>Protection</th>
<th>Route</th>
<th>Number of Doses</th>
<th>Vaccination Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BCG (Bacillus Calmette Guerin) Lyophilized vaccine</td>
<td>Tuberculosis</td>
<td>Intra dermal</td>
<td>1</td>
<td>At birth (upto 1 year of age, if not given earlier)</td>
</tr>
<tr>
<td>2</td>
<td>OPV (Oral Polio Vaccine)-Liquid vaccine</td>
<td>Polio</td>
<td>Oral</td>
<td>5</td>
<td>Birth dose for institutional deliveries, Primary three doses at 6, 10 &amp; 14 week and one booster dose at 16-24 month of age. Given orally</td>
</tr>
<tr>
<td>3</td>
<td>Hepatitis B – Liquid Vaccine</td>
<td>Hepatitis B</td>
<td>Intra muscular</td>
<td>4</td>
<td>Birth dose (within 24 hours) for institutional deliveries. Primary three doses at 6, 10 &amp; 14 week.</td>
</tr>
<tr>
<td>No.</td>
<td>Vaccine Service (in States/UTs)</td>
<td>Antigen(s)</td>
<td>Route</td>
<td>Age</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------</td>
<td>------------</td>
<td>-------</td>
<td>-----</td>
<td>-------------</td>
</tr>
<tr>
<td>4</td>
<td>DPT (Diphtheria, Pertussis and Tetanus Toxoid) – Liquid vaccine</td>
<td>Diphtheria, Pertussis and Tetanus</td>
<td>Intra muscular</td>
<td>5</td>
<td>Three doses at 6, 10 &amp; 14 week and two booster dose at 16-24 month and 5-6 years of age</td>
</tr>
<tr>
<td>5</td>
<td>Measles – Lyophilized vaccine</td>
<td>Measles</td>
<td>Subcutaneous</td>
<td>2</td>
<td>9-12 months of age and 2nd dose at 16-24 months.</td>
</tr>
<tr>
<td>6</td>
<td>Hib (given as pentavalent containing Hib+DPT+Hep B) (in 8 States) – Liquid vaccine</td>
<td>Hib Pneumonia and Hib meningitis</td>
<td>Intra muscular</td>
<td>3</td>
<td>6, 10 &amp; 14 week of age</td>
</tr>
<tr>
<td>7</td>
<td>Japanese Elephantiasis (JE) vaccination (in selected high disease burden Districts) Lyophilized vaccine</td>
<td>Japanese Encephalitis (Brain fever)</td>
<td>Subcutaneous</td>
<td>2</td>
<td>9-12 months of age and 2nd dose at 16-24 months (6 month after vaccination drive)</td>
</tr>
<tr>
<td>8</td>
<td>TT (Tetanus Toxoid) – Liquid vaccine</td>
<td>Tetanus</td>
<td>Intra - muscular</td>
<td>2</td>
<td>10 years and 16 years of Age. For pregnant woman, two doses given (one dose if previously vaccinated within 3 Year)</td>
</tr>
<tr>
<td>9</td>
<td>Injectable Polio Vaccine IPV</td>
<td>Polio</td>
<td>I/D</td>
<td>2</td>
<td>6 weeks &amp; 14 weeks (Introduced in some States).</td>
</tr>
<tr>
<td>10</td>
<td>Fractional Injectable Vaccines</td>
<td>Polio</td>
<td>-</td>
<td>2</td>
<td>6 weeks &amp; 10 weeks</td>
</tr>
</tbody>
</table>

In addition following vaccination is provided,

**Japanese Encephalitis** (JE) in endemic districts across 20 States have been identified. JE vaccination campaign has been completed in 154 Districts covering nearly 108 million children;

**Pentavalent vaccine** has been introduced in 8 States/UTs i.e. Tamil Nadu, Kerala, Haryana, J&K, Gujarat, Karnataka, Goa and Puducherry. Pentavalent vaccine expansion is planned in 12 States/UTs i.e. Andhra Pradesh, Telangana, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Punjab, Rajasthan, West Bengal, Delhi, Uttarakhand by December 2014.

**New vaccines** to be introduced as per National Technical Advisory Group on Immunisation (NTAGI) recommendation
1) **Injectable Polio Vaccine (IPV):** National Technical Advisory Group on Immunisation (NTAGI) recommended Injectable Polio Vaccine introduction as an additional dose along with 3rd dose of DPT in the entire country in the first quarter of 2016. Fractional IPV is given at 6 weeks & 10 weeks.

2) **Rota virus vaccine:** NTAGI recommended the introduction of rotavirus vaccine in Universal Immunization Programme in a phased manner.

3) Rubella vaccine is to be introduced as MR vaccine replacing the measles containing vaccine first dose (MCV1) at 9 months and second dose (MCV2) at 16–24 months. (Refer Recent Gol Guidelines)

### Check Your Progress 1

i) a) In 1985 ...................................... Programme was launched.

   b) Mission Indradhanush was launched in .............................................

ii) Name Vaccines under Universal Immunisation Programme.

   ...........................................................................................................

   ...........................................................................................................

   .............................................................................................................

iii) Name the disease protected under Universal Immunisation Programme.

   .............................................................................................................

   .............................................................................................................

5.3 **OPEN VIAL POLICY OF GOVT. OF INDIA**

This is applicable to all liquid formulations (OPV, TT, DT, DPT, Hep B and liquid formulation of Penta valent vaccine containing HiB). These vaccines can be used up to 4 weeks (even if they have been opened) if maintained properly and certain conditions are met. They have preservatives, so contamination is prevented.

According to this, opened multidose vials of above vaccines may be reused in subsequent immunisation sessions for up to four weeks in fixed health facilities if all the following conditions are met.

- The expiry date has not passed.
- The vial has been stored under appropriate cold chain conditions (i.e. refrigerated between 2°C and 8°C).
- The vaccine vial septum (where the needle is put in to withdraw doses) has not been submerged in water (to prevent this from happening, well-sealed ice packs should be used in vaccine carriers and water should not be allowed to accumulate where the vials are stored).
- An aseptic technique has been used to withdraw all doses.
- The vaccine vial monitor (VVM), if attached, has not reached the discard point.

It takes into consideration the **Potency** (heat sensitivity) of the vaccine and **safety** (from contamination).
Potency is determined by heat sensitivity and whether or not the vaccine has been reconstituted. The heat sensitivity of freeze dried (lyophilized) vaccines drops substantially when these vaccines are reconstituted. Liquid formulation vaccine viz., OPV, DPT, Hep B etc. remain potent as long as cold chain is maintained.

Safety depends on risk of contamination with a pathogen and bacterio-static or virucidal effect of preservatives in the vial. Risk of contamination is higher in multi-dose than single dose vaccine because vaccine is exposed to risk of contamination every time a dose is withdrawn from the vial.

Remember:

**Open vial policy** Does not apply to Measles, BCG, MMR, yellow fever, rabies vaccine and JE vaccine. Freeze dried (lyophilized) vaccines do not have preservatives. At the end of session or 6 hours whichever earlier, these vaccines should be discarded.

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**Check Your Progress 2**

i) How is potency and safety of vaccine determined?

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... ...

... ...

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### 5.4 MISSION INDRADHANUSH

Despite being operational for over 30 years, UIP has been able to fully immunise only 65% children in the first year of their life and the increase in coverage has stagnated in the past 5 years since year 2009 to an average of 1% every year.

To strengthen and invigorate the program and achieve full immunisation coverage for all children at a rapid pace, the Government of India launched Mission Indradhanush in **December 2014**. The ultimate goal of Mission Indradhanush is to ensure full immunisation with all available vaccines for children up to two years and pregnant women.

The Mission is strategically designed to achieving high quality routine immunisation coverage while contributing to strengthening health systems that can be sustained over years to come.

The Government has identified 201 high focus districts across 28 states in the country that have the highest number of partially immunised and unimmunised children. There were total four rounds in the first phase of the mission. The first round of the first phase was started from 7th April, 2015 and continued for more than a week. Next 3 rounds occurred in May, June and July.

In the second phase which started on 7th October, 2015, aim was to achieve full immunisation in 352 Districts which includes 279 mid priority Districts, 33 Districts from the North East states and 40 Districts from phase one where huge number of missed out children were detected. The second, third and fourth rounds of this phase started from 7th November, 7th December 2015 and 7th January 2016.
Mission Indradhanush will target these districts through intensive efforts and special immunisation drives to improve the routine immunisation coverage in the country. The Mission Indradhanush, depicting seven colours of the rainbow, targets to immunise all children against seven vaccine preventable diseases, as given below

1) Diphtheria
2) Pertussis (*Whooping Cough*)
3) Tetanus
4) Tuberculosis
5) Polio
6) Hepatitis B
7) Measles.

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**5.5 Vaccines under Universal Immunisation Programme and Frequently Asked Questions**

We will discuss about various vaccines and frequently asked questions (FAQs) in following sub sections.

**5.5.1 BCG Vaccine**

- It is a live attenuated, freeze dried bacterial vaccine.
- The dose is 0.05 ml till one month of age.
- After one month, till one year of age the dose is 0.1 ml.
- The diluent is normal saline. Vaccine comes in a ten dose vial, so one ml of diluent is added to the vial to make ten doses. After reconstitution, the vaccine can be used within 3–4 hours, after that left over vaccine has to be discarded.
- Vaccine is given intra-dermal, in left arm, just above the deltoid, with a 26 Gauge needle and 0.1 to 1ml syringe. Only the tip of the needle is inserted in the skin. A correct injection would raise a wheel of > 5mm at the site.
- After the vaccination, the mother/attendant should be told that injection site is not to be touched. There would be a papule at the injection site within 2–3 weeks, which will turn into a nodule by 5–6 weeks. Then it would break into an ulcer, which will heal spontaneously within 6–12 weeks, forming a scar.
- There is no need to revaccinate the child even if there is no scar formation.
- The BCG vaccine is contraindicated in immune-compromised persons (e.g. HIV infection etc.), those on immune-suppressive therapy (e.g. corticosteroids etc.), patients suffering from generalised eczema, infective dermatosis etc. and pregnancy.
- The efficacy of the vaccine is well documented in prevention of severe forms of tuberculosis infection, but there is little impact in reducing the overall risk of infection.
Adverse effects

The Adverse effects following infection (AEFI): include following.

- **Minor reactions**: local pain, swelling and tenderness etc.
- **Rare serious adverse reactions**: see Table No. 5.2

If there is a local abscess formation after vaccination, it should be aspirated if not healing spontaneously. If this does not heal then it should be incised and treated with local application of INH powder.

Do not clean the injection site with anti-septic, as it may affect the vaccine efficacy.

**Frequently Asked Questions (FAQ)**

Why give BCG vaccine only on the left upper arm?

BCG is given on the left upper arm to maintain uniformity and for helping surveyors in verifying the receipt of the vaccine.

Why do we give 0.05 ml dose of BCG to newborns (below 1 month of age)?

This is because the skin of newborns is thin and an intra-dermal injection of 0.1ml may break the skin or penetrate into the deeper tissue and cause local abscess and enlarged axillary lymph nodes. Dose of 0.05 ml is sufficient to elicit adequate protection.

Why is BCG given only up to one year of age?

Most children acquire natural clinical/ sub-clinical tuberculosis infection by the age of one year. This too protects against severe forms of childhood tuberculosis e.g. TB meningitis and miliary disease.

If no scar appears after administering BCG, should one re-vaccinate the child?

There is no need to revaccinate the child even if there is no scar.

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5.5.2 Diptheria, Pertussis and Tetanus (DPT) Vaccine

- **DPT vaccine is a combined vaccine** which protects against three diseases viz., diphtheria, pertussis and tetanus.

- It comes as a liquid preparation, ready for use, sterile, whitish turbid, uniform suspension of diphtheria toxoid, tetanus toxoid and inactivated whole cell Bordetella pertussis bacilli. These antigens are adsorbed onto Alumimum phosphate (to increase immunogenic effects) and suspended in isotonic solution of sodium chloride. Thiomersal is added as preservative.

- It usually comes in a 5 ml vial, with 10 doses of 0.5 ml each.

- The protective efficacy for diphtheria and tetanus is more than 95% and for pertussis is almost 80%.

- **DPT three doses (1, 2 & 3) are given at**: At 6 weeks, 10 weeks & 14 weeks; 0.5 ml I/M at Antero-lateral side of mid thigh.
• All the children immunised with DPT should be observed for minimum 30
  min for any immediate adverse reaction.

• DPT 1\textsuperscript{st} booster: is given at 16–24 months;

• DPT 2\textsuperscript{nd} Booster: is given 5 years; 0.5 mL/IM Upper Arm

• The opened vial can be used in subsequent session under open vial policy.

• Vaccine is contraindicated in: infants and children having high fever or
  acute illness, presence of neurological disorder, older children (over 6 years
  of age) and adult, child who suffered a severe reaction to this vaccine
  administered earlier. (see Table 5.2 for serious side effects).

The Adverse effects following infection (AEFI):

• Local reactions: pain, redness and swelling etc.

• Systemic adverse effects: fever, chills, general malaise etc.

• For severe adverse effects see Table 5.2. below

**Table 5.2: Severe Adverse Effects**

<table>
<thead>
<tr>
<th>Severe Adverse Effects</th>
<th>Interval b/w Vaccination and Onset</th>
<th>Number of Events per Million Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent (&gt;3 hours) inconsiderable screaming</td>
<td>0-24 hours</td>
<td>1,000-60,000</td>
</tr>
<tr>
<td>Seizures</td>
<td>0-3 days</td>
<td>570</td>
</tr>
<tr>
<td>Hypotonic hypo responsive episode</td>
<td>0-24 hours</td>
<td>570</td>
</tr>
<tr>
<td>Anaphylaxis/shock</td>
<td>0-1 hour</td>
<td>20</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>0-3 days</td>
<td>0-1</td>
</tr>
</tbody>
</table>

**Frequently Asked Questions (FAQ)**

**Why DT is replaced by DPT vaccine for children above 2 years of age?**

As Pertussis cases were reported in higher age group children and the risk of AEFIIs was not found to be more after DPT vaccine as compared to DT vaccine.

**If a child could not receive DPT1, 2, 3 and OPV 1, 2, 3 according to the schedule, till what age can the vaccine be given?**

The DPT vaccine can be given until 7 years of age and OPV can be given till 5 years of age. If a child has received previous doses but not completed the schedule, do not restart the schedule and instead administer the remaining doses needed to complete the series.

**Why should there be a minimum gap of 4 weeks between two doses of DPT?**

This is because decreasing the interval between two doses may not obtain optimal antibody production for protection.
Why give the DPT vaccine in the antero-lateral mid thigh and not the gluteal region (buttocks)?

DPT is given in the antero-lateral mid-thigh and not the gluteal region to prevent damage to the sciatic nerve. Moreover, the vaccine deposited in the fat of gluteal region does not invoke the appropriate immune response.

What should one do if the child is found allergic to DPT or develops encephalopathy after DPT?

A child who is allergic to DPT or develops encephalopathy after DPT should be given the DTaP / DTw vaccine instead of DPT for the remaining doses, as it is usually the P (whole cell Pertussis) component of the vaccine which causes the allergy/encephalopathy. It may be purchased with locally available resources.

5.5.3 Tetanus Toxoid (TT) Vaccine

It is a purified tetanus toxoid (adsorbed) monovalent vaccine. It contains 5 ml of vaccine, with 10 doses of 0.5 ml each. Efficacy is almost 100%.

Dosage

- **Children**: 10 years & 16 years 0.5 ml I/M Upper Arm (under the NIS)
- Pregnant females: first pregnancy: two doses of TT are given, one month apart (first dose early in pregnancy, second dose 4 weeks apart).
- In subsequent pregnancy within three years of first pregnancy, give just one booster of TT.
- If the subsequent pregnancy occurs after three years, then two doses of TT vaccine are given.
- There are practically no contraindications, but precaution should be observed in those persons giving a history of allergy.

Primary immunisation with TT vaccine

In case a person is unimmunised and comes for vaccination after age of 6 years; 2 doses of TT, 0.5 ml, deep I/M, one month apart are give. Booster is given after one year.

- Than booster of TT is given after the last dose every 10 years.

The **Adverse effects** following infection (AEFI):

- **Local reactions**: pain, redness and swelling etc.
- **Systemic adverse effects**: fever, chills, general malaise etc.
- For **severe adverse** effects see Table 5.3

**Frequently Asked Questions (FAQ)**

If a girl received all doses of DPT and TT as per the NIS till 16 years of age and she gets pregnant at 20 years, should she get one dose of TT during pregnancy?

Give 2 doses of TT during the pregnancy as per the schedule.
Is TT at 10 years and 16 years is meant only for girls?
No, it is to be given to both boys and girls.

Can TT be given in the first trimester of pregnancy?
Yes, it should be given as soon as pregnancy is diagnosed.

5.5.4 Measles Vaccine

- It is a live attenuated, freeze dried vaccine.
- The vaccine comes in a 5 dose vial, each dose is 0.5 ml. Diluent is distilled water. So 2.5 ml of the diluents is added to the vaccine vial to make 5 doses. Do not use any other liquid as diluents. First dose is given at 9 months of age, given sub-cutaneous at the right arm.
- Second dose is given at 16–24 months.
- The vaccine contains no preservative that is why it is very prone for external contamination after reconstitution. So the vaccine should be utilised within 3–4 hours of reconstitution.
- **Contraindications include:** high grade fever or severe illness, pregnancy, immune-compromised persons (e.g. HIV infection etc.), those on immune-suppressive therapy (e.g. cortico-steroids etc.), history of allergy to vaccine components etc.

The **Adverse effects** following infection (AEFI):

- **Local reactions:** Pain, redness and swelling etc. are not that common.
- **Systemic adverse effects:** Toxic shock syndrome is a serious adverse effect which can occur if the vaccine gets contaminated. The child presents with high fever, diarrhoea and vomiting. The case fatality rate is high and death may occur within 2–3 days. Clustering of cases may be seen if the same vaccine is given to other children.
- For other severe adverse effects see table 5.2.

Frequently Asked Questions (FAQ)

Why give the Measles vaccine only on the right upper arm?
The Measles vaccine is given on the right upper arm to maintain uniformity and to help surveyors in verifying the receipt of the vaccine.

If a child has received the Measles vaccine before 9 months of age, is it necessary to repeat the vaccine later?
Yes, the Measles vaccine needs to be administered, according to the National Immunisation Schedule i.e. after the completion of 9 months until 12 months of age and at 16–24 months. If not administered in the ideal age for Measles vaccine, it can be administered until 5 years of age.

What is a measles catch-up campaign?
A measles catch-up campaign is a special campaign to vaccinate all children in a wide age group in a state or a district with one dose of measles vaccine. The catch-up campaign dose is given to all children, both immunised and
unimmunised, who belong to the target age group. The goal of a catch-up campaign is to quickly make the population immune from measles and reduce deaths from measles. A catch-up campaign must immunise nearly 100% of target age group children.

Why 2nd dose of Measles vaccine is introduced in the National Immunisation Programme?

Measles is highly infectious disease causing illness and death due to complications as diarrhoea, pneumonia or brain infection. One dose of measles vaccine at 9 months of age protects 85% of infants. With 2nd dose we aim to protect all the children who remain unprotected after first dose.

If a child comes late for the first dose, then can it get the second dose?

All efforts should be made to immunise the children at the right age i.e. first dose at completed 9 months to 12 months and second dose at 16–24 months. However if a child comes late then give two doses of Measles vaccine at one month interval until 5 years of age.

If a child received one dose of Measles vaccine during an SIA campaign, should it receive the routine dose of Measles vaccine?

Yes, the child should receive routine doses of Measles vaccine according to the Immunisation schedule irrespective of the measles SIA dose.

Why the amount of diluent provided by manufacturers is more than the amount of vaccine doses to be administered?

The manufacturer provides more quantity of diluent than required, e.g. for 5 dose measles vial the diluent is more than 2.5 ml and for 10 dose BCG vial, it is more than 1ml. The reason for this is to take care of the unavoidable vaccine wastage which occurs due to:
- Some dead space in the hub and needle
- Sticking of the vaccine to the inner wall of the vaccine vial and
- Inefficiency of the HWs to draw entire amount of vaccine from the vial. Therefore, it is important to draw the entire amount of diluent from the ampoule and use it to reconstitute the vaccine.

5.5.5 Poliomyelitis Vaccine

Bivalent oral polio vaccine. This live viral vaccine contains types 1 & 3 polio virus (Sanin strains). Earlier trivalent OPV used to be given, but since 25th April 2016, only bivalent OPV is to be used.

- Vaccine comes in a vial of 20 doses (2 ml). Due to variation in pH, the colour of OPV may vary from light yellow to pink.
- Two drops are given orally.
- According to vaccination schedule; Birth dose for institutional deliveries,
- Primary three doses at 6, 10 & 14 week and one booster dose at 16–24 month of age is given orally. Care should be taken not to contaminate multi-dose dropper with saliva.
• Vaccine comes under open vial policy, so if some doses are left after the immunisation session, the remaining doses can be given in the subsequent session if the required conditions are fulfilled.

• Apart from UIP, bOPV is also given on Supplementary Immunisation Activities (SIAs) in children 0–5 years of age to interrupt transmission of polio virus in endemic areas. The routine Immunisation programme should continue unaffected from these SIAs.

The **Adverse effects** following infection (AEFI):

There are no side effects in majority. Very rarely, the vaccine may suffer vaccine associated paralysis.

Persons in close contact with the recently vaccinated child may very rarely be at risk of vaccine associated paralysis.

The vaccine is contraindicated in those with primary immune deficiency disease or suppressed immune responses from medication, leukemia, lymphoma or generalised malignancy.

**Inactivated (Salk) polio vaccine:**

• It is a killed viral vaccine, contains antigens against all the three strains. It induces humoral immunity (there is no local immunity like with OPV).

• Under the NIS, only one dose is at 14 weeks along with third dose of OPV. This single dose is for risk mitigation, as we have started giving only bOPV instead of trivalent OPV.

• Otherwise for immunisation with IPV, total 4 doses are required; 3 doses at 4 to 8 weeks interval, followed by booster after 6–12 months after last dose.

• This vaccine can be given in persons with immunodeficiency disorders, over 50 years of age and in pregnancy. There is no risk of Vaccine derived paralytic polio.

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**Frequently Asked Questions (FAQ)**

**Till what age can a child be given OPV?**

OPV can be given to children till 5 years of age.

**Can OPV and vitamin A be given together with DPT-Booster dose?**

Yes.

**Can an infant be breastfed immediately after OPV?** Yes.

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**Polio Eradication program in India**

There is a remarkable achievement, particularly considering the fact that in 2009 India accounted for nearly half of the total number of polio cases globally and there were an estimated 2 lakh cases of polio every year in the country in the year 1978.

On 25 February 2012, World Health Organization (WHO) removed India from the global list of polio endemic countries. As on date no wild polio virus case has been reported in the country after January 2011 This success can be attributed to the concerted efforts made toward improving both quality and coverage of pulse
polio rounds as under: Political commitment, Assured financial resources, Continuous Innovation, Quality of pulse polio rounds, innovative communication strategy, Effective partnership between Government of India, WHO, UNICEF and States Governments, special focus on Mobile and migrant populations, Rapid Response Teams (RRT) and International Border vaccination.

5.5.6 Hepatitis B Vaccine

- Is a recombinant DNA vaccine, available as monovalent vaccine or as part of penta-valent vaccine.
- Adjuvant is aluminium hydroxide.
- Pediatric dose (upto 10 years of age) is 0.5 ml. Under UIP, for institutional deliveries one dose is given to the neonate at birth, then three doses are given at 6, 10 and 14 weeks along with DPT.
- Route of administration is intra-muscular in the antero-lateral aspect of mid/upper thigh.
- The contraindication is history of allergy to the vaccine components; otherwise the vaccine is well tolerated.
- The vaccine comes in a liquid form in a vial containing 10 doses.

Frequently Asked Questions (FAQ)

Can Hepatitis B vaccine be mixed in the same syringe with DPT and given as one injection?

No, DPT and Hepatitis B vaccine (if supplied separately) cannot be mixed or administered through the same syringe.

Until what age can Hepatitis B vaccine be given?

According to the National Immunisation Schedule, Hepatitis B vaccine should be given with the first, second and third doses of DPT till one year of age.

Why give the birth dose of Hepatitis B vaccine only within 24 hours of birth?

The birth dose of Hepatitis B vaccine is effective in preventing peri-natal transmission of Hepatitis B if given within the first 24 hours.

5.5.7 Pentavalent Vaccine

- As the name suggests, the vaccine contains antigens for protection against five diseases i.e. diphtheria, pertussis and tetanus, hepatitis B and Haemophilus Influenza B (HiB) associated pneumonia and meningitis.
- It is given in selected states only. The dose is 0.5 ml, intra-muscular at antero-lateral aspect of mid/upper thigh at 6, 10 and 14 weeks of age. No booster dose is given under UIP.
- It comes as a liquid preparation containing 10 doses.
- Severe reaction to previous dose is a contraindication. Children with moderate or severe acute illness should not be administered pentavalent vaccine.
• During the initial months of pentavalent vaccine introduction, only those children who come for the first dose of DPT are administered pentavalent vaccine.

• Infants who have already received either their first or second doses of DPT & Hep B (i.e., DPT1/HepB 1 or DPT2/HepB 2) will complete the schedule with DPT & Hep B only. This is called ‘Phasing in’ of pentavalent vaccine in UIP.

• Children will continue to receive DPT boosters at the age of 16–24 months and 5–6 years of age using DPT vaccine. Similarly, birth dose of HepB using single antigen HepB vaccine will continue and must be provided within 24 hours of birth. Vaccine has not been associated with any serious.

• **Adverse effects.** However, redness, swelling and pain at the site of injection may occur in as many as 25% of those who have been vaccinated. Such reactions usually start within 1 day after immunisation and last for 1–3 days.

• The rate of adverse events following immunisation (AEFI) is not any higher than when DPT vaccine.

• The storing temperature for vaccine is as for all the other vaccines i.e. +2°C to +8°C. The vaccine comes under open vial policy.

### 5.5.8 Japanese Encephalitis Vaccine

• Multi-dose vials with 5 doses, supplied with the diluent vial of 2.5 ml which contains Phosphate Buffer solution.

• The vaccine should be reconstituted with the supplied diluent only. After reconstitution it turns into a transparent orange red or light pink liquid. After reconstituting the time of reconstitution should be noted on the vial.

• The reconstituted vaccine should be used within two hours of reconstitution, beyond which the vaccine should be discarded.

• It is a live attenuated SA-14-14-2 vaccine, to prevent Japanese encephalitis in selected states.

• Under UIP, 2 doses are given subcutaneous at upper arm. First dose at 9 months, second dose at 16-24 months of age. The dose is 0.5 ml, given subcutaneously in the left upper arm.

• **Adverse reactions:** Occasional mild local or systemic reactions. Rare, but serious, neurological adverse events attributed to IMB vaccine have been reported, but no causal relationship has been confirmed.

As occasional allergic reactions to components of the vaccine may occur up to 2 weeks after administration, it is advisable to ensure that the complete course of vaccination is administered well in advance of departure.

**Contraindications and precautions:**

Contraindications:

- High Fever (Vaccination to be done only after advise from a Medical officer).
- Severe malnourishment, Acute infectious disease, Ear infection, Tuberculosis, Heart, Liver and Kidney problems, Pregnancy, Allergy, Convulsions, Person
treated with any immunosuppressive therapy. Person with a proven or suspected hypersensitivity to Kanamycin or Gentamicin. A hypersensitivity reaction to a previous dose is a contraindication. In principle, the live attenuated vaccine should be avoided in pregnancy unless there is a high risk of exposure to the infection.

### Frequently Asked Questions (FAQ)

**If a child 16-24 months of age has been immunised with JE vaccine during an SIA, can it receive the JE vaccine again, as part of RI?**

No, currently this is a single dose vaccine and should not be repeated.

**If a child above 2 years (24 months) of age has not received the JE vaccine through either RI or an SIA, should s/he be given the JE vaccine?**

Yes, the child is eligible to receive a dose of the JE vaccine, through RI, till the age of 15 years.

### Check Your Progress 3

1. a) BCG is a .................................................................
   b) Dose of BCG till one month is ............................... ml.
   c) ................................................................. is a combined vaccine.
   d) ................................................................. is an attenuated freeze vaccine.
   e) Killed viral vaccine is ............................................
   f) Recombinant DNA vaccine is ..................................

### 5.6 COLD CHAIN

It is a system of storing and transporting vaccines at recommended temperature from the manufacture to the point of use. If temperature is not maintained then the potency of the vaccine may be lost.

The key elements of cold chain are:

- **Personnel:** to manage vaccine storage and distribution.
- **Equipment:** to store and transport vaccines and to monitor temperature Fig. 1.5 a-c.
- **Procedures:** to ensure that vaccines are stored and transported at appropriate temperatures.

**Walk in Freezer:** These are big insulated rooms, (one can actually walk in) to maintain temperature 0 to −20°C. These are used for storing OPV and frozen ice packs for long term Fig 5.1a.

**Deep freezers:** For maintaining temperature between −15°C to −25°C; used for making ice packs Fig. 5.1b.
Ice lined refrigerator: They maintain a temperature of $+2^{\circ}\text{C}$ to $+8^{\circ}\text{C}$. used to store vaccines at PHC level. Because of ice lining in these, these ILRs can maintain temperature even if there are electricity failures. Fig 5.1c.

Cold boxes: They are insulated boxes of 5–20 liter capacity. They maintain a temperature of $+2^{\circ}\text{C}$ to $+8^{\circ}\text{C}$. used for transportation and emergency storage of vaccines and ice packs. Fig 5.1d

Vaccine carriers: With 4 frozen ice packs, it maintain a temperature of $+2^{\circ}\text{C}$ to $+8^{\circ}\text{C}$ for 12 hours, if not opened frequently. Fig 5.1e.

Ice packs: Plastic containers filled with water. These are frozen in the deep freezers and when placed in non-electrical equipments such as vaccine carriers and cold boxes, they maintain temperature and increase hold over time. Fig. 5.1f.

Points to remember

- The optimum temperature to store all the vaccines is $+2^{\circ}\text{C}$ to $+8^{\circ}\text{C}$.
- Store the diluents also at the same temperature.

Fig. 5.1: (a-f) Cold chain
The risk of cold chain failure increases as vaccines move along the cold chain from manufacturer to the vaccination site.

Manufacturer → stores at the Center / States → regional stores \\
Sub-center/vaccination site ← Primary health center ← District stores

India has built a vast cold chain infrastructure to ensure that only potent and effective vaccines reach millions of beneficiaries across the country. The vaccines are supplied by manufacturers directly to four Government Medical Store Depots (GMSD) at Karnal, Mumbai, Chennai and Kolkata, and State and regional vaccine stores. The GMSDs supply to the States and regional vaccine stores; State and regional vaccine stores supply vaccines to Divisional vaccine stores and district. The vaccines are further supplied to last cold chain points which are usually situated in Primary Health Centers (PHCs) and Community Health Centers.

Transportation of vaccines from States/Regional stores to divisions and districts is done in cold boxes using insulated vaccine vans. Vaccines carriers with icepacks are used to transport vaccines from PHCs to the outreach sessions in the vaccine vans.

The performance and efficiency of the cold chain system at different levels is monitored continuously, through supervisory visits, review meetings. The Government of India procures and supplies all UIP vaccines along with diluents to all States. In addition to vaccines, syringes of different capacities, are also procured centrally and supplied to States. The process involves vaccines and logistics forecasting, scheduling, ensuring supplies as per need, and so on. It is important to ensure that the cold chain system is not over burdened and there are no under supplies. Supplies are made to States on a quarterly basis on receipt of indent. State Vaccine Stores can store vaccines for three months and so can district vaccine stores. PHCs/CHCs send monthly indents to district stores. PHCs can store vaccines for a maximum of one month only.

**Thermo-sensitivity of vaccines**

Vaccines sensitive to heat in the order of most sensitive to least sensitive areas follows Fig. 5.2:

- BCG (after reconstitution)
- OPV
- Measles
- DPT
- BCG (before reconstitution)
- DT, TT, Hep B, JE

Vaccines sensitive to freezing in the order of most sensitive to least sensitive are:

- Hep B
- DPT
- DT
- TT

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The appearance of the vaccine may remain unchanged even after damage, so one should be very careful while maintaining the cold chain.

**Vaccine Vial Monitor (VVM):** is a heat sensitive material placed on a vaccine vial to register cumulative heat exposure over time. Till the time inner square is lighter than outer circle, the vaccine can be used if within expiry date see diagram below Fig. No.5.3.

**How to read a VVM**

Inner square is lighter than outer circle.

*If the expiry date has been passed*
USE the vaccine

At a later time, inner square is lighter than circle. *If the expiry date has not been passed USE the vaccine*

**Discard point:**

Inner square match colour of outer circle. *Do Not use the vaccine inform your supervisor*

**Beyond the Discard point:**

Inner square darker than outer circle *Do Not use the vaccine inform your supervisor*

**Thermometers:** Either dial or stem (alcohol) are used to monitor temperature in cold chain equipments. Recordings of temperature are taken every morning and evening and records are maintained and corrective action is taken if the recorded temperature is outside the recommended range.
5.7 ADVERSE EVENTS FOLLOWING IMMUNISATION

- **Vaccine reaction**: An event caused or precipitated by the active component or one of the other components of the vaccine. This is due to the inherent properties of the vaccine e.g. Anaphylaxis due to measles vaccine

- **Programme Error**: An event caused by an error in vaccine preparation, handling or administration e.g. Bacterial Abscess due to un-sterile injection

- **Coincidental**: An event that occurs after immunisation but is not caused by the vaccine. This is due to a chance association e.g. Pneumonia 4 days after oral polio vaccine administration

- **Injection Reaction**: Event from anxiety about, or pain from the injection
itself rather than the vaccine e.g. Fainting spell in a teenager after immunization

- **Unknown**: Event's cause cannot be determined

- **Common minor vaccine reactions**:

Local reaction (pain, swelling and/or redness), fever and systemic symptoms.

Fever should be anticipated in nearly half of those vaccinated in the case of DPT or TT. **Summary of Rare serious Adverse Effects, onset interval and rate is given in Table 5.2 below**

**Table 5.2: Summary of Rare serious Adverse Effects, of vaccines**

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Reaction</th>
<th>Interval between Vaccination and Onset</th>
<th>Number of Events per Million Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCG</td>
<td>Suppurative adenitis</td>
<td>2-6 months</td>
<td>10-100</td>
</tr>
<tr>
<td></td>
<td>BCG Osteitis</td>
<td>Up to several years</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Disseminated BCG infection</td>
<td>1-12 months</td>
<td>–</td>
</tr>
<tr>
<td>Hib</td>
<td>None Known</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Hep B</td>
<td>Anaphylaxis</td>
<td>0-1 hour</td>
<td>1-2</td>
</tr>
<tr>
<td>Measles/MMR⁺</td>
<td>Febrile seizures</td>
<td>5-12 days</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td>Thrombocytopenia (low platelets)</td>
<td>60 days</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Anaphylaxis</td>
<td>0-1</td>
<td>1</td>
</tr>
<tr>
<td>OPV</td>
<td>Vaccine-Associated Paralytic Poliomyelitis</td>
<td>4-30 days</td>
<td>Up to 0.4⁺</td>
</tr>
<tr>
<td>Tetanus</td>
<td>Brachial Neuritis</td>
<td>2-28 days</td>
<td>5-10</td>
</tr>
<tr>
<td></td>
<td>Anaphylaxis</td>
<td>0-1 hour</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sterile abscess</td>
<td>1-6 weeks</td>
<td>6-10</td>
</tr>
<tr>
<td>DPT</td>
<td>Persist (&gt;3 hours) inconsolable screaming</td>
<td>0-48 hours</td>
<td>1,000-60,000</td>
</tr>
<tr>
<td></td>
<td>Seizures</td>
<td>0-3 days</td>
<td>600⁺</td>
</tr>
<tr>
<td></td>
<td>Hypotonic Hypo Responsive Episode (HIE)</td>
<td>0-24 HOURS</td>
<td>30-990</td>
</tr>
<tr>
<td></td>
<td>Anaphylaxis/ Shock</td>
<td>0-1 hour</td>
<td>1-6</td>
</tr>
<tr>
<td>Japanese Encephalitis</td>
<td>Serious allergic reaction</td>
<td>0-2 weeks</td>
<td>10-1000</td>
</tr>
<tr>
<td></td>
<td>Neurological event</td>
<td>0-2 weeks</td>
<td>1-2.3</td>
</tr>
</tbody>
</table>
a Reaction (except anaphylaxis) do not occur if already immune (-90% of those receiving a second dose): Children over six years are unlikely to have febrile seizures.

b VAPP risk is higher for first dose (12 peer 1.4 to 3.4 million doses) compared to 1 per 5.9 millions for subsequent doses and 1 per 6.7 million doses for subsequent contacts.

c Seizures are mostly febrile in origin, and the rate depends on history, family and age, with a much lower risk in infants under the age of 4 months.

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**Check Your Progress 5**

1) Explain vaccine reaction.

........................................................................................................

........................................................................................................

2) List infection reactions.

........................................................................................................

........................................................................................................

3) Write common minor vaccine reactions.

........................................................................................................

........................................................................................................

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**5.8 REASONS FOR LOW IMMUNISATION COVERAGE**

Following are the reasons for low immunisation coverage:

- **Failure to provide immunisation** at planned outreach, sub-center or PHC sites.
- **Dropouts**: Children who receive one or more vaccination, but do not return for subsequent doses.
- **Unreached populations**
  - Children whose parents do not know about immunisation or face socio-economic barriers to utilize services.
- **Lack of geographic access**: Children who live too far away from a health center or outreach site to realistically complete a full immunisation schedule.
- **Resistant populations**: Children whose parents do not believe in immunisation services, even though a health center is within reach.
- **Missed Opportunities**: Children who visit the health center for some other reason, but are not screened for immunisation by health workers.
5.9 CALCULATING THE BENEFICIARIES PER MONTH FOR EACH VACCINE

Let us explain this with the help of an example.

For example, if the monthly target for a village is 1 infant and 1 pregnant woman, then the beneficiaries for each vaccine (and injection load) for such a village can be calculated as follows:

- **TT** = Monthly target of pregnant women x 2 doses (2 injections)
- **BCG** = Monthly target of infants x 1 dose (1 injection)
- **DPT** = Monthly target of infants x 5 doses# (5 injections)
- **bOPV** = Monthly target of infants x 4 doses##
- **HepB** = Monthly target of infants x 3 doses (3 injections)
- **Measles** = Monthly target of infants x 2 doses (2 injections)
- **JE** = Monthly target of infants x 1 dose (1 injection)

Therefore, a total of about 14 injections are required for a target of each infant per month.

Calculate the requirement of vaccine vials per month

- **TT/BCG/DPT/HepB** = \( \frac{\text{Beneficiaries per month} \times 1.33^*}{10} \)
- **OPV** = \( \frac{\text{Beneficiaries per month} \times 1.33^*}{20} \)
- **Measles/JE** = \( \frac{\text{Beneficiaries per month} \times 1.33^*}{5} \)

Based on the specific needs, add the calculations of beneficiaries for the following doses:

**OPV-0** = Monthly target of infants x 1 dose

**HepB-Birth** = Monthly target of infants x 1 dose.

**TT-10** = expected 10 yr old population x 1 dose

**TT-16** = expected 16 yr old population x 1 dose

# Including 2 booster doses

## Including 1 booster dose

* Vaccines = 25% wastage rate or 1.33 WMF (Wastage Multiplication Factor)

0.1 ml auto-disable syringes (ADS) = Beneficiaries for BCG x 1.11*

- 0.5 ml ADS = Beneficiaries for (TT+ DPT+ HepB+ Measles+ JE) x 1.11*
- Reconstitution Syringes = (BCG + Measles+JE vials) x 1.11*

* Syringes = 10% wastage rate or 1.11 WMF (Wastage Multiplication Factor)
5.10 INJECTION SAFETY AND WASTE DISPOSAL

A large number of injection procedures are undertaken in lakhs of vaccination sessions across the country every year. Unsafe injection practices can harm the recipient of the injection, the health worker and the community resulting in potentially life threatening infections such as HIV/AIDS, Hepatitis B and C, etc. To ensure safe injection practices, continuous supply of injection safety equipments (AD syringes, reconstitution syringes, hub cutters and waste disposal bags) is ensured.

Trainings are conducted and supported by job-aids, on job training (supportive supervision). Disposal of immunisation waste is strictly as per Central Pollution Control Board (CPCB) guidelines for biomedical waste disposal. The principles followed are segregation of waste at source (at the session site), transportation to the PHC or CHC, treatment of sharps and potentially bio-hazardous plastic waste, disposal of sharps in sharp pits and treated plastic waste through proper recycling Fig. 5.5. The states are provided funds to procure hub cutters, black and red plastic bags and construction of sharp pits in PHCs and CHCs.

### Waste from Immunisation Session

- Cut hub of AD and Disposable syringe
- Plastic part of syringe
- Broken vials and ampoule
- Needle caps
- Wrappers

### Send to Health Facility at end of session

- Disinfection 1% Hypo chloride solution (for 30 minutes)
- Disinfection 1% Hypo chloride solution (for 30 minutes)

Dispose in Safety Pit  | Recycle  | Dispose as Municipal Waste

To prepare 1% Hypochlorite, dissolve 10-15 g or 1 tablespoon full of bleaching powder in 1 liter of water in a well ventilated area. Chlorine solution gradually loses strength; therefore prepare freshly diluted solutions daily. Use clear water, because organic matter destroys...
5.11 LET US SUM UP

In this unit you have learnt about the details of universal immunisation programme, Open Vial Policy, Mission Indradhanush, Cold chain vaccine under Universal Immunisation Programme, adverse effects of immunisation and reasons of low coverage. While conducting immunisation session in the community you will be asked many questions and queries related to immunisation, its side effects, dose normal reaction, action, duration etc. The focus on vaccines under UIP with frequent asked questions will acquaint you with knowledge to answer the queries of community and be vigilant while administration of various vaccines.

5.12 MODEL ANSWERS

Check Your Progress 1

1) a) Universal Immunisation Programme
   b) 2014

2) Under UIP, following vaccines are provided:
   1) BCG (Bacillus Calmette Guerin)
   2) DPT (Diphtheria, Pertussis and Tetanus Toxoid)
   3) OPV (Oral Polio Vaccine)
   4) Measles
   5) Hepatitis B
   6) TT (Tetanus Toxoid)
   7) JE vaccination in selected high disease burden districts).
   8) Hib containing Pentavalent vaccine (DPT+HepB+Hib) (In selected States)

3) Diseases Protected by Vaccination under UIP
   1) Diphtheria
   2) Pertussis
   3) Tetanus
   4) Polio
   5) Tuberculosis
   6) Measles
   7) Hepatitis B.
8) Japanese Encephalitis (commonly known as brain fever).
9) Meningitis and Pneumonia caused by Haemophilus Influenzae type b

Check Your Progress 2

1) **Potency** is determined by heat sensitivity and whether or not the vaccine has been reconstituted.

**Safety** depends on risk of contamination with a pathogen and bacteriostatic or virucidal effect of preservatives in the vial. Risk of contamination is higher in multi-dose than single dose vaccine because vaccine is exposed to risk of contamination every time a dose is withdrawn from the vial.

Check Your Progress 3

1) a) Attenuated Freezed dried bacterial vaccine.
   b) 0.5 ml
   c) DPT
   d) Measles
   e) Salk Vaccine
   f) Hepatitis B.

Check Your Progress 4

1) Key elements of cold chain are:
   - **Personnel**: to manage vaccine storage and distribution.
   - **Equipment**: to store and transport vaccines and to monitor temperature
   - **Procedures**: to ensure that vaccines are stored and transported at appropriate temperatures.

2) Vaccine Vial Monitor (VVM)

   - Inner square is lighter than outer circle. **If the expiry date has been passed USE the vaccine**
   - At a later time, inner square is lighter than circle. **If the expiry date has not been passed USE the vaccine**
   - **Discard point**:
     - Inner square match colour of outer circle. **Do Not use the vaccine inform your supervisor**
   - **Beyond the Discard point**:
     - Inner square darker than outer circle
     - **Do Not use the vaccine inform your supervisor**
Check Your Progress 5

1) **Vaccine reaction:** An event caused or precipitated by the active component or one of the other components of the vaccine. This is due to the inherent properties of the vaccine e.g. Anaphylaxis due to measles vaccine

2) **Injection Reaction:** Event from anxiety about, or pain from the injection itself rather than the vaccine e.g. Fainting spell in a teenager after immunization.

3) **Common, minor vaccine reactions:**
   - Local reaction (pain, swelling and/or redness), fever and systemic symptoms.
   - Fever should be anticipated in nearly half of those vaccinated in the case of DPT or TT.

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