

# Immunization Guidelines



Department of Public Health & Safety  
Health Policy & Strategy Sector

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# **Immunization Guidelines**

Dubai Health Authority  
Department of Public Health & Safety  
Health Policy & Strategy Sector

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# Abbreviations

DHA	: Dubai Health Authority
UAE	: United Arab Emirates
HPV	: Human Papilloma Virus
MMR	: Measles, Mumps, Rubella
VIS	: Vaccine Information Systems
TIG	: Tetanus Immunoglobuline Globuline
HBIG	: Hepatitis B Immunoglobulin
VVM	: Vaccine Vial Monitor
OPV	: Oral Polio Vaccine
WHO	: World Health Organization
UNICEF	: United Nations International Children Emergency Fund
VQC	: Vaccine Qualified Clinic
AEFI	: Adverse Event Following Immunization
FDA	: Food & Drug Administration
IPV	: Inactivated poliovirus vaccine
Hib	: Haemophilus Influenza Type b
HAV	: Hepatitis A Vaccine
TB	: Tuberculosis
BCG	: Bacillus Calmette-Guerin
ACLS	: Advanced Cardiac Life Support
ATLS	: Advanced Trauma Life Support
CPR	: Cardiopulmonary Resuscitation
DHA	: Dubai Health Authority
DM	: Dubai Municipality
MOH	: Ministry of Health
PALS	: Paediatric Advanced Life Support

# Acknowledgement

This guideline is the product of a sincere effort of health professionals representing all concerned stakeholders in the Emirate of Dubai as well as the Federal Ministry of Health. The insight and depth of experience of participants has enriched the process and improved the quality of the final document.

The Dubai Health Authority wishes to express sincere gratitude to following for their contribution to the development of this guideline; Central Preventive Medicine Dept & Office of the NFP-IHR – MOH; Dubai Police; American Hospital Dubai; Medcare Hospital.

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The committee members:

- |                             |  |
|-----------------------------|--|
| Dr. Ali Hassan Al Marzooqi  | - Former Director, Public Health & Safety Department   |
| Dr. Aizeldin El Gak Ibrahim | - Head of Preventive Medicine Section  |
| Dr. Hisham Al Khatib        | - Senior Public Health Specialist -DHA   |
| Dr. Fatma Al Olama          | - Head of Child Health - DHA   |
| Dr. Mhd. Oussama Kayali     | - Head of Health Regulation Section - DHA  |
| Dr. Fathia Hatim            | - Head of Health Promotion Section - DHA   |
| Dr. Abeer Khayat            | - Chief of Pediatrics - American Hospital  |
| Dr. Moeena Zain             | - Specialist Infectious Disease - American Hospital  |
| Dr. Jyoti Joshi             | - Specialist Community Medicine -<br>Central Preventive Medicine Dept & Office of the<br>NFP IHR - MOH |
| Dr. Emad Abdulkarim         | - Consultant Community Medicine & Vaccinology<br>MOH   |
| Dr. S. M Anees              | - Chief Paediatrics -Medcare Hospital  |
| Ms. Noora Al Saadi          | - Head of Nursing Dept - Dubai Police  |

# Foreword

Immunization is one of the most cost-effective health interventions known to mankind. With immunization, smallpox has been eradicated and polio eradication is also in sight

Dubai Health Authority announced the first immunization policy in the Emirate of Dubai as part of the initiatives of the Dubai Health Strategy that aims to reduce the burden of vaccine preventable diseases.

The introduction of this policy will pledge the improvement of immunization services as well as provision of technical guidance to healthcare providers to ensure that they follow best practices in terms of administering and storing vaccines.

This document was developed within this policy is the culmination of a one-year process that brought together a task force set by the department of Public Health and Safety at the Health Policy and Strategy sector within Dubai Health Authority; and includes experts from government and private health care sectors.

The approach adopted in the document has been inspired mainly by the guiding principles of the World Health Organization and by the National Program of Immunization in the United Arab Emirates.

The process of developing this document provides a model for the kind of collaboration across professionals that are essential to assure the provision of unified immunization services, in addition to its significant for the commitment it reflects to harmonize and coordinate data collection, improving reporting and data sharing, and fostering new levels and modes of collaboration.

It is hoped that these comprehensive and updated immunization guidelines will give the technical support that required standardizing and regulating the immunization services at health care facilities in the Emirate of Dubai. Complying with these guidelines by health care professionals will ensure unified immunization services at both public and private health sectors.

**Laila Al Jassmi**

CEO Health Policy and Strategy Sector /DHA



# Introduction

## Scope

This regulation applies to every hospital licensed under the Dubai Health Authority (DHA) establishment law, including government, semi government, and private hospitals, and hospitals operating in free zone areas.

## Purpose

The DHA is the sole responsible entity ensuring that all healthcare facilities and professionals in the Emirate of Dubai provide the highest level of safety and quality immunization services at all times, through the development, establishment, and enforcement of minimum required standards for vaccine qualified clinics (VQCs).

Based on the DHA objective of better health with focus on prevention as well as cure, and based on the UAE Federal law number (27) of 1981 concerning prevention of communicable diseases. Dubai Health Authority along with other concerned sectors developed this vaccination service requirement with aim to regulate immunization practice and vaccination against the communicable diseases in the Emirate of Dubai

The assessment, licensure, control, and surveillance of human vaccines are major challenges for any health regulatory authorities in the world as confronted by a steadily increasing number of novel products, complex quality concerns, and new technical issues arising from rapid scientific advances. Because vaccines are given to healthy individuals, they undergo a more rigorous approval process than drugs which are given to cure sick people.

## Immunization Concept

Immunization is one of the most successful and cost-effective public health interventions. Globally, it prevents an estimated 2.5 million child deaths every year in all age groups from diphtheria, tetanus, pertussis, and measles. Small pox has already been eradicated and Polio is the next disease targeted for eradication using vaccines and is to be followed by Measles.

Immunization as an effective preventive intervention is intended to support the body immune defense against infections. Its aim is to protect individuals and communities from infectious diseases.

Vaccines contain the same antigens or parts of antigens that cause diseases, but the antigens in vaccines are either killed or greatly weakened. When they are injected into fatty tissue or muscle, vaccine antigens are not strong enough to produce the symptoms and signs of the disease but are strong enough for the immune system to produce antibodies against them. The memory cells that remain prevent re-infection when they encounter that disease in the future.

Newborn babies are immune to many diseases because they have antibodies they got from their mothers. However, the duration of this immunity may last only a month to about a year. Further, young children do not have maternal immunity against some vaccine-preventable diseases, such as whooping cough. If a child is not vaccinated and is exposed to a disease germ, the child's body may not be strong enough to fight the disease. Before vaccines, many children died from diseases that vaccines now prevent,

such as whooping cough, measles, and polio. Those same germs exist today, but babies are now protected by vaccines, so we do not see these diseases as often. Therefore, the first years of a child's life constitute the period of greatest vulnerability to infectious diseases. It is precisely during that period vaccines are recommended.

Immunizing individual children also helps to protect the health of our community, especially those people who are not immunized. People who are not immunized include those who are too young to be vaccinated, those who cannot be vaccinated due to medical reasons (e.g., children with leukemia), and those who cannot make an adequate response to vaccination. Through herd immunity, these individuals are less likely to be exposed to disease germs that can be passed around by unvaccinated children. Immunization also slows down or stops disease outbreaks.

In addition to their ability to prevent disease among members of the community, vaccines can make substantial contributions to the quality of life of families and communities. Disease prevention results in substantial cost savings whether measured by personal, family, insurer or community expenditures. Vaccines reduce the need for visits to physician's offices, hospital admissions, medication use, and contribute to better school attendance by healthier students.

Vaccines are biological substances that can lose their effectiveness if they become too hot or too cold and therefore, may not offer protection against the disease specified and will need to be discarded. Vaccine effectiveness depends upon vaccine efficacy, which depends on maintaining the vaccine 'cold

chain' at all levels from the manufacturer to the recipient.

Vaccines are safe and effective. However, they are neither perfectly safe nor perfectly effective. Consequently, some persons who receive vaccines will be injured or not be protected. Most adverse events associated with vaccines are minor and involve local soreness or redness at the injection site or perhaps fever for a day or so. Rarely, however, vaccine can cause more serious adverse events. Therefore it is imperative to have a surveillance program for monitoring any adverse events following immunization.

The National Immunization Program is being continually updated to include the best and safest available technology to our children in UAE.

# 1

# Immunization & Vaccination Procedures

## 1.1 General Principles of Immunization

All biologic materials involved in the production of a specific immune state against a specific infection in a human are termed “Immunobiologics”. All immunobiologics function on one of two principles; active immunization and passive immunization.

### 1.1.1 Active Immunization

This is the process of administering immunogens to stimulate a protective antibody or a cell-mediated response in a person. Active immunization takes between two to six weeks to complete. The product being used may be any of the following:

#### **Vaccine**

A suspension of either whole or part of an organism that is used to induce immunity against a specific infectious disease when injected, inhaled or ingested is called a vaccine e.g. Influenza vaccine.

#### **Toxoid**

Toxoid is a modified microbial toxin that

still retains its antigenicity and is able to stimulate immunity to a relevant toxin. Common toxoids are Tetanus toxoid.

### 1.1.2 Passive Immunization

Passive immunization refers to the passive transfer of pre-formed antibodies to a person to provide them limited immunity. Passive immunity is useful if immediate protection is needed, but lasts a much shorter duration, generally till approx. 3 months. It may be given up to 3 weeks before or up to 72 hours after the exposure. These antibodies are provided generally in any of the following forms:

#### **Immunoglobulin**

Immunoglobulin is a preparation derived from a large pool of human plasma that contains a specified amount of preformed antibodies to a variety of common infectious diseases including Measles, Diphtheria, and Polio. It also contains a variable amount of antibodies to several other common infections like varicella and hepatitis B. Immunoglobulins can be administered either intravenously or intramuscularly depending on the exact formulation. There is generally a higher incidence of allergic reactions with immunoglobulins.

## Specific Immunoglobulin

Specific immunoglobulin are special preparations that are very high in antibody content against a particular disease are also available. They are prepared using only immunized donors or individuals recovering from a recent infection. Common examples include Tetanus Immunoglobulin. They are always given intra-muscularly.

## Antitoxins

Antitoxins are antibodies to specific bacterial toxins that have been derived from animals. Examples include diphtheria and botulinum anti toxins.

## 1.2 Types of Vaccines

### 1.2.1 A. Live Attenuated Vaccines:

Live attenuated vaccines are manufactured using live micro-organisms that have been genetically modified to

maintain their antigenicity but lose their pathogenicity. They may be viral or bacterial. Live attenuated vaccines stimulate potent immune response resulting in prolonged immunity. Live attenuated vaccines cannot be given to immuno-compromised individuals or their close contacts, or during pregnancy. Examples of live attenuated vaccines are: measles, mumps, rubella, polio, and varicella vaccines (Table 1).

### 1.2.2 Inactivated Viral or Bacterial Vaccines:

Inactivated vaccines contain either deactivated microorganisms or only purified components of the toxins. Since there is no risk of developing infections from these vaccines, they can be given to all individuals. Immunity produced by these vaccines may not be life-long and usually require boosters. Examples include hepatitis A, hepatitis B, HPV, inactivated polio, and tetanus vaccines (Table 1).

Killed vaccines/inactivated	Live vaccines	Toxoids
Pertussis component in DTP/DTap/Tdap	Oral Polio vaccine	Tetanus & diphtheria components in DTP/DTap/Tdap
Hep B & Hep A vaccines	MMR	Tetanus toxoid (TT)
Injectable polio vaccine	BCG	Tetanus & diphtheria in DT/Td
Meningococcal vaccines	Yellow fever vaccine	
Influenza	Varicella vaccine	
Cholera	Oral typhoid	
Pneumococcal vaccines	Rotavirus vaccine	
Rabies		
Haemophilus Influenza type B		
Typhoid capsular polysaccharide (IM)		
Human papillomavirus vaccine		

Table1 : Types of vaccines; killed vaccines, live vaccines, and toxoids.

## 1.3 Vaccine Administration

Appropriate vaccine administration is critical to vaccine effectiveness. The following information provides general guidelines for administration of vaccines for those who administer vaccines. This information should be used in conjunction with professional standards for medication administration and vaccine manufacturers' product guidelines.

### 1.3.1 Patient Preparation:

Patients should be prepared for vaccination with consideration for their age and stage of development. Parents/guardians and patients should be encouraged to take an active role before, during and after the administration of vaccines.

#### Screening

All patients should be screened for contraindications and precautions for each scheduled vaccine.

#### Patient Education

Healthcare professionals should be prepared to discuss the benefits and risks of vaccines using Vaccine Information Statements (VIS) and other reliable resources. Updated VIS in 39 languages are available for free download from the US Centers for Disease Control and Prevention web site <http://www.immunize.org/vis/>.

#### Atraumatic Care

Healthcare providers need to utilize a variety of techniques to minimize the stress and discomfort associated with receiving injections.

### 1.3.2 Infection Control

Healthcare professionals should follow Standard Precautions to minimize the

risks of spreading disease during vaccine administration.

#### Hand washing

Hands should be washed thoroughly with soap and water or cleansed with an alcohol-based waterless antiseptic between patients, before vaccine preparation or any time hands become soiled.

#### Gloving

Gloves are not required to be worn when administering vaccines unless the person administering the vaccine is likely to come into contact with potentially infectious body fluids or has open lesions on the hands.

#### Needle stick injuries

Needle stick injuries should be reported immediately to the site supervisor, with appropriate care and follow-up given as directed by the institution guidelines.

#### Equipment disposal

All used syringe/needle devices should be placed in puncture proof containers to prevent accidental needle sticks and reuse. Empty or expired vaccine vials are considered medical waste and should be disposed of according to UAE regulations.

### 1.3.3 Vaccine Preparation

#### Equipment selection

*Syringe Selection* - A separate needle and syringe should be used for each injection. A parenteral vaccine may be delivered in either a 1-mL or 3-mL syringe as long as the prescribed dosage is delivered.

*Needle Selection* - Vaccine must reach the desired tissue site for optimal immune response. Therefore, needle selection should be based upon the prescribed route, size of the individual, volume and

viscosity of the vaccine, and injection technique.

## Inspecting vaccine

Each vaccine vial should be carefully inspected for damage or contamination prior to use. The expiration date printed on the vial or box should be checked. Vaccine can be used through the last day of the month indicated by the expiration date unless otherwise stated on the package labeling. Expired vaccine should never be used.

## Reconstitution

Some vaccines are prepared in a lyophilized form that requires reconstitution, which should be done according to manufacturer guidelines. Diluent solutions vary; use only the specific diluent supplied for the vaccine. Once reconstituted, the vaccine must be either administered within the time guidelines provided by the manufacturer or discarded. Changing the needle after reconstitution of the vaccine is not necessary unless the needle has become contaminated or bent.

## Prefilling syringes

Filling syringes in advance is **strongly discouraged**, because of the increased risk of administration errors, and possible contamination in vaccines that do not contain a preservative. Syringes other than those filled by the manufacturer are designed for immediate administration, not for vaccine storage.

Only in certain circumstances, such as a busy school clinic, more than one syringe can be filled. One person should prefill only a few syringes at a time, and the same person should administer them. Any syringes left at the end of the clinic day should be discarded.

Under no circumstances should MMR,

varicella, or zoster vaccines ever be reconstituted and drawn prior to the immediate need for them. These live virus vaccines are unstable and begin to deteriorate as soon as they are reconstituted with diluent.

## Labeling

Once a vaccine is drawn into a syringe, the content should be indicated on the syringe. There are a variety of methods for identifying or labeling syringes (e.g. keep syringes with the appropriate vaccine vials, place the syringes in a labeled partitioned tray or use color coded labels or (preprinted labels).

## 1.4 Routes of Administration

### 1.4.1 Subcutaneous injections (SC)

Sub-Q or SC injections are administered into the fatty tissue found below the dermis and above muscle tissue.

**Site** - Subcutaneous tissue can be found all over the body. The usual sites for vaccine administration are the thigh (for infants <24 months of age) and the upper outer triceps of the arm (for persons >24 months of age).

**Needle Gauge & Length** - SQ injections can be achieved using 5/8-inch, 23- to 25-gauge needle.

**Technique** - Follow standard medication administration guidelines for site assessment/selection and site preparation. However, care should be taken to avoid the routine use of alcohol swabs to prepare the injection site since it can reduce the affectivity of the vaccine.

To avoid reaching the muscle, pinch up the fatty tissue, insert the needle at a 45° angle and inject the vaccine into the tissue.

Withdraw the needle and apply light pressure to the injection site for several

seconds with a dry cotton ball or gauze.

### 1.4.2 Intramuscular injections (IM)

IM injections are administered into muscle tissue below the dermis and subcutaneous tissue.

**Site** - Although there are several IM injection sites on the body, the recommended IM sites for vaccine administration are the vastus lateralis muscle (anterolateral thigh) and the deltoid muscle (upper arm). The site depends on the age of the individual and the degree of muscle development.

**Needle Gauge** - needle size 22- to 25-gauge is recommended for intramuscular injection.

**Needle Length** - For all intramuscular injections; decision on needle size and site of injection must be made for each person on the basis of the size of the muscle, the thickness of adipose tissue at the injection site, the volume of the material to be administered, injection technique, and the depth below the muscle surface into which the material is to be injected.

For the majority of infants, a 1-inch, 22-25- gauge needle is sufficient to penetrate muscle in an infant's thigh. For newborn (first 28 days of life) and premature infants, a 5/8 inch needle usually is adequate if the skin is stretched flat between thumb and forefinger and the needle inserted at a 90-degree angle to the skin.

Older Children (24months through 10 years), the deltoid muscle can be used if the muscle mass is adequate. The needle size for deltoid site injections can range from 22 to 25 gauge and from 5/8 to 1 inch on the basis of the size of the muscle and the thickness of adipose tissue at the injection site. A 5/8-inch needle is adequate only for the deltoid muscle and only if the skin is stretched flat between thumb and forefinger and the needle inserted at a 90° angle to the

skin. For toddlers, the anterolateral thigh can be used, but the needle should be at least 1 inch in length.

Adolescents and Adults (11 Years or Older), the deltoid muscle is recommended for routine intramuscular vaccinations. The anterolateral thigh also can be used. For men and women weighing less than 130 lbs (60kg) a 5/8-1-inch needle is sufficient to ensure intramuscular injection. For women weighing 130-200lbs (60-90 kg) and men 130-260 lbs (60-118kg), a 1-1½-inch needle is needed. For women weighing more than 200 lbs (90 kg) or men weighing more than 260 lbs (118 kg), a 1½-inch needle is required.

**Technique** - Follow standard medication administration guidelines for site assessment, selection and site preparation. However, care should be taken to avoid the routine use of alcohol swabs to prepare the injection site as it can reduce the affectivity of the vaccine.

To avoid injection into subcutaneous tissue, spread the skin of the selected vaccine administration site taut between the thumb and forefinger, isolating the muscle. Another technique, acceptable mostly for pediatric and geriatric patients, is to grasp the tissue and "bunch up" the muscle.

Insert the needle fully into the muscle at a 90° angle and inject the vaccine into the tissue.

Withdraw the needle and apply light pressure to the injection site for several seconds with a dry cotton ball or gauze.

Aspiration is the process of pulling back on the plunger of the syringe and should be performed prior to injection to ensure that the medication is not injected into a blood vessel. Although this practice is advocated by some experts, the procedure is not required because no large blood vessels exist at the recommended injection sites.

# 2 Childhood Immunization and National Immunization Program Recommended by DHA

Routine immunizations are started in infancy; however, if a child is not immunized in infancy, immunizations should be started as early as possible. When this happens, a catch-up schedule may be followed, depending on the child's age and the prevalence of specific diseases at the time.

Childhood recommended vaccines include BCG, diphtheria, tetanus toxoid, pertussis (DTaP), poliovirus vaccine (IPV/OPV), measles, mumps, rubella (MMR), haemophilus influenza type b (Hib) vaccine, hepatitis B vaccine (HBV), varicella, and pneumococcal vaccines. Please refer to national immunization vaccine schedule (Table 2).

## National Immunization Program

Age Vaccine	Birth	2 Mos	4Mos	6 Mos	12 Mos	18 Mos	5 - 6 Years
BCG	BCG						
Diphtheria, Pertusis, Tetanus		Dtap	Dtap	Dtap		Dtap	DPT
Haemophilus Influenza Type b		Hib	Hib	Hib		Hib	
Hep. B	HBV	HBV	HBV	HBV			
Polio		IPV	OPV	OPV		OPV	OPV
Pneumococcal		PCV	PCV	PCV		PCV	
Measles,Mumps,Rubella					MMR		MMR
Varicella					Varicella		Varicella



 Combined Dose     Single Dose

Table 2: National immunization program.



An interrupted primary series of immunizations does not need to be restarted; rather, the original series should be resumed regardless of the length of time that had lapsed.

## 2.1 DHA vaccine schedules

### 2.1.1 DHA immunization schedule for children between 0-6 years

- At birth: BCG, Hep B.
- Two months: DTaP, Hib, Hep B, IPV, PCV.
- Four months: DPT, Hib, Hep B, OPV, PCV.
- Six months: DPT, Hib, Hep B, OPV, PCV.
- 12 months: MMR, varicella.
- 18 months: DTaP, Hib, OPV, PCV.
- Five to six years: DPT, OPV, MMR, varicella.

### 2.1.2 DHA immunization schedule for persons aged 7--18 years

- Td/ Tdap at age 11--12 years for those who have completed the recommended childhood DTP/DTaP vaccination series.
- Meningococcal conjugate vaccine (MCV4) at age 11--12 years and at age 13--18 years if not previously vaccinated. Meningococcal polysaccharide vaccine (MPSV4) is an acceptable alternative.
- Hepatitis B 3-dose series to those who were not previously vaccinated.
- Varicella 2 doses series if not previously immunized.

- MMR 2 doses at least 4 weeks apart if not previously immunized.
- Human papilloma virus vaccine is recommended for girls 11-16 years of age.

## 2.2 DHA Catch up immunization schedule

### 2.2.1 Catch up vaccination schedule for children 4months through 6 years who are more than one month behind or who start late (Table 3)

#### Hepatitis B:

3-dose series of Hep B vaccine should be administered. The interval between 1 and 2nd dose should be at least 4 weeks, between 2nd and 3rd dose should be at least 8 weeks, and at least 16 weeks between 1st and 3rd dose. Minimum age for 3rd dose of Hep B vaccine is 24 months.

#### DTP/DTap:

Child should receive 5 doses by the age of 6 years. The minimum interval between 1st and second dose and between 3rd and 4th dose is 4 weeks.

The minimum interval between 3rd and 4th dose and between 4th and 5th dose is 6 months. However, the fifth dose is not necessary if the 4th dose was administered after age of 4 years.

#### Haemophilus Influenzae type b:

Children 12-59 months of age, who received 2 or 3 doses of Hib vaccine before 12 months of age, or one dose between 12 and 14 months of age, will need a final Hib vaccine dose with a

minimum interval of 8 weeks from the previous dose.

Unvaccinated children 12-15 months of age should receive 2 doses of Hib vaccine 8 weeks apart.

Unvaccinated children 15 to 59 months should receive one dose of Hib vaccine.

### **Pneumococcal vaccine:**

Children 12-59 months of age, who received 2 or 3 doses of pneumococcal vaccine before 12 months of age, or one dose between 12 and 23 months of age, will need a final pneumococcal vaccine dose with a minimum interval of 8 weeks from the previous dose.

Unvaccinated children 12-15 months of age should receive 2 doses of Pneumococcal vaccine 8 weeks apart.

Unvaccinated healthy children 15 to 59 months should receive one dose of Pneumococcal vaccine.

Children 12-59 months of age, who received 2 or 3 doses of pneumococcal vaccine before 12 months of age, or one dose between 12 and 23 months of age, will need a final Pneumococcal vaccine dose with a minimum interval of 8 weeks from the previous dose.

A 4th dose of Pneumococcal vaccine is necessary for all high risk children 12 months through 59 months who received 3 doses at any age.

Pneumococcal polysaccharide vaccine (PPSV) should be administered to children aged 2 years or older with certain underlying medical conditions, including a cochlear implant, at least 8 weeks after the last dose of PCV.

### **Polio vaccine**

DHA recommends total of five doses.

Catch up schedule and intervals between polio vaccine doses are shown in table (3).

For children who received an all-IPV or all-oral poliovirus (OPV) series, a fourth dose is not necessary if third dose was administered at age  $\geq 4$  years. If both OPV and IPV were administered as part of a series, a total of 4 doses should be given, regardless of the child's current age.

### **Rotavirus vaccine**

Vaccination should not be initiated for infants aged 15 weeks 0 days or older. The maximum age for the final dose in the series is 8 months 0 days.

### **MMR**

A total of two doses are recommended for all children; a second dose of MMR vaccine is administered routinely at age 4 through 6 years.

The minimum interval between the 2 doses of MMR is 4 weeks.

### **Varicella vaccine**

A total of two doses are recommended for all children; a second dose of varicella vaccine is administered routinely at age 4 through 6 years.

The minimum interval between the 2 doses of varicella is 3 months. However, if the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.

Vaccine	Minimum age for dose 1	Minimum interval between doses			
		Dose 1 to dose 2	Dose 2 to dose 3	Dose 3 to dose 4	Dose 4 to dose 5
Hep B	Birth	4 weeks	4 weeks at least 16 weeks after 1st dose		
Rotavirus	6 weeks	4 weeks	4 weeks		
Dtap	6 weeks	4 weeks	4 weeks	6 months	6 months
Haemophilus influenzae type b		4 weeks if first dose administered at younger than age 12 months  8 weeks (as final dose) if first dose administered at age 12–14 months  No further doses needed if first dose administered at age 15 months or older	4 weeks 4 if current age is younger than 12 months  8 weeks (as final dose) if current age is 12 months or older and first dose administered at younger than age 12 months and second dose administered at younger than 15 months  No further doses needed if previous dose administered at age 15 months or older	8 weeks (as final dose); this dose only necessary for children aged 12 months through 59 months who received 3 doses before age 12 months	
Pneumococcal		4 weeks if first dose administered at younger than age 12 months  8 weeks (as final dose for healthy children) if first dose administered at age 12 months or older or current age 24 through 59 months  No further doses needed for healthy children if first dose administered at age 24 months or older	4 weeks if current age is younger than 12 months  8 weeks (as final dose for healthy children) if current age is 12 months or older  No further doses needed for healthy children if previous dose administered at age 24 months or older	8 weeks (as final dose); this dose only necessary for children aged 12 months through 59 months who received 3 doses before age 12 months or for children at high risk who received 3 doses at any age	
Polio	6 weeks	4 weeks	4 weeks	6 months	6 months
MMR	12 months	4 weeks			
Varicella	12 months	3 months			

**Table 3 :** Catch up immunization schedule for persons aged 4 months through 6 years who are more than one month behind or who start late.

## 2.2.2 Catch-up immunization schedule for persons aged 7 through 18 years who start late or who are more than 1 month behind (Table 4)

### Td and Tdap

Children 7 through 18 years who never received DTP/DTap/DT/dT vaccine

should receive total of 4 doses of Td. The minimum interval between 1st and 2nd dose and between the 2nd and 3rd dose is 4 weeks.

Children 7-18 years whose immunization is incomplete doses of DTaP/Td should be counted as part of the Td/DTap series. If the first dose of DTaP/DT vaccine was given before 12 months of age a 4th and final dose of the vaccine is indicated 6

months after the previous dose. If the child's first dose of Dtap/DT/dT vaccine was given after 12 months of age then a 3rd and final dose is indicated 6 months after the previous dose.

Tdap can be substituted for a single dose of Td in the catch-up series for children aged 7 through 10 years or as a booster for children aged 11 through 18 years; Td should be used for other doses.

### Polio vaccine

Polio vaccine catch up schedule for children 7 through 18 years of age is

similar to those younger than 7 years. Oral polio vaccine is not recommended to be administrated after 15 years of age.

### Varicella vaccine

Varicella vaccine is given as 2 doses 3 months apart for children <13 years of age and 4 weeks apart for children older than 13 years of age.

### MMR vaccine

MMR vaccine is administered as 2 dose series at least 4 weeks apart.

Vaccine	Minimum age for dose 1	Minimum interval between doses		
		Dose 1 to dose	Dose 2 to dose 3	Dose 3 to dose 4
Hep B	Birth	4 weeks	4 weeks at least 16 weeks after 1st dose	
DT/Tdap	7years	4 weeks	4 weeks if first dose administered at younger than age 12 months 6 months if first dose administered at 12 months or older	6 months
Polio	6 weeks	4 weeks	4weeks	6 months as final dose if this dose administered at age 4 years or older
MMR	12 months	4 weeks		
Varicella	12 months	3 months if child is <13 yrs 4 weeks if child is >13 yrs		
HPV	9 years	Routine dosing intervals are recommended		

**Table 4 :** Catch up immunization schedule for persons aged 7 through 18 years who are more than one month behind or who start late.

## 2.3 Multiple Vaccinations

### 2.3.1 Simultaneous administration of vaccines

Simultaneous administration refers to administering 2 vaccines on the same day. Several vaccines can be given together as long as there are no contraindications for individual agents. There are no contra-indications to simultaneous administration live attenuated vaccines with inactivated or toxoid vaccines. It is safe, efficient and desirable to provide different vaccines at the same visit. This can go a long way to improve patient compliance and maximize the benefit on the population.

When administering multiple vaccines, vaccines should never be mixed in the same syringe unless approved for mixing by manufacturer.

Separate sites should be used for different vaccines. If more than one vaccine must

be administered in the same limb, the injection sites should be separated by 1-2 inches so that any local reactions can be differentiated.

The location of each injection should be documented in the patient's health record.

### 2.3.2 Interval between vaccines not administered simultaneously

There is no minimum interval between administration of inactivated or toxoid vaccines.

There is no minimum interval to separated administration of inactivated and live vaccines.

Two or more live vaccines should either be given concurrently or separated by a minimum of 4 weeks interval.

**Table 5** summarizes minimum intervals between different vaccines.

Vaccines	Minimum Interval
Two live vaccines	4 weeks
Live vaccines and inactivated vaccines	None
Two inactivated vaccines	None
Between cholera and yellow fever vaccines	3 weeks
Between MMR/varicella and yellow fever vaccines	4 weeks

*Table 5: Minimum interval between vaccines not given simultaneously.*

### 2.3.3 Active and passive immunization

In several circumstances, active and passive immunizations are given together to provide both the short term immediate protection and the longer lasting antibody responses elicited by active immunizations. For example, the administration of hepatitis B vaccine and hepatitis B immune globulin to a neonate born to a hepatitis B positive mother. If a vaccine and an immune

globulin preparation are administered simultaneously, a separate anatomic site should be used for each injection.

If the vaccine and the immunoglobulin preparation are not administered simultaneously, the vaccine and the immune globulin should be separated by a minimum interval, [Table 6](#) summarizes the minimum interval between different vaccines and antibodies when are not administered simultaneously.

Product given first	Interval
Between live vaccine to antibody (immunoglobulin)	2 weeks before an antibody can be given
Between an immunoglobulin to live vaccine	3 months before a vaccine can be given
Between an immunoglobulin to inactivated vaccine	6 weeks
Between an immunoglobulin to measles/MMR vaccine:	Variable, based on specific immunoglobulin
- Hep B immunoglobulin HBIG	
- Measles Immunoglobulin	
- Tetanus immunoglobulin (TIG)	
- Hep A immunoglobulin	
- Rabies Immunoglobulin (RHIG)	
- Varicella Immunoglobulin (VZIG)	

*Table 6: Interval between vaccines (live and inactivated) and immunoglobulin preparations not administered simultaneously.*

# 3 Vaccine Management and Cold Chain

## 3.1 Vaccine Storage and the Cold Chain

It is an organized system composed of people, equipments and procedures aimed to maintain and monitor vaccines at an acceptable temperature from the manufacturer to the persons who are to be vaccinated so as to preserve safety, efficacy and potency of the vaccine.

Anyone handling vaccination is

responsible for their potency, at each step in transport, storage and administration of vaccines. Vaccines are delicate biological substances that can become less effective or destroyed if they are frozen, exposed to heat or direct sunlight or fluorescent light.

Generally, vaccines must be strictly maintained at a temperature between 2°C and 8°C. The Cold Chain reaches from the manufacturer to the recipient needs (**Figure 1**).

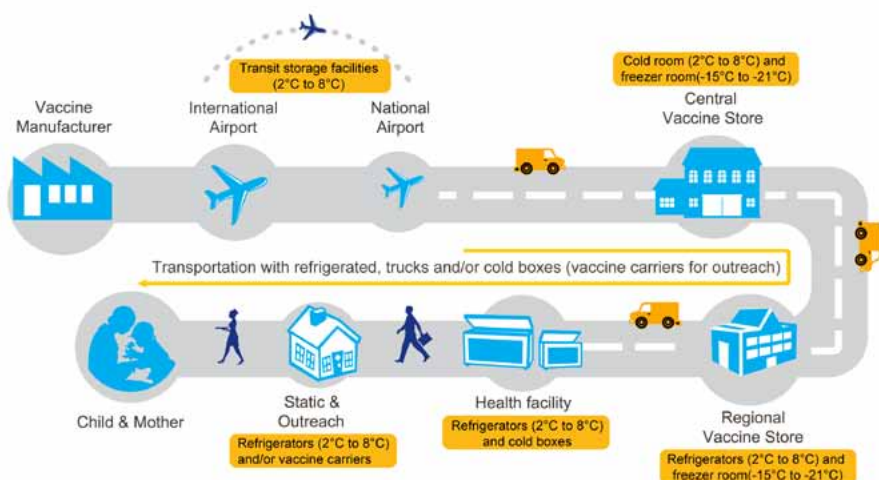


Figure 1: Cold Chain

## 3.2 Vaccine Storage Equipment

### 3.2.1 The Refrigerator

A refrigerator has two compartments: the main compartment and the freezer. The main compartment is where vaccines are stored. It should work at temperatures between 0°C and +8°C. The freezer is where ice is made; it works at temperatures below freezing point. To ensure that the refrigerator works well; it should be loaded and used correctly, and desired temperature should be maintained and monitored continuously.

#### Loading and using the refrigerator

- The vaccines should be kept on the top and middle shelves of the main compartment.
- The vaccines should be stacked carefully so that air can circulate between the boxes.

- In standard refrigerators, plastic bottles of water or spare ice packs should be kept on the lower shelf of the main compartment; this helps to maintain the refrigerator working at a constant temperature.
- The diluent water, used to reconstitute vaccines such as measles vaccine, should be kept in the main compartment with the vaccine.
- A special box in the main compartment should be used for keeping returned vaccines that has been taken to an immunization session in a vaccine carrier.
- Ice packs and ice cubes should be kept in the freezer.
- Absolutely, no food or drink should be kept in the vaccine refrigerator.
- Vaccines should never be stacked on the shelves of the refrigerator door because this area is not cold enough.
- Expired and partially used vaccines should never be kept in the refrigerator and should be discarded immediately.

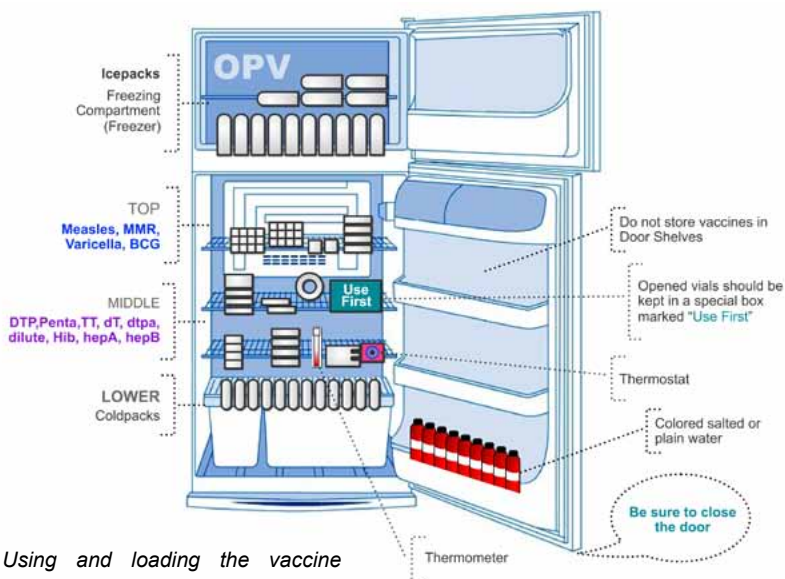


Figure 2 : Using and loading the vaccine refrigerator.



In case they have to be saved for replacement or documentation; they have to be marked clearly and kept somewhere else outside the refrigerator.

- The refrigerator door should be kept closed. Opening the refrigerator door should be limited to no more than two to three times a day and should be closed quickly. Thus, planning ahead of time is essential to avoid unnecessary prolonged or frequent opening of the refrigerator door (**Figure 3**).
- Vaccine refrigerator should be defrosted regularly. Newer refrigerators specific for vaccines usually are equipped with auto-defrost.



*Figure 3: Vaccine refrigerator door should be kept closed all the time and not to be used for any personal stuff.*

## Maintaining and monitoring the temperature of the main compartment

- The refrigerator is equipped with a thermostat to control the refrigerator

temperature. The thermostat is adjusted using a knob in the main compartment. The knob has numbers 1-6 or 1-7, and an arrow to show which number is currently in use. Higher numbers indicate colder temperature.

- A thermometer should be used to measure the refrigerator temperature continuously; this should be kept in the main compartment.
- The refrigerator temperature should be checked twice daily, once in the morning and once in the afternoon, and should be recorded. The temperature record should be kept on top of the refrigerator or on the outside of the refrigerator door.
- It is advisable to assign one person to be in charge for the vaccine refrigerator temperature checks and records. However, all staff who use the vaccine refrigerator should be aware of these checks and records, and recognize any temperature defaults and what actions to take.

## 3.2.2 Vaccine Carriers

Vaccine carriers are containers made of insulation material (**Figure 4**). They are used for carrying and storing small quantities of vaccines during transportation and immunization sessions. Ice packs are used in vaccine carriers to preserve temperature. Care should be taken to avoid direct contact of certain vaccines vials, including DTP/DTap, DT, Td, TT, Hib, HBV, and pneumococcal vaccines, with ice packs.



*Figure 4 : Vaccine carriers.*

## 3.2.3 Ice Packs

Ice packs are flat plastic bottles filled with water or gel (**Figure 5**). They are used for lining the walls of cold boxes and vaccine carriers to keep them cold, and in vaccine refrigerator to help to stabilize its temperature and to maintain a safe temperature level for longer period of time in case of electricity failure.

When filling ice packs with water, they should not be filled all the way to the brim; air space should be left to allow ice expansion. Salt should not be added to the water as it lowers the temperature to sub-zero temperature; which is not recommended for some vaccines that should not be exposed to freezing point including DTP, DTap, DT, Td, TT, Hib, and pneumococcal vaccine.

Ice packs should be loosely packed in deep freezer or freezer compartment in

upright or oblique position; they should not be stacked on top of each other to avoid cracking the freezer compartment.

Any damaged or leaking ice packs should not be used and should be replaced.



*Figure 5 : Different types of ice packs.*

### 3.2.4 Cold box

Cold boxes are used to collect and transport large quantities of vaccines for health centers and regional store. Cold boxes can be used to store vaccines for several days (maximum 144 hours or 6 days without opening the box) in case of electricity failure. Ice packs (24 packs) are usually required to maintain desired temperature in the ice box.

## 3.3 Vaccine Cold Chain Monitors

### 3.3.1 Cold Chain Monitor Card (CCM)

CCM was introduced to monitor international shipment of vaccines. WHO recommends one card per shipping box containing 3000 doses. The monitor card has two heat-sensitive indicators in the form of a strip with 4 windows. The first indicator is for the A, B, and C windows, and the second one is for the D window. They are separate because they are activated by different temperatures. The instructions for interpreting the readings are printed on the monitor card ([Figure 6](#)).

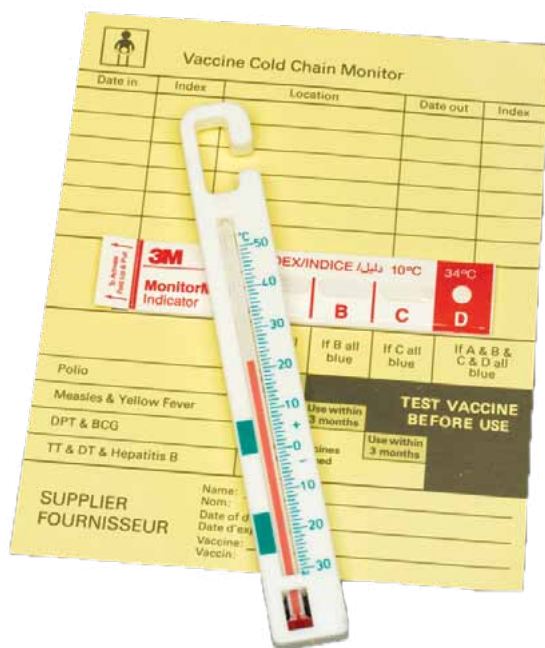


Figure 6 : Cold chain monitor card (CCM).

To activate the card a small tab on the left hand side of the strip should be pulled out. When the strip is exposed to temperature above 10°C; a blue color begins to appear in the first window, marked 'A'. If the temperature then drops below 10°C the blue color stops spreading to next window. Each time the strip is exposed to temperatures above 10°C the blue color will spread further across the windows from A to C. The color change is irreversible. When the card is exposed to temperature above 34°C; the window labeled D turns blue within one hour. Once the color has changed to blue it will never change back to white (Figure 7).

There is usually one monitor card packed with each shipment of 3,000 doses of vaccine. When the vaccine arrives at each level, central, regional, or sub-regional stores, the distributor should check the monitor card for any blue color on the strip. If there is no blue color, it means that this shipment of vaccine has never been exposed to temperatures above 10°C. The distributor should fill in the top part of the monitor card with the date of arrival of the shipment, the name, the location of the cold store, and mark the index column. In case there is no blue color showing in any of the windows, a dash filled in the index column. If window A is entirely blue, the letter "A" should be written in the index column. If window A & B are entirely blue, the letters "A & B" should be written and so on. If any window is partially blue it should be documented in the index column.

The monitor cards should always be kept in the cold room or refrigerator, along with the vaccines with which they are originally packed with. The card should be checked periodically for any color changes and appropriate actions must be taken when there is blue color showing in any of the cards. The distributor may have to send



Figure 7: Activation of the monitor card.

vaccines to several destinations at the same time. The ideal situation would be to have enough monitor cards for each destination. Before the distributor puts the monitor card with vaccine he has to write the date on which the vaccine leaves the store, and enter the index registered on the monitor.

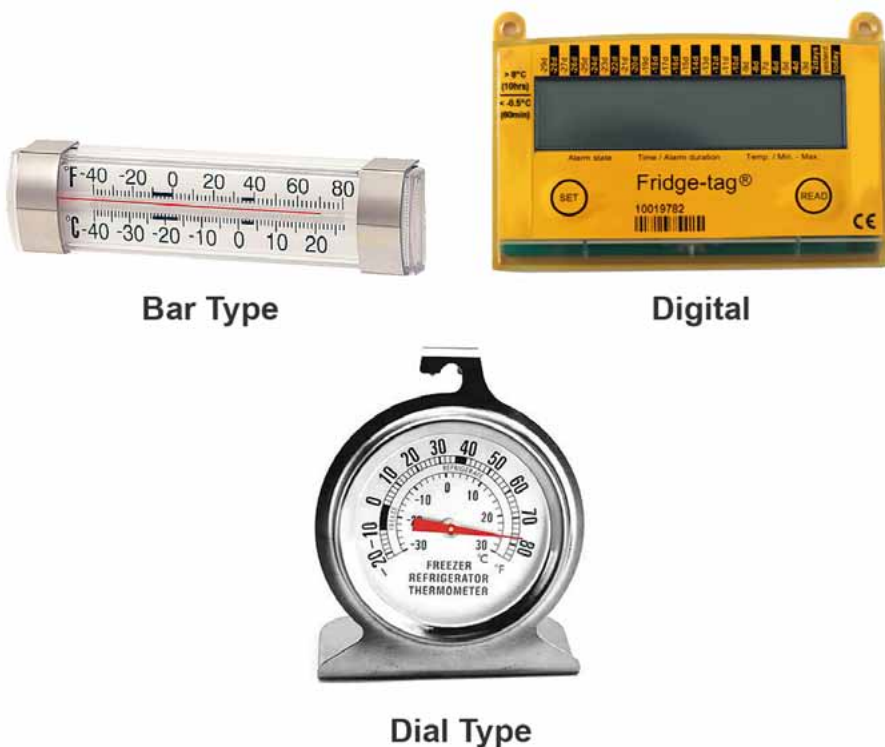
The healthcare professionals at regional, sub-regional and health center levels should follow the same steps when they pack their cold boxes and vaccine carriers.

In case of vaccines with VVM the CCM will not be applicable.

### 3.3.2 Cold chain refrigerator and freezer graph

The purpose of the graph is to monitor the refrigerator and freezer temperature and to identify any impending problem of cold chain failure. It is important that at least one

vaccine thermometer is available in each vaccine refrigerator to monitor temperature. There are several types of vaccine thermometers for this purpose (Figure 8).



*Figure 8: Types of vaccine thermometers.*

If the temperature rises steadily over a few days it may probably mean that the compressor is failing. Immediately the responsible staff should be informed to take appropriate action for repairs.

If the temperature chart shows wide variations between the beginning of the session and the end of the session, this

may indicate frequent opening of the refrigerator door. In this case actions should be taken to minimize door opening and perhaps to increase the temperature stability by increasing the number of cold packs in the refrigerator.

Sample of cold chain refrigerator graph is shown in (Figure 9).

**DHA**

**Refrigerator Temperature Chart**

Department:		Location:		Month Year:												Refrigerator No:																
Day:		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Time:	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A
	+15																															
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	+1																															
	0°C																															
	-1°C																															
	-2°C																															
	-3°C																															
	-4°C																															
	-5°C																															
	Staff Name & No.																															

**Instructions**

1. Check the fridge temperature at the same time everyday.
2. Record the fridge temperature on this daily quality control in the correct temperature box.
3. Draw line to join temperature results and from a graphical record.
4. If the temperature is below +2C or above +8C inform the engineering department.
5. Save this record in your unit for one year.

**M : Morning Session**  
**A : Afternoon Session**

Figure 9: Cold chain refrigerator graph.

In case of a cold chain failure due to power failure for short breaks (< 2 hours); the best solution is to keep the fridge door closed with the vaccines inside, meanwhile, time should be utilized for identifying the problem, solving it, and preparing the cold box.

If power failure continued beyond 2 hours; the vaccines and cold chain monitors should be transferred to a vaccine carrier or vaccine cold box.

After the problem has been solved and the temperature of the refrigerator has returned to the safe range 2°C to 8°C the vaccines and cold chain monitors should be replaced in the refrigerator.

### 3.3.3 Freezer indicators

Freezer indicator is irreversible temperature indicator, to show if a package of vaccines was exposed to freezing temperature. The color changes from white to blue if exposed to temperature below 0°C (blue) for more than 1 hour. This warns the recipient that the vaccine was probably frozen (Figure 10).

Vaccines such as DTP, T, DT, Td, Hib and HBV lose their potency if frozen or exposed to freezing temperature.

If it is suspected that these vaccines have been frozen the “**shake test**” should be performed as described below to confirm or rule out whether the vaccine being tested has been frozen or not (Figure 11).

The shake test is most easily demonstrated using a vaccine vial that you personally froze and do not intend to use for immunization. This vial can be used

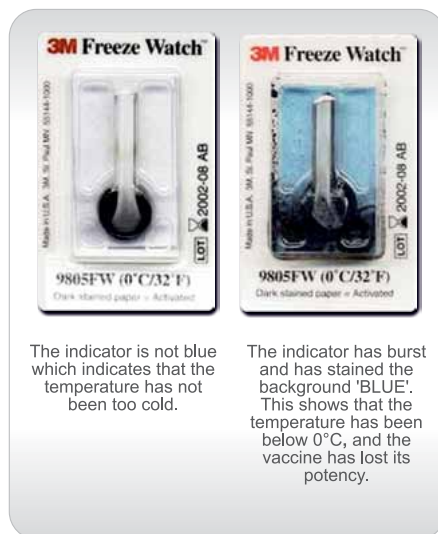


Figure 10: Freezer indicators.

as a “frozen control sample” and is to be compared with suspect vaccines from the same batch number. To perform the test; both vials should be shaken vigorously for 10-15 seconds, then left at rest, and observed to compare sedimentation rate. If the frozen control vial shows much faster sedimentation than in the vial being tested, the vaccine in question is probably potent and may be used. If, however, the sedimentation rate is similar and contains flakes, the vial under test should not be used. It is important that the shake test is done using both “tested” and “control” vaccine vials produced by the same manufacturer. Since the batches may behave differently, therefore the shake test should be repeated with all batches involved in the shipment.

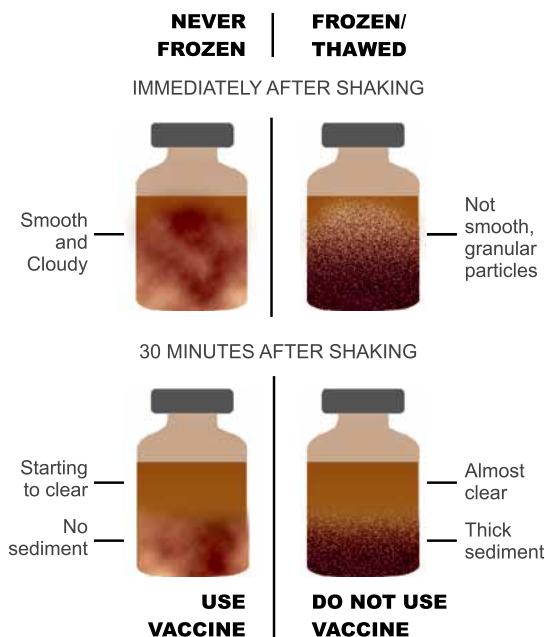


Figure 11: The shake test.

### 3.3.4 The vaccine vial monitor

The Vaccine Vial Monitor (VVM) is one of the most significant developments in the history of cold chain technology. It is applied directly to a vaccine vial by the vaccine manufacturer; it enables the health care professional to verify at the time of use whether each vaccine is in usable condition and has not lost its potency and/or efficacy due to exposure to heat. More and more vaccines are now being supplied with VVM.

Vaccine itself exhibits no visible change with heat exposure. Prior to the development of the vaccine vial monitor, there was no way for health care professional to recognize if a vaccine had been properly refrigerated. Now, with the vaccine vial monitor, the health care professional can easily identify if a vial had been exposed to too much heat and

thus avoid giving it to patients (Figure 12).

WHO, UNICEF and manufacturers of OPV decided in their meeting in Oct 94 that all vials of oral polio vaccine, which meet WHO standards, shall be fitted with vaccine vial monitors as of 1st January 1996.

The benefits of using vaccine vial monitors include the ability to keep opened vials of polio vaccine until fresh supplies arrives, decrease in vaccine wastage rates by 30%, the flexibility to take vaccine «beyond the cold chain» where it is necessary in reaching difficult locations, and giving the health care professionals confidence that they are administering vaccines unharmed by heat exposure.

Future vaccines will contain individual vaccine vial monitors.



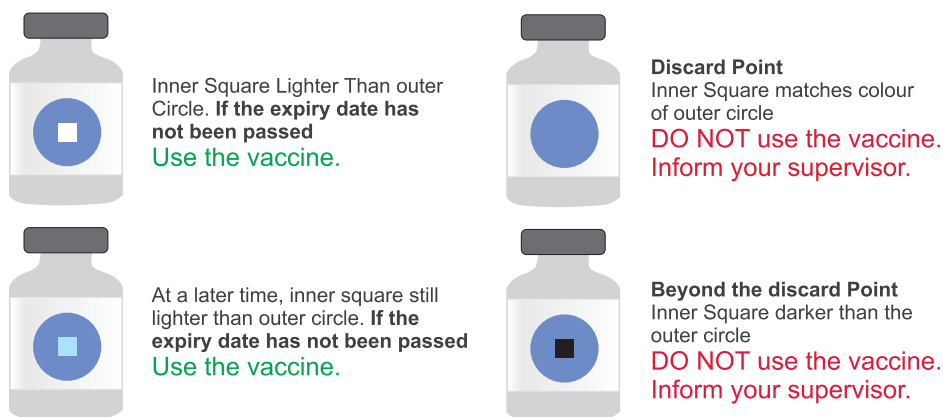


Figure 12: The vaccine vial monitor (VVM).

### 3.4 Key points for handling and storing vaccines

#### 3.4.1 Ordering vaccines

It is recommended to keep 2-3 weeks supply at a time. The quantity of required vaccines can be estimated based on usage and left over, seasonal variations, disease outbreaks, and storage capacity.

#### 3.4.2 Receiving vaccines

Upon receiving vaccines from the distributor, the health care provider should make sure that the packs are still cool, the contents of the shipment match the order form, and the monitor card does not reflect any heat exposure. Afterward the new stock of vaccines should be entered ledger book. And vaccines should be stored in the fridge immediately, with the new vaccines behind current stock to ensure rotation.

When storing vaccines, the following points should be considered:

Vaccines should be kept in their packaging as this provides insulation and protects against thermal insult.

- Monitors should be kept together with the vaccine they arrived with
- The door and drawers of fridges should be filled with bottles of water to maintain steady temperatures.
- Vaccine stock should not exceed 50% of a domestic fridge volume in order to allow for circulation of air in fridge.
- Vaccines should not be stored against the walls of the refrigerator, on the refrigerator door, close to the rear freeze plate or the refrigerator icebox.
- The refrigerator should be placed in a well-ventilated room, away from direct sunlight or heat source, and along an internal rather than external wall.

# 4 Immunization Information System

Vaccination Information System (VIS) generally require updating the registry forms and vaccination cards used for recording and reporting vaccine administration, forms for adverse events, forms for ordering vaccines and vaccine stock ledgers, and any other forms that are required by health regulation or public health and safety department.

The forms used should reflect the vaccine that is actually used according to the immunization schedule. In addition to the forms, the various sectors that use the information will also need to be updated to assure unified reporting system.

The VIS process includes aggregate immunization coverage data from the vaccination clinics (public and private) levels upwards, including reporting at national level.

Collaboration and communication with the different sectors providing vaccination services is needed to make sure of adequate VIS that required for monitoring and evaluation of immunization services.

## 4.1 General recommendations:

Vaccine Qualified Clinics (VQCs) should have a book or register where each child's immunization history can be registered and tracked back.

- Child immunization cards should be available at each VQC visit.
- The VQC should have a system to ensure that the children who are cared for in a specific clinic are fully immunized.
- The clinics must make regular reports to Dubai Health Regulation Department on the progress of the immunization activities.
- All private clinics must maintain an **immunization record register** as per the format recommended by Dubai Health Regulation Department (appendix. This register must be kept updated and would be inspected during routine visits by Dubai Health Regulation supervisor.
- Monthly vaccination and consumption of the **vaccines reports** should be completed each month and submitted to Health Regulation Department.

## 4.2 Basic recording tools:

The main recording tools that each health facility must use are:

- Immunizations register.
- Child immunization card.
- Tally sheets.
- Vaccination Adverse Events Reporting form.
- System for tracking defaulters.

### 4.2.1 Immunization Register

The immunization register helps health professionals keep track of the immunization services they offer to each child (Appendix 1). A register should include the following information, as well as any information required by your health facility:

- A unique identification number.
- Registration date (usually the date of the first visit).
- Name of the child.
- Child's birth date.
- Details of vaccinations provided.
- Next appointment.

Below are the steps that describe the use of the immunization registry:

- The children must be registered as soon as they arrive at the health facility and have all information completed as soon as vaccination is provided.
- It is not recommended to create a new entry in the register each time the child is brought for immunization.
- Look for a corresponding entry in the

register according to the immunization card. If not available, locate in the registry based on information obtained from the mother.

- For a new child not immunized before; create a new entry in the register and issue a new immunization card.
- For a child who has come to your health facility for the first time but has received immunizations in another health facility, create a new entry in the register, ask for the immunization card and mark on the register immunizations that the child has already received.
- A referral form should be completed and send to the health facility where the child followed.

### 4.2.2 Child Immunization Card

A child's immunization card is a document that reflects child's immunization status, which can be a separate document or part of a general child health record e.g. "Road to Health Card".

The child immunization card should include:

- The child's unique identification number.
- Name of child.
- Child's birth date.
- Child's sex.
- Name and address/contact information of parents.

Each child should have an immunization card. The immunization card should reflect the national immunization schedule with the child's immunization history and status marked correctly. The immunization card should be kept by the child's parents/guardian. The immunization card should be checked and updated at each immunization visit,

including documentation of the date of each immunization and the due date for the next immunization.

The immunization card serves as a reminder for parents to return to the clinic for the next immunization visit, helps the health professionals determine child's immunization status, and can be useful to conduct coverage surveys. In certain circumstances the immunization card is the only available documentation for the child's immunization records; this is usually the case if the patient moves from one health care facility to another or if the immunization registers are not well maintained.

### 4.2.3 Tally sheets

Tally sheets are forms on which health care professionals make a mark every time a dose of vaccine is administered. Tally sheets are useful for survey and reporting purposes.

A new tally sheet should be used for each vaccination session. At the end of each immunization session the tally sheet provides data on the total the number of doses of each vaccination given during the session. Information obtained will be used to monitor vaccination performance and prepare a monthly report (Appendix 2).

### 4.2.4 Vaccination Adverse Events reporting form

Adverse event following vaccination is a medical incident that occurs after administration of vaccine, causes concern, and is believed to be caused by the vaccination.

Common events are to be expected and health professionals should advise parents at each visit of the likely consequences of vaccination and how to deal with them.

Rare events which might be serious and should be reported include the following:

- All injection site abscesses.
- All deaths that are thought by health professionals, or the public, to be related to immunization.
- All cases requiring hospitalization that is thought by health professionals, or the public, to be related to immunization.
- Other severe or unusual medical incidents that are thought by health professionals, or the public, to be related to immunization.

These events usually occur within a month of immunization. However, some medical incidents can be related to immunization have a delayed onset. (Please refer to Chapter 5).

### 4.2.5 System for tracking defaulters

Each health facility (VQC) should devise an appropriate way for tracking children who do not show up for their immunizations on the appointed days. Monitoring and follow up of defaulters should be done regularly. Upon identifying defaulters, immediate contact with guardian/parent should be made to remind them about vaccination date. Different means of contact can be used such as phone calls or e-mails.

Here are some tracking systems that can easily be used for tracking defaulters:

#### Electronic tracking system

*Immunization register* - Immunization register can be used to identify defaulters. At the end of each month, the immunization register can be reviewed to identify children who may have failed to receive doses of vaccine when due.

Reminder cards - To make immunization

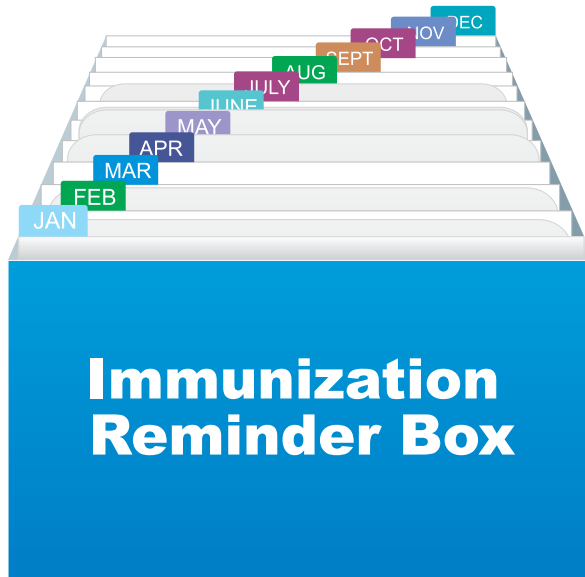


Figure 13: Immunization reminder card

“reminder” cards; a copy of the immunization card should be filed in a box for the month when the infant’s next vaccination is due.

### 4.3 Reporting Immunization services

The immunization data collected needs to be consolidated into a Summary Report, either manually or electronically, for transmission from the health facility to the higher authority levels. At each level the data should be analyzed and used to improve immunization services.

The format of the summary report should be defined at local/national level and should be standard for all health facilities. Health professionals should ensure that the reports prepared are complete, timely and accurate.

Summary Report should include:

- Reporting on vaccinations given.
- Reporting on vaccine-preventable diseases in your area.
- Reporting on any adverse reactions following immunization.
- Reporting vaccine usage and wastage patterns.
- Any specific problems encountered during the reporting period (e.g. stock-outs, transportation problems, cold chain failure).

# 5

## Immunization Adverse Events

An adverse event following immunization (AEFI) is any adverse event that follows immunization and is believed to be caused by the immunization. Reported adverse events can either be true adverse events, i.e. really a result of the vaccine or immunization process, or coincidental events that are not due to the vaccine or immunization process but are temporally associated with immunization.

Every immunization program should endeavor to make vaccination risk-free. Furthermore, those in charge should address any cause for concern that arises in the population about the safety of immunization, for example the effects observed during clinical trials prior to the issuing of licenses or during the experimental stages of a vaccine's development.

The failure to deal rapidly and effectively with allegations of vaccine-related adverse events can undermine confidence in a vaccine and ultimately reduce immunization coverage and increase disease incidence.

The existence of many events that are supposedly related to a given vaccine indicate that there may be a problem with its application (program operation errors), such as contamination, improper injection, problems in the

cold chain, dosage errors, or dilution or administration of vaccines as though they were drugs. It is imperative that each vaccination provider be aware of these potential problems and recognizes them when they occur, so that they are corrected immediately. Nevertheless, vaccine-associated adverse events may affect healthy people and should be promptly identified to allow for additional research and appropriate action.

In order to respond promptly, efficiently, and with scientific rigors to vaccine safety issues, WHO has established a Global Advisory Committee on Vaccine Safety. DHA has established a reporting system and all vaccine related adverse events will be reported (Appendix 3).

AEFIs are classified into five categories; vaccination reaction, program error, coincidental, injection reaction, and unknown when the cause of the AEFI remains unknown.

### 5.1 Vaccine reactions

Vaccine reactions are events caused or precipitated by the vaccine when given correctly caused by the inherent properties of the vaccine.

Vaccine reactions may be classified into common, minor reactions or rare, more serious reactions. Most vaccine reactions

are minor and settle on their own. More serious reactions are very rare and in general do not result in long-term problems.

### 5.1.1 Common, minor vaccine reactions

Common, minor vaccine reactions include local and systemic reactions. These reactions can result as part of the immune response, or reaction to some of the vaccine's components such as aluminum adjuvant, stabilizers or preservatives. These reactions occur within a day or two of immunization (except for measles/MMR – 6 to 12 days after immunization) and they only last one to a few days.

#### Local reactions

Local reactions include pain, swelling and/or redness at the injection site and can be expected in about 10% of vaccinees, except for those injected with DTP (whole cell), or tetanus boosters, where up to half can be affected. BCG causes a specific local reaction that starts as a papule (lump) two or more weeks after immunization that then becomes ulcerated and heals after several months, leaving a scar. Keloid

(thickened scar tissue) from the BCG lesion is more common among Asian and African populations.

#### Systemic reactions

Systemic reactions include fever and occur in about 10% or less of vaccinees, except for DTP where it is again about half. Other common systemic reactions (e.g., irritability, malaise, loss of appetite) can also occur after DTP. For measles/MMR and OPV the systemic reactions arise from vaccine virus infection. Measles' vaccine causes fever, rash and/or conjunctivitis, and affects 5-15% of vaccinees. It is very mild compared to 'wild' measles, but for severely immunocompromised individuals, it can be severe, even fatal. Vaccine reactions for mumps (swollen parotid gland) and rubella (joint pains and swollen lymph nodes) affect less than 1% of children. Rubella vaccine causes symptoms more often in adults, with 15% suffering from joint pains. Systemic reactions from OPV affect less than 1% of vaccinees with diarrhea, headache and/or muscle pain. [Table 7](#) summarizes the occurrence of common minor vaccine reactions and their treatments.

Vaccine	Local reaction: pain, swelling, redness	Fever > 38	Irritability, malaise, and systemic symptoms
BCG	90-95%	-	-
Hib	5-15%	2-10%	-
Hep B	Adults 15%, children 5%	1-6%	-
MMR/Measles	10%	5-15%	5% (rash)
OPV	-	<1%	<1%
TD/Td	10% (more frequent with booster doses)	10%	25%
DTP(whole cell)	Up to 50%	Up to 50%	Up to 50%
Treatment	Cold compressors at injection site, paracetamol	Give extra fluids, paracetamol, sponge bath	Give extra fluids, paracetamol

**Table 7:** Common, minor vaccine reactions and treatment.

## Rare and more serious vaccine reactions

Rare and more serious vaccine reactions include reactions such as seizures, thrombocytopenia, hypotonic hyporesponsive episodes, and persistent inconsolable screaming. Most of these reactions do not lead to long-term problems. Anaphylaxis, while potentially fatal, is treatable without leaving any long-term effects. Although

encephalopathy is included as a rare reaction to measles or DTP vaccine, it is not certain that these vaccines in fact cause encephalopathy (brain damage). Some serious events that have been reported following immunization are likely to be coincidental rather than true reactions. Table 8 summarizes the occurrence of some rare vaccine reactions and their treatments.

Vaccine	Reaction	Onset interval	Number of reactions per doses	Reaction per million doses
BCG	Suppurative lymphadenitis BCG osteitis	2-6 months 1-12 months	1 in 1-10 000 1 in 3 000 to 1 in 100 million	100-1000 0.01 -300
	Disseminated BCG infection	1-12 months	~1 in 1 million	0.19-1.56
Hib	None known			
Hep B	Anaphylaxis	0-1 hour		
MMR/Measles	Febrile seizure	6-12 days	1 in 3000	330
	Thrombocytopenia	15-35 days	1 in 30 000	30
	Anaphylactoid reaction	0-2 hours	~1 in 100 000	~10
	Anaphylaxis	0-1 hour	~1 in 1 000 000	~1
	Encephalopathy	6-12 days	<1 in 1 000 000	<1
OPV	Vaccine associated paralytic poliomyelitis (VAPP)	4-30 days	1 in 2.4-3 million	1 in 750,000 for 1st dose & 1 in 5.1 million for subsequent doses
Tetanus	Brachial neuritis	2-28 days	0.5-1 in 100 000	5-10
	Anaphylaxis	0-1 hour	1 in 100 000 to 1 in 2 500 000	0.4-10
TD/Td	Same as tetanus			
DTP(whole cell)	Persistent inconsolable screaming (>3hours)	0-24 hours	1 in 15 to 1 in 1000	(0.1-6%) 1000-60 000
	Seizures	0-2 days	1 in 1750 to 1 in 12 500	80-570@ 30 -990
	Hypotonic, hyporesponsive episode	0-24 hours	1 in 1000-33 000	
	Anaphylaxis	0-1 hour	1 in 50 000	20
	Encephalopathy (risk may be zero)	0-2 days	0-1 in 1 million	0-1

Table 8: Rare vaccine reactions, onset interval, and rates.



## Prevention and treatment of vaccine reactions

Vaccines are very rarely contraindicated. However, it is important to check for contraindications to avoid serious reactions. For example, vaccines are contraindicated if there is serious allergy to the vaccine or its components. Live vaccines should not be given to immune-deficient children.

Advice on managing the common reactions should be given to parents, as well as instructions to return if there are more serious symptoms. This will help to reassure parents about immunization and prepare them for these common reactions.

A feverish child can be cooled with a tepid sponge or bath, and by wearing cool clothing. Extra fluids need to be given to feverish children. For a local reaction, a cold cloth applied to the site may ease the pain.

### 5.1.2 Program error

Program errors result from errors and accidents in vaccine preparation, handling, or administration (Table 9). They are preventable and detract from the overall benefit of the immunization program. The identification and correction of these errors are of great importance.

A program error may lead to a cluster of events associated with immunization. These clusters are usually associated with a particular provider, or health facility, or even a single vial of vaccine that has been inappropriately prepared or contaminated. Program errors can also affect many vials (e.g. freezing vaccine during transport leading to an increase in local reactions).

The most common program error is infection as a result of non-sterile injection. The infection can manifest as a local reaction (e.g. suppuration, abscess) or systemic effect (e.g. sepsis or toxic shock syndrome), or blood borne viral infection (e.g. HIV, hepatitis B or C).

Symptoms arising from a program error may help to identify the likely cause. For example, children immunized with contaminated vaccine or injection equipment can also lead to a bacterial abscess. The bacterium is usually *Staphylococcus aureus*. The most frequent symptoms include local tenderness, tissue infiltration, vomiting, diarrhea, and high temperature. Bacteriological examination of the vial, if still available, can confirm the source of the infection.

For BCG vaccine, injection abscess can arise from improper injection of the vaccine; subcutaneous rather than intradermal injection.

Sterile abscesses are rare. They are caused by local reactions from aluminum containing vaccines, especially DTP. Inadequate shaking of the vaccine before use, superficial injection, and use of frozen vaccine, increase the risk for sterile abscess and local reactions.

Operational Program Error	Anticipated Event
<p>Non-sterile injection:</p> <ul style="list-style-type: none"> <li>Recycling of a syringe or disposable needle.</li> <li>Use of syringes that do not ensure adequate sterility.</li> <li>Contaminated vaccine or diluent.</li> <li>Utilization of lyophilized vaccines longer than indicated time of use.</li> </ul>	<ul style="list-style-type: none"> <li>Infection, as a localized abscess at the injection site, sepsis, toxic shock syndrome, or death.</li> <li>Blood-borne infection, such as hepatitis or HIV.</li> </ul>
<p>Reconstitution error:</p> <ul style="list-style-type: none"> <li>Reconstitution with the wrong dilutant.</li> <li>Replacement of the vaccine or dilutant with a drug.</li> </ul>	<ul style="list-style-type: none"> <li>Adverse effect of a drug—for example, insulin.</li> <li>Ineffective vaccine.</li> </ul>
<p>Injection in the wrong place:</p> <ul style="list-style-type: none"> <li>BCG administered subcutaneously.</li> <li>DTP/DT/TT administered too superficially.</li> <li>Injection in the buttock.</li> </ul>	<ul style="list-style-type: none"> <li>Reaction or local abscess.</li> <li>Reaction or local abscess.</li> <li>Injury to the sciatic nerve.</li> </ul>
Improper transport/storage of vaccines.	<ul style="list-style-type: none"> <li>Ineffective vaccine.</li> </ul>
Ignoring of contraindications.	<ul style="list-style-type: none"> <li>Serious foreseeable reactions.</li> </ul>

*Table 9: Operational Program Errors and their Consequences.*

### To avoid program errors:

- Vaccines must only be reconstituted with the diluents supplied by the manufacturer.
- Reconstituted vaccines must be discarded at the end of each immunization session and never retained.
- No other drugs or substances should be stored in the refrigerator of the immunization center.
- Immunization workers must be adequately trained and closely supervised to ensure that proper procedures are being followed.
- Careful epidemiological investigation of an AEFI is needed to pinpoint the cause and to correct immunization practices.

### 5.1.3 Coincidental

An event may occur coincidentally with immunization and at times may be falsely attributed to be a result of the vaccine. These coincidental events are inevitable given the large number of vaccine doses administered, especially in a mass campaign.

Vaccines are normally scheduled early in life, when infections and other illnesses are common, including manifestations of an underlying congenital or neurological condition. It is therefore possible for many events, including deaths, to be falsely attributed to vaccine through chance association.

### 5.1.4 Injection reaction

Injection reactions are not related to the vaccine, but to the injection. Individuals can react in anticipation to and as a result

of an injection of any kind. This reaction is unrelated to the content of the vaccine.

Fainting is relatively a common injection reaction among individuals who are needle-phobic. Fainting can be anticipated when immunizing older children, and can be reduced by minimizing stress in those awaiting injection, through short waiting times, comfortable room temperatures, preparation of vaccine out of recipient's view, and privacy during the procedure. Fainting does not require any management beyond placing the patient in a recumbent position. Avoiding injury from the fall is important, and those at risk should be immunized while seated. However, fainting can occur many minutes after immunization.

Hyperventilation can occur as a result of anxiety about the immunization; leading

to light-headedness, dizziness, tingling around the mouth and in the hands. Younger children tend to react differently to anxiety. They can react with screaming, vomiting, or breath-holding which can cause unconsciousness. In some cases children may develop convulsions as a result of anxiety; however they do not need to be investigated but should be reassured.

In a group situation, mass hysteria is possible, especially if a vaccinee is seen to faint or have some other reaction. Clear explanations about the immunization and calm, confident delivery will decrease the level of anxiety about the injections, and thus reduce the likelihood of such reaction.

# 6 Specific Vaccines

## 6.1 BCG vaccine

Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (Mtb) is a common disease, which throughout history has been a leading cause of human disease and death. Cases of TB are rising in parallel with the HIV/AIDS pandemic. The disease primarily affects the lungs but any of the body systems can be involved. TB is particularly dangerous when it infects the nervous system (tuberculous meningitis) and when it is widely spread throughout the body (miliary TB).

### 6.1.1 BCG vaccine, storage, and administration

Bacille Calmette Guérin (BCG) contains a live attenuated (weakened) strain of *Mycobacterium bovis*. BCG vaccine has a documented protective effect against meningitis and disseminated TB in children. It is used in many countries with a high prevalence of TB to prevent childhood tuberculous meningitis and miliary disease. It does not prevent primary infection and does not prevent reactivation of latent pulmonary infection.

BCG Vaccine should be stored in dark between 2°C and 8°C.

BCG vaccines are given by the intradermal route in the deltoid region of the left upper arm.

### 6.1.2 Immunization schedule

BCG vaccine is currently recommended by the DHA to administer only at birth or first contact with health services. DHA has emphasized this policy, because of consistent evidence that BCG protects against serious childhood forms of tuberculosis.

Revaccination and booster doses of BCG are not routinely recommended by DHA.

### 6.1.3 BCG vaccine side effects

BCG is the only commonly used vaccine to induce a local ulcer. The local lesion begins as a papule, two or more weeks after vaccination; it generally proceeds to ulceration, and heals after several months leaving a round slightly depressed scar in most vaccinees.

Local injection site abscesses may occur, typically as a result of improper injection technique when the vaccine is given into the subcutaneous layer of the skin.

Regional lymphatic involvement, axillary or cervical lymphadenitis, will heal

spontaneously and it is best not to treat the lesion if it remains unattached to the skin. An adherent or fistulated lymph gland may be drained and an anti-tuberculosis drug may be instilled locally. Systemic treatment with anti-tuberculosis drugs is ineffective.

Rare complications, including lupus vulgaris, erythema nodosum, iritis, osteomyelitis and generalized BCGitis, traditionally has been seen in children with severe immune deficiencies, should be treated systemically with anti-tuberculosis regimens.

### 6.1.4 Contraindications for BCG vaccine

BCG vaccination should not be given to persons who are immunosuppressed (e.g., persons who are HIV infected) or who are likely to become immunocompromised (e.g., persons who are candidates for organ transplant).

BCG vaccination should not be given during pregnancy. Even though no harmful effects of BCG vaccination on the fetus have been observed, further studies are needed to prove its safety.

### 6.1.5 Precautions for BCG vaccine

BCG is contraindicated in immunosuppressed individuals.

## 6.2 Hepatitis B vaccine

Hepatitis B is one form of viral inflammation of the liver with a variable course. The infection is spread by direct contact with blood and body fluids. Chronic infection develops especially in infants and young children and can result in hepatic cirrhosis or hepatocellular carcinoma.

### 6.2.1 Hepatitis B vaccine (Hep B), storage, and administration

Hepatitis B vaccines products are available in the UAE as single-antigen formulations, and as a component of combination vaccines such as DTaP-Hep B, DTaP-Hep B-Hib-IPV, and Hep A-Hep B.

Hepatitis B vaccine should be stored at 2-8°C. It should not be frozen or exposed to freezing temperatures.

Hepatitis B vaccine should be injected as 0.5 ml intramuscular into the deltoid muscle of children or into the anterolateral thigh of infants to maximize immunogenicity.

### 6.2.2 Hep B immunization schedule

- DHA recommends that all children receive their first dose of Hepatitis B vaccine at birth and complete the vaccine series by age 6–18 months.
- Older children and adolescents who did not previously receive the Hepatitis B vaccine should also be vaccinated.
- The vaccination schedule most often used for adults and children consists of three intramuscular injections. The minimum interval between the first and second doses is 4 weeks. The third dose of vaccine must be administered at least 8 weeks after the second dose and 16 weeks after the first. In infants, administration of the final dose is not recommended before age 24 weeks (164 days).
- A 4-dose schedule may be administered if a birth dose is given and a combination vaccine is used to complete the series.
- Only single-antigen hepatitis B vaccine can be used for the birth dose.

- When the hepatitis B vaccine schedule is interrupted, the vaccine series does not need to be restarted.
- Booster doses are not recommended for persons with normal immune status who were vaccinated as infants, children, or adolescents.
- Pregnancy is not a contraindication to Hep B vaccination. Pregnant women who are identified as being at risk for HBV infection during pregnancy should be vaccinated.

### 6.2.3 Hep B vaccine side effects

- Minor reactions including pain and redness at the injection site and developing temperature of 37.6°C or higher.
- Severe problems such as severe allergic reaction are extremely rare.

### 6.2.4 Hep B vaccine contraindications

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.

### 6.2.5 Precautions

- Moderate or severe illness at the time of scheduled vaccine.
- Infant weighing less than 2000 grams.

## 6.3 Diphtheria vaccine

Diphtheria is caused by toxigenic strains of *Corynebacterium diphtheriae*. Usually the infection presents as membranous nasopharyngitis or obstructive laryngotracheitis. Other serious complications of diphtheria include myocarditis and peripheral neuropathies.

### 6.3.1 Diphtheria vaccine, storage, and administration

There are four combination vaccines used to prevent diphtheria, tetanus and pertussis: DTaP/DTP, Tdap, DT, and Td. Two of these (DTaP/DTP and DT) are given to children younger than 7 years of age, and two (Tdap and Td) are given to older children and adults.

Upper-case letters in these abbreviations denote full-strength doses of diphtheria (D) and tetanus (T) toxoids and pertussis (P) vaccine. Lower-case “d” and “p” denote reduced doses of diphtheria and pertussis used in the adolescent/adult-formulations. The “a” in DTaP and

Tdap stands for “acellular,” meaning that the pertussis component contains only a part of the pertussis organism.

All diphtheria containing vaccines should be stored at 2-8°C. They should not be frozen or exposed to freezing temperatures.

Diphtheria immunization is administered intramuscularly.

### 6.3.2 Diphtheria immunization schedule

- Routine immunization for children 2 months to 7 years of age consists of 5 doses of diphtheria and tetanus toxoid-containing vaccines. This is usually achieved by giving DTaP/DTP vaccine. DT can substitute DTaP/DTP when pertussis vaccine is contraindicated.
- Children over 7 years of age and adults, who have not been immunized during infancy, three doses of vaccine are required with an interval of 4-6 weeks between the first and second doses, and 6-12 months between the second and third doses. Tdap can be

used for the first dose with Td vaccine for the subsequent doses.

### 6.3.3 Contraindications for DT/Td vaccines

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.
- See also section {6.4.3}.

### 6.3.4 Precautions for DT/Td vaccines

- Guillian-Barré syndrome (GBS) within 6 weeks after previous dose of tetanus toxoid-containing vaccine.
- History of arthus-type hypersensitivity reactions after a previous dose of tetanus toxoid-containing vaccine: defer vaccination until at least 10 years have elapsed since the last tetanus toxoid-containing vaccine.
- Moderate or severe acute illness with or without fever.

## 6.4 Pertussis vaccine

Pertussis is caused by *Bordetella pertussis*. Typically, pertussis is a disease of prolonged duration that is characterized by upper respiratory infection that progresses to paroxysms of cough. It can affect all age groups. Complications among infants include pneumonia, seizures, encephalopathy and death.

### 6.4.1 Pertussis vaccine, storage, and administration

Immunization is achieved by administration the acellular vaccine or whole cell vaccine in combination with diphtheria and tetanus toxoid (DTap,

DTP). Refer to diphtheria immunization section{6.3.1} for additional information on different types of vaccines.

All pertussis containing vaccines should be stored at 2-8°C. They should not be frozen or exposed to freezing temperatures.

The vaccine is given intramuscularly.

### 6.4.2 Pertussis immunization schedule

- A total of 5 doses of pertussis vaccine are recommended as a primary series before school entry, or 4 doses if the 4th dose was given after the 4th birthday
- A single booster dose of the Tdap vaccine is recommended for adolescents 11 to 18 years of age.
- Children ages 7–10 years who are not fully immunized against pertussis should receive a one-time dose of Tdap.

### 6.4.3 Contraindications for DTP,DTap or Tdap vaccines

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.
- Encephalopathy (e.g., coma, decreased level of consciousness, prolonged seizures) not attributable to another identifiable cause within 7 days of administration of previous dose of DTP,DTaP or Tdap.

### 6.4.4 Precautions for DTP/DTap vaccines

- Progressive neurologic disorder, including infantile spasms, uncontrolled epilepsy, progressive encephalopathy; defer DTaP until neurologic status clarified and stabilized.

- Temperature of 105° F or higher (40.5° C or higher) within 48 hours after vaccination with a previous dose of DTP/DTaP.
- Collapse or shock-like state (i.e., hypotonic hyporesponsive episode) within 48 hours after receiving a previous dose of DTP/DTaP.
- Seizure 3 days or more after receiving a previous dose of DTP/DTaP.
- Persistent, inconsolable crying lasting 3 or more hours within 48 hours after receiving a previous dose of DTP/DTaP.
- Guillian-Barré syndrome (GBS) within 6 weeks after a previous dose of tetanus toxoid-containing vaccine.
- Moderate or severe acute illness with or without fever.

#### 6.4.5 Precautions for Tdap vaccine

- GBS within 6 weeks after a previous dose of tetanus toxoid-containing vaccine.
- Progressive or unstable neurologic disorder, uncontrolled seizures, or progressive encephalopathy: defer vaccination until a treatment regimen has been established and the condition has stabilized.
- History of arthus-type hypersensitivity reactions after a previous dose of tetanus or diphtheria toxoid-containing vaccine: defer vaccination until at least 10 years have elapsed since the last tetanus toxoid-containing vaccine.
- Moderate or severe acute illness with or without fever.

## 6.5 Tetanus vaccine

Tetanus is an acute, often fatal, disease caused by an exotoxin produced by the bacterium *clostridium tetani*. It is characterized by generalized rigidity and convulsive spasms of skeletal muscles. The muscle stiffness usually involves the jaw (lockjaw) and neck and then becomes generalized. The vaccine is given intramuscularly.

### 6.5.1 Tetanus vaccine, storage, and administration

Tetanus toxoid is available as a single antigen preparation, combined with diphtheria toxoid (TD, Td), and combined with both diphtheria toxoid and pertussis (DTp,DTap,Tdap). Refer to diphtheria immunization section {6.3.1} for additional information on different types of vaccines. The use of single tetanus toxoid is not recommended.

There are combination vaccines that contain tetanus toxoid including DTaP-Hep B-Hib-IPV, and DTap-Hib-IPV combinations.

All tetanus containing vaccines should be stored at 2-8°C. They should not be frozen or exposed to freezing temperatures.

The vaccine is given intramuscularly.

### 6.5.2 Tetanus immunization schedule

- Primary immunization series consists of four doses at 2, 4, 6 and 15-18 months. The minimum interval between 1st and 2nd doses and between 3rd and 4th doses is 4 weeks. The 4th dose is administered after 12 months of age and at least 6 months after the 3rd dose.



- A booster dose is recommended at 4-6 years of age. However, a fifth dose is not needed if the 4th dose was given after the 4th birthday.
- Additional booster doses of tetanus and diphtheria toxoids are required every 10 years; the first Td booster (preferably Tdap for the first booster) can start at 11-12 years of age if 5 years have elapsed since the last dose of DTP, DTap, or DT.
- Td is the vaccine of choice for children 7 years and older and adults. The primary series is 3 to 4 doses depending on the individual's vaccination history; refer to catch up immunization schedule section {2.2.2} and table (4) for additional information.

### 6.5.3 Tetanus vaccine side effects

- Local reactions including erythema, induration and pain are common and usually self-limited.
- Fever and systemic symptoms are not common.
- Exaggerated local (Arthus-like) reaction is occasionally reported following receipt of diphtheria or tetanus containing vaccine. The reaction presents as extensive painful swelling from shoulder to elbow starting 2-8 hours after injection. This reaction is mainly reported in adults who had received frequent doses of diphtheria or tetanus toxoids.

### 6.5.4 Contraindications for tetanus vaccine

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.

- Moderate or severe acute illness with or without fever.
- Refer to section {6.4.3} for additional information on contraindications for DTP, DTap and Tdap vaccines.

### 6.5.5 Precautions for tetanus vaccine

- If generalized reaction is suspected to represent allergy, it may be useful to perform skin testing before discontinuing tetanus immunization.
- History of Arthus-type hypersensitivity reactions after a previous dose of tetanus or diphtheria toxoid-containing vaccine: defer vaccination until at least 10 years have elapsed since the last tetanus toxoid-containing vaccine.
- If contraindicated to use tetanus toxoid containing vaccine; TIG should be considered in case of injury other than clean minor wound.

## 6.6 Poliomyelitis vaccine

Polio is an infectious disease caused by a virus that lives in the throat and intestinal tract. Most of polio infections are unapparent or asymptomatic and less than 1% of all polio infections result in flaccid paralysis. The disease affects the anterior horn cells of the spinal cord leading to lower motor neuron paralysis. Until polio is eradicated in every country, it remains a threat to children in polio-free countries.

### 6.6.1 Poliomyelitis Vaccine, storage, and administration

There are two types of vaccine that protect against polio: inactivated polio vaccine (IPV) and oral polio vaccine (OPV). Both trivalent OPV and IPV vaccines are

highly effective in producing immunity to poliovirus and protection from paralytic poliomyelitis. However, IPV appears to produce less local gastrointestinal immunity than does OPV.

There are combination vaccines that contain inactivated polio vaccine including DTaP-Hep B-Hib-IPV, and DTaP-Hib-IPV.

IPV is relatively heat stable and may be shipped without refrigeration provided it is delivered within 4 days. It should be maintained at 2°–8°C. Freezing should be avoided.

OPV is unstable and must be stored and shipped frozen (-15°C), after thawing, it must be kept not longer than 30 days at a temperature <10° C.

IPV is given intramuscularly, OPV is given orally.

## 6.6.2 Poliomyelitis immunization schedule

- Until the UAE is declared as polio free region, and in order to reduce the occurrence of vaccine-associated paralytic polio; DHA recommend the use of sequential schedule of IPV followed by OPV.
- A total of five doses of Polio vaccine are recommended by DHA before school entry. The first dose is usually given at 2 months of age as IPV, but can be given as early as 6 weeks of age, followed by OPV at 4, 6 and 18 months of age. The final dose is given as OPV at age 4–6 years.
- Combination vaccines containing inactivated polio vaccine can be used to provide the first dose of Polio vaccination.

## 6.6.3 Polio vaccine side effects

- Minor local reactions (pain, redness) may occur following IPV.
- No serious adverse reactions to IPV have been documented.
- Vaccine-associated paralytic polio (VAPP) is a rare adverse reaction following live oral poliovirus vaccine. VAPP is more likely to occur in persons 18 years of age and older than in children, and is much more likely to occur in immunodeficient children than in those who are immunocompetent.

## 6.6.4 Contraindications for poliomyelitis vaccines

- Severe allergic reaction (anaphylaxis) to a vaccine component, or following a prior dose of vaccine.
- Contraindications to combination vaccines that contain IPV are the same as the contraindications to the individual components.
- OPV should not be given to persons who are immunosuppressed or to individuals with susceptiblesusceptible or immunocompromised caretakers and household contacts. Inactivated poliovirus vaccine (IPV), may be administered in such cases.
- Pregnancy.

## 6.6.5 Precautions for poliomyelitis vaccine

- Moderate or severe acute illness.
- Persons with allergies that are not anaphylactic, such as skin contact sensitivity, may be vaccinated.
- The majority of infants excrete poliovirus after receiving OPV.

Contacts of children vaccinated with OPV are exposed to the infection.

## 6.7 Haemophilus Influenza Type b vaccine

The *Haemophilus influenzae* type b (Hib) causes pneumonia, bacteremia, epiglottitis, meningitis, septic arthritis, cellulites, otitis media, and pericarditis. Hib meningitis can result in permanent sequelae ranging from mild hearing loss to mental retardation. Since the introduction of Hib conjugate vaccine; the incidence of invasive Hib disease had decreased dramatically among infants and children.

### 6.7.1 Hib Vaccine, storage, and administration

There are 3 single-antigen Hib conjugate vaccine products based on conjugates of the Hib capsular polysaccharides (polyribosyl-ribitol phosphate, PRP) with an immunogenic protein carrier. These include Hib oligosaccharide conjugate vaccine (HbOC vaccine) linked to a nontoxic variant of diphtheria toxin, PRP outer membrane protein conjugate vaccine (PRP-OMP vaccine) linked to outer membrane protein of meningococcal group B, and PRP tetanus toxoid conjugate vaccine (PRP-T vaccine) linked to tetanus toxoid carrier.

There are combination vaccines that contain Hib vaccine including DTap-Hib, DTap-Hep B-Hib-IPV, and DTap-Hib-IPV.

Hib containing vaccines should be stored at 2-8°C. They should not be frozen or exposed to freezing temperatures.

The Hib vaccine is given intramuscularly.

### 6.7.2 Immunization schedule

- Infants should receive three doses of Hib containing vaccine at 2, 4, and 6

months of age followed by a booster after 12 months of age, at least 2 months after the dose.

- Unvaccinated infants 7 through 11 months of age should receive two doses of Hib vaccine 2 months apart, followed by a booster after 12 months of age, at least 2 months after the dose.
- Unvaccinated infants 12 through 14 months of age should receive one dose of Hib vaccine followed by a booster at least 2 months later.
- Unvaccinated child 15 through 59 months should receive a single dose of the Hib vaccine.
- Unvaccinated healthy children over 59 months of age do not require Hib vaccination. However, unvaccinated children over 59 months of age, with high risk conditions such as immunodeficiency, immunosuppression, and asplenia, should be given at least one dose of Hib vaccine.

### 6.7.3 Hib vaccine side effects

- Local reactions such as swelling, redness, or pain following the administration of Hib vaccine are mild and self-limited.
- Systemic reactions such as fever and irritability are infrequent.

### 6.7.4 Contraindications for Hib vaccine

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.
- Moderate or severe acute illness with or without fever.
- Hib conjugate vaccines are

contraindicated in infants less than 6 weeks of age because of the potential for the development of immunologic tolerance.

### 6.7.5 Precautions for Hib vaccine

- Minor illnesses are not contraindication to Hib vaccination.
- Refer to other components of combined vaccine for additional information on precautions and contraindications.

## 6.8 Pneumococcal vaccine

*Streptococcus pneumoniae* (pneumococcus) remains a leading cause of serious illness, including bacteremia, meningitis, and pneumonia among children and adults worldwide. It is also a major cause of sinusitis and acute otitis media (AOM). The emergence of pneumococcal strains resistant to penicillin and other antibiotics complicates the treatment of pneumococcal disease and might reduce the effectiveness of recommended treatment regimens.

Conditions that increase the risk of invasive pneumococcal disease include decreased immune function from disease or drugs, functional or anatomic asplenia, chronic heart, pulmonary including asthma, liver, or renal disease, smoking cigarettes, and cerebrospinal fluid, or CSF leak.

### 6.8.1 Pneumococcal Vaccines, storage, and administration

There are two types of pneumococcal vaccines; pneumococcal conjugate and pneumococcal polysaccharide vaccine.

There are two licensed pneumococcal conjugate vaccines licensed for use in UAE; PCV-10 and PCV-13. PCV-10 (synflorix) is a 10-valent vaccine using protein D from *H. influenzae* as the protein carrier and containing the serotypes 4, 9V, 14, 19F, 23F, 18C, 6B, 1, 5, and 7F. PCV-13 (Prenar13) is a 13-valent vaccine contains polysaccharides of the capsular antigens of pneumococcal serotypes 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F, individually conjugated to a nontoxic diphtheria carrier protein.

The 23-valent pneumococcal polysaccharide vaccine (PPSV23) (Pneumovax23) contains 23 capsular polysaccharide antigens of pneumococcal serotypes: 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, and 33F.

Both types of vaccines are given intramuscularly.

### 6.8.2 Pneumococcal immunization schedule

- PCV13 is recommended as a 4 dose series at ages 2, 4, 6, and 12--15 months. The minimum interval between doses is 4 weeks; however the 4th dose after 12 months of age should be separated by at least 8 weeks from previous dose.
- **Unvaccinated children 7 months and older** do not require a full series of 4 doses. Unvaccinated children 7-11 months of age should receive 2 doses with an interval of at least 4 weeks between doses. The third dose should be administered at age 12-15 months at least 8 weeks after the second PCV13 dose. **Unvaccinated children 12-23 months** of age require 2 doses of PCV13 vaccine with an interval of at least 8 weeks between doses

- **Unvaccinated healthy children aged 24--59 months** should receive a single dose of PCV13.
- For children 24 through 71 months of age, who have underlying medical conditions, and were vaccinated using PCV7, should receive a single supplemental PCV13 dose at least 8 weeks after the most recent dose of PCV7 or PPSV23. This includes children who have received PPSV23 previously and constitute the final dose of PCV for these children.
- Children aged 24--71 months, with underlying medical conditions, who are unvaccinated or received < 3 doses of PCV7 before 24 months of age should receive 2 doses of PCV13 with an interval of at least 8 weeks between doses followed by one dose of PPSV23 administered at age  $\geq 2$  years and at least 8 weeks after the most recent dose of PCV13.
- Children aged 6--18 years who have not received PCV13 previously and are at increased risk for invasive pneumococcal disease, should receive a single dose of PCV13 may be administered for regardless of whether they have previously received PCV7 or PPSV23.
- Children who have received PPSV23 previously also should receive recommended PCV13 doses.
- When elective splenectomy, immunocompromising therapy, or cochlear implant placement is being planned, PCV13 and/or PPSV23 vaccination should be completed at least 2 weeks before surgery or initiation of therapy.
- A second dose of PPSV23 is recommended 5 years after the first

dose of PPSV23 for children who have anatomic or functional asplenia, including SCD, HIV infection, or other immunocompromising condition. No more than 2 PPSV23 doses are recommended

### 6.8.3 Pneumococcal vaccine side effects

- PCV-13 can cause mild reactions including injection-site reactions, fever, decreased appetite, irritability, and increased or decreased sleep.
- Rare reactions has been reported after PCV-13 including hypersensitivity reaction (face edema, dyspnea, and bronchospasm), seizures, and urticaria or urticaria-like rash.
- PPSV23 administration can lead to mild local reactions such as pain at the injection site, erythema, and swelling.

### 6.8.4 Contraindications for pneumococcal vaccine

- Vaccination with PCV13,PCV10, and PPSV23 is contraindicated in persons known to have a severe allergic reaction such as anaphylaxis to any component of the vaccine, including any sever reaction to any diphtheria toxoid-containing vaccine in case of using PCV13.
- Moderate or severe acute illness.

### 6.8.5 Precautions for Pneumococcal vaccine

- Minor acute illness (e.g. diarrhea or mild upper-respiratory tract infection with or without fever).

## 6.9 Measles vaccine

Measles is a highly contagious respiratory disease caused by a virus. Measles causes fever, runny nose, cough and

rash. Complication includes otitis media, pneumonia, post-infection encephalitis and death.

### 6.9.1 Measles Vaccine, storage, and administration

The vaccine is derived from attenuated live virus prepared in chicken embryo cell culture.

Measles vaccine is available as monovalent (measles only) formulation, and in combination formulations such as measles-mumps-rubella (MMR), and measles-mumps-rubella-varicella (MMRV) vaccines. The MMR or MMRV vaccines are the recommended products of choice in most circumstances.

The vaccine should be stored at 2-8°C and protected from sunlight. The MMR vaccine should not be frozen or exposed to freezing temperatures.

The MMR vaccine should be given by subcutaneous injection at 0.5ml.

### 6.9.2 Measles immunization schedule

- DHA recommends a 2-dose schedule of measles / measles - containing vaccine in childhood, with the first dose administered at age 12–15 months (not earlier) and the second dose at age 4–6 years.
- Delay in administering the first dose of measles vaccine is not recommended.
- The second dose of measles vaccine is usually recommended at school entry; however, it can be given at an earlier age in case of an outbreak, provided the interval between first and second dose is at least 4 weeks.
- Children who are not re-immunized at school entry should receive the second

dose at 11-12 years of age.

- If the child receives a measles vaccine before the age of 12 months, 2 additional doses are required after 12 months of age.

### 6.9.3 MMR vaccine side effects

- Mild reactions including fever, rash, and lymphadenopathy.
- Moderate reactions including febrile seizure, arthralgia, and thrombocytopenia.
- Severe reactions such as serious allergic reaction.
- Several other severe problems have been known to occur after a child gets MMR vaccine. But this happens so rarely, experts cannot be sure whether they are caused by the vaccine or not. These include deafness, long-term seizures, coma, or lowered consciousness and permanent brain damage.

### 6.9.4 Contraindications for MMR vaccine

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
- Pregnancy
- Known severe immunodeficiency (e.g., from hematologic and solid tumors, congenital immunodeficiency, long-term immunosuppressive therapy; or patients with HIV infection who are severely immunocompromised).

### 6.9.5 Precautions for MMR vaccine

- Moderate or severe acute illness with or without fever.

- Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on the product).
- History of thrombocytopenia or thrombocytopenic purpura.
- Need for tuberculin skin testing.

### 6.10 Mumps vaccine

Mumps is a systemic disease caused by a virus and is characterized by swelling of one or more of the salivary glands, usually the paratoid glands. Central nervous system involvement and orchitis are relatively common complications. Some other rare complications include thyroiditis, myocarditis, pancreatitis, and hearing impairment.

#### 6.10.1 Mumps Vaccine, storage, and administration

Mumps vaccine is live-attenuated vaccine.

Mumps vaccine can be administered either alone as a monovalent vaccine or, preferably, as the combined vaccine containing measles, mumps, and rubella (MMR) or measles, mumps, rubella, and varicella vaccines (MMRV).

The vaccine should be stored at 2-8°C and protected from sunlight. The MMR vaccine should not be frozen or exposed to freezing temperatures.

It is administered by subcutaneous injection of 0.5 ml.

#### 6.10.2 Mumps immunization schedule

- Mumps vaccine should be given as MMR routinely to children at 12 to 15 months of age with a second dose of MMR at 4 to 6 years of age.

- Susceptible children, adolescents, and adults born after 1957 should be offered Mumps immunization (usually MMR) since mumps is still endemic throughout most of the world.
- The routine use of mumps vaccine is not advised for persons born before 1957 unless they are considered susceptible.

### 6.11 Rubella vaccine

The virus that causes rubella usually produces a subclinical or a mild disease characterized by rash, mild fever and lymphadenopathy. Occasionally patients develop arthralgia, thrombocytopenia, and rarely encephalitis. The congenital rubella syndrome due to maternal infection is associated with ocular, cardiac, neurological and skeletal defects of the infected newborn.

#### 6.11.1 Rubella Vaccine, storage, and administration

- The rubella vaccine is a live attenuated vaccine.
- The vaccine can be given alone or, preferably, as a combined vaccine containing measles-mumps-rubella (MMR) or measles-mumps-rubella-varicella (MMRV).
- Rubella vaccine is administered as 0.5 ml subcutaneously after reconstitution.
- The vaccine should be stored at 2-8°C and protected from sunlight. The MMR vaccine should not be frozen or exposed to freezing temperatures.

#### 6.11.2 Immunization schedule

- DHA recommends a 2-dose schedule of Rubella-containing vaccine in childhood, with the first dose administered at age



12--15 months (not earlier) and the second dose at age 4--6 years

- The second dose of rubella vaccine is usually recommended at school entry; however, Children who are not reimmunized at school entry should receive the second dose by 11-12 years of age.
- All older children not previously immunized should receive at least one dose of rubella vaccine as MMR or MMRV if 12 years of age or younger.

## 6.12 Varicella vaccine

Chickenpox is an infectious disease caused by the varicella-zoster virus, which results in a blister-like rash, itching, tiredness, and fever. Adults, infants, adolescents, and immuno-compromised people are more likely to have more severe illness. Serious complications from chickenpox include bacterial infections viral pneumonia, and encephalitis. with serious complications

### 6.12.1 Varicella vaccine, storage, and administration

Varicella vaccine is a live attenuated preparation of the wild virus.

Varicella vaccine can be administered as single-antigen varicella vaccine or as a combined vaccine containing measles, mumps, rubella, and varicella (MMRV).

Only single-antigen varicella vaccine may be used for vaccination of persons over 13 years of age. MMRV is not licensed for use among persons aged >13 years.

Varicella containing vaccines available in UAE should be stored at 2-8°C and protected from sunlight. However, other brands of single varicella or combination

MMRV vaccines, the manufacturer instructions should be followed.

### 6.12.2 Varicella immunization schedule

- All healthy children should receive their first dose of varicella-containing vaccine routinely at age 12--15 months.
- A second dose of varicella vaccine is recommended routinely for all children aged 4-6 years without evidence of varicella immunity (before entering school). However, it may be administered at an earlier age provided that the interval between the first and second dose is >3 months.
- Persons aged >13 years without evidence of varicella immunity should receive two doses of single-antigen varicella vaccine administered subcutaneously, 4-8 weeks apart. MMRV is not licensed for use among persons aged >13 years.

### 6.12.3 Varicella vaccine side effects

- Minor reactions including soreness or swelling at the injection site, fever, and mild rash, up to a month after vaccination. It is possible for these people to infect other members of their household, but this is extremely rare.
- Seizure caused by fever (very rare).
- Serious adverse events are very rare including encephalitis, ataxia, pneumonia, arthritis, hepatitis, vasculitis, and thrombocytopenia.

### 6.12.4 Contraindications for Varicella vaccine

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.



- Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy; or patients with HIV infection who are severely immunocompromised).
- Pregnancy.

### 6.12.5 Precautions for Varicella vaccine

- Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product).
- Moderate or severe acute illness with or without fever.

## 6.13 Hepatitis A vaccine

Hepatitis A is caused by hepatitis A virus (HAV). Most of HAV infections in children are asymptomatic. However, symptomatic cases presents as an acute self-limited disease associated with fever, malaise, jaundice, anorexia and nausea. Chronic infection does not occur.

### 6.13.1 Hepatitis A vaccine (Hep A), storage, and administration

Hepatitis A vaccine is an inactivated vaccine and is highly immunogenic.

There are pediatric and adult formulations. Pediatric formulations are given to children 1-18 years of age and adult formulations are recommended to people 19 years of age and older.

A combination of Hep A and Hep B vaccine is licensed for use in people 18 years and older.

Hepatitis A vaccine should be stored at 2-8°C. It should not be frozen or exposed to freezing temperatures.

The vaccine is given intramuscularly.

### 6.13.2 Hep A immunization schedule

- The vaccine is given to people 12 months and older in a 2-dose schedule, 6-12 months apart.
- The combination Hep A/Hep B vaccination are given to people 18 year or older in a 3-dose schedule, with the second dose one month after the first dose, and the third dose 6 months after the initial dose.

### 6.13.3 Hep A vaccine side effects

- Minor reactions including soreness at the injection site, headache, loss of appetite, and tiredness usually last 1 or 2 days.
- Very rarely, serious allergic reaction occurs within a few minutes to a few hours of the shot.

### 6.13.4 Hep A vaccine contraindications

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.

### 6.13.5 Hep A vaccine precautions

- Moderate or severe illness at the time of scheduled vaccine.
- The safety of hepatitis A vaccination during pregnancy has not been determined.

## 6.14 Meningococcal vaccine

Neisseria Meningitidis is a gram negative, diplococcus responsible for causing acute bacterial meningitis and

septicemia. Meningococcal meningitis presents as fever, stiff neck and a change in mental status often with a purpuric rash. Mortality is 5-10%, despite adequate medical therapy. Up to 19% of all survivors suffer serious sequelae like deafness, neurologic deficits or limb loss.

Invasive meningococcal disease is acquired by aerosol or direct inhalation of respiratory secretions from a healthy or sick person. Humans are the only reservoir of this organism.

### 6.14.1 Meningococcal vaccine, storage and administration

Meningococcal disease occurs in the form of epidemics in sub-saharan Africa and in large gatherings as in Hajj or Umrah. N. Meningitidis has several sero-groups based on differences in the capsular proteins. They include sero-groups A, B, C, Y and W-135. 90% of all disease is caused by A, B and C. Most epidemics in the “meningitis belt” in Africa are caused by sero-group A, whereas B and C are more common elsewhere in the world. However, recent reports of W-135 meningococcal disease in Saudi Arabia and Y- group in the US are evidence of shifting trends.

There are two types of meningococcal vaccines available: Polysaccharide and Conjugate.

Meningococcal Polysaccharide vaccines, MPSV4 (Menomune) are purified, heat-stable, lyophilized capsular polysaccharides from meningococci of the respective sero-groups. They are either bivalent (A and C) or quadrivalent (A, C, Y and W-135). MPSV4 is approved for ages 2 years and above. In less than 2 years of age, group C polysaccharides fail to elicit protective immunity and cause tolerance to C antigens in future. The recommended single dose of

reconstituted vaccine contains 50 µgm of each polysaccharide group. It is given subcutaneously. It is the only vaccine approved for over 56 yrs.

### Meningococcal polysaccharides Vaccine:

- Mencevax is a Lyophilized preparation of purified polysaccharides from *Neisseria meningitidis* (meningococcus) of serogroup A, C, W135 and Y
- Each 0.5 ml dose of reconstituted vaccine contains 50 µg of each of the polysaccharide of serogroups A, C, W135 and Y. (reference PI)
- Mencevax<sup>TM</sup> ACWY is indicated for the active immunisation of children from 2 years of age, adolescents and adults against meningococcal disease caused by meningococci of serogroups A, C, W135 and Y.
- Mencevax<sup>TM</sup> ACWY Posology and method of administration: The recommended dose of the vaccine contained in 0.5 ml must be administered. In adults and children over 5 years of age immunity will persist for up to 3 years. Children who were aged under 5 years when first vaccinated should be considered for revaccination after 2-3 years if they remain at high risk. Mencevax<sup>TM</sup> ACWY is for subcutaneous use only.

Meningococcal oligosaccharide diphtheria Conjugate vaccines, CRM 197 (Menveo), are capsular polysaccharides conjugated to a diphtheria protein. Conjugate vaccines induce enhanced levels of anti-capsular IgG antibodies. It is licensed for active immunization for ages 2 years through 55 years of age. It is given as a single 0.5 ml intra-muscular injection that is reconstituted by mixing two vials.

Meningococcal Polysaccharide diphtheria toxoid conjugate vaccine (Menactra) is

conjugate vaccine and is approved for 9 months through 55 years of age. Dosage for children 9 months – 23 months of age is 0.5ml intra-muscularly for 2 doses three months apart. For children > 2 years, a single dose is given.

Conjugated diphtheria toxoid vaccine (Menactra) is approved for use in ages 9 months through 55 years and over 2 years; whereas the polysaccharide as well as the other conjugated vaccine (Menveo) can be used after 2 years of age.

### 6.14.2 Immunization schedule of meningococcal vaccine

- Meningococcal vaccines are recommended for all travelers to Saudi Arabia for Umrah or Hajj, children between 9 months and 23 months with certain high risk conditions including complement deficiencies, HIV or residence in a hyper-endemic area, children between 2 years to 10 years who have anatomic or functional asplenia, and all children 11 – 18 yrs.
- Children who receive primary vaccination at < 7 years of age will need a booster dose to be given in 3 years if they remain at risk.
- Children who received primary vaccination between 7 and 11 years will need a booster dose after 5 years of primary vaccination.
- Children who receive primary vaccination at 11 years and older will need a single one time booster at 16-18 years of age.

### 6.14.3 Side effects of Meningococcal vaccine

- Half of all vaccinees have mild local side effects including erythema or

swelling at the injection site that generally resolves in 1-2 days. More common with the conjugated vaccine than the MPSV4.

- Guillian Barre syndrome can rarely occur.

### 6.14.4 Contraindications of meningococcal vaccine

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.
- Severe illness or high fever.

### 6.14.5 Precautions with meningococcal vaccine

- Pregnancy (MCV4 is the only meningococcal vaccine with not enough data in pregnancy, so caution is advised). The rest can be given in pregnancy.

## 6.15 Influenza vaccine

Human Influenza can be caused by one of three Influenza viruses A, B or C. Only types A and B cause widespread illness. The clinical picture is characterized by the abrupt onset of constitutional and respiratory symptoms including fever, myalgia, headache, malaise, nonproductive cough, sore throat, and rhinitis. Among children, otitis media, nausea, and vomiting also are reported. Influenza can also cause primary influenza viral pneumonia, exacerbate underlying medical conditions (e.g., pulmonary or cardiac disease), and lead to secondary bacterial infections.

### 6.15.1 Influenza vaccine, storage and administration

There are two types of influenza vaccine:

trivalent inactivated whole virus vaccine (TIV), and live attenuated influenza vaccine (LAIV).

TIV can be used for people 6 months of age and older, including healthy people, those with chronic medical conditions, and pregnant women.

TIV is injected into the muscle of the upper arm or thigh.

LAIV can be used for healthy people 2-49 years of age. LAIV cannot be given during pregnancy.

LAIV is administered by nasal spray.

LAIV is currently not available in the UAE.

Influenza vaccine should be kept at temperature of 2-8 °C and protected from light. Influenza vaccine should never be frozen.

### 6.15.2 Influenza vaccine immunization schedule

- Annual influenza vaccine should be given to infants older than 6 months of age, all children, adolescents, and healthy adults. Priority should be given to targeted high- risk groups that include age > 65 years, diabetes, chronic pulmonary or cardiac conditions, presence of immunosuppression either by illness or iatrogenic, diseases requiring long-term aspirin therapy and chronic renal dysfunction including dialysis. It is also indicated after the first trimester of pregnancy and in travelers who are traveling to an area with a current outbreak. In addition, for the close, household contacts of people who are in the high risk group, vaccination is a good strategy. Influenza vaccine must be given annually.

- For inactivated vaccines, two doses administered at least 4 weeks apart

are required for unvaccinated infants and children until 8 years of age.

- For adults and children above 9 years of age, boosters are not indicated.

### 6.15.3 Influenza vaccine side effects

- Diffuse myalgias and low grade fever for 1-2 days can occur.
- About one person in a million people vaccinated can get Guillian- Barre syndrome.

### 6.15.4 Influenza vaccine contraindications

- As the inactivated vaccine is prepared in chicken eggs, any person with anaphylaxis to eggs, chicken protein or neomycin should not be offered this vaccine.
- History of Guillian-Barre syndrome following a prior influenza is an absolute contra-indication.
- Live attenuated vaccine has several contra-indications based on immune status of the patients. Please refer to section for live virus vaccines.

### 6.15.5 Influenza vaccine precautions

- Moderate to high febrile illness.

## 6.16 Rotavirus vaccine

Rotavirus is the most common cause of severe gastroenteritis in infants and young children worldwide. The clinical spectrum of rotavirus illness in children ranges from mild, watery diarrhea of limited duration to severe diarrhea with vomiting and fever than can result in dehydration with shock, electrolyte imbalance, and death.

### 6.16.1 Rotavirus vaccines, storage, and administration

There are two different rotavirus vaccine products that are licensed for use in infants in the UAE; RV5 and RV1. RV5 is pentavalent human-bovine reassortant rotavirus vaccine (RotaTeq). RV1 is a monovalent human rotavirus vaccine (Rotarix). Both products differ in composition and schedule of administration.

RV1 (rotarix) and RV5 (rotateq) vaccines require refrigerator storage temperatures between 2°C to 8°C.

### 6.16.2 Rotavirus immunization schedule

RV5 is to be administered orally in a 3-dose series, with doses administered at ages 2, 4, and 6 months. RV1 is to be administered orally in a 2-dose series, with doses administered at ages 2 and 4 months.

### 6.16.3 Rotavirus vaccine side effects

- Mild side effects include irritability, temporary diarrhea or vomiting after getting a dose of rotavirus vaccine.
- There is slight increased risk of intussusception following rotavirus vaccination, particularly shortly after the first dose.

### 6.16.4 Contraindications for rotavirus vaccine

- Rotavirus vaccine should not be administered to infants who have a history of a severe allergic reaction (e.g., anaphylaxis) after a previous dose of rotavirus vaccine or to a vaccine component.

- Latex rubber is contained in the RV1 oral applicator, so infants with a severe (anaphylactic) allergy to latex should not receive RV1. The RV5 dosing tube is latex-free.
- Children with severe combined immune deficiency (SCID).
- Rotavirus vaccine should not be administered to infants with acute moderate or severe gastroenteritis until the condition improves.

### 6.16.5 Precautions for rotavirus vaccine

- Altered immunocompetence other than SCID.
- History of intussusception
- Chronic gastrointestinal disease such as congenital malabsorption syndromes, Hirschsprung's disease, or short-gut syndrome. In these cases the benefit and risks of vaccination should be considered. However, no data are available on the safety and efficacy of rotavirus vaccine in these conditions.
- Spina bifida or bladder exstrophy are at high risk for acquiring latex allergy, and thus should receive RV5 instead of RV1.
- Moderate or severe acute illness with or without fever.

## 6.17 Typhoid vaccine

Typhoid fever is an acute, life-threatening febrile illness caused by the bacterium *Salmonella Enterica*, serotype Typhi. Paratyphoid fever is a similar illness caused by *S. Paratyphi* A, B or C. It is characterized by fever, headache, severe malaise and often mild abdominal pain. Serious complications include

intestinal hemorrhage or perforation. Typhoid vaccines do not protect against paratyphoid fever.

### 6.17.1 Typhoid vaccine, storage and administration

There are currently two formulations: oral live, attenuated vaccine manufactured by Ty21a strain of *S.typhi* and a Vi capsular polysaccharide vaccine for intra-muscular use. A third heat-phenol parenteral inactivated vaccine is also available, but its use is associated with substantially more adverse reactions, with no increase in efficacy compared to either Ty21a or ViCPS. Thus, when not contraindicated, either oral Ty21a or parenteral ViCPS is preferable.

Oral Ty21 a vaccine is indicated for children 6 years of age and older and adults. The vaccine should be taken as one enteric-coated capsule every other day for a total of four capsules. Each capsule should be taken with cool liquid, no warmer than 37 C, approximately 1 hour before meals. The capsule must be kept refrigerated and all four doses must be taken to achieve maximal efficacy. Booster doses are recommended every 5 years for individuals with ongoing risk.

Vi Capsular Polysaccharide vaccine is the primary vaccination of persons 2 years of age and older with Vi CPS. It consists of one 0.5ml (25mcg) dose administered intramuscularly. Booster doses recommended every 2 years for those at risk.

Parenteral Inactivated vaccine is now no longer recommended. If necessary, it consists of two doses given subcutaneously at interval of 4 weeks or longer. For those 10 years of age and older, the dose is 0.5 ml, and for those less than 10 years of age, the dose is 0.25ml. If time is insufficient for administration of two doses of the vaccine at an interval of

four weeks or longer, three doses of the parenteral vaccine at weekly intervals are given. However, this schedule may be less effective.

The protective efficacy of the vaccine is 50-80% and continued precautions about food and water are still recommended.

### 6.17.2 Typhoid Vaccine Immunization Schedule:

Typhoid vaccination is recommended for:

- Travelers to areas where a risk of exposure to *S typhi* is recognized. Risk is greatest for travelers to developing countries especially South Asia including India, Nepal, Pakistan, Afghanistan, Latin America, and Africa, who have prolonged exposure to contaminated food and drink.
- Persons with exposure to a documented typhoid fever carrier, such as occurs with continued household contact.
- Laboratory workers with frequent contact with *S typhi*.
- Regular booster doses are recommended for those at ongoing risk.

### 6.17.3 Typhoid vaccine side effects

- Fever and headache occur in up to 5% with the oral vaccine.
- Headache can develop in 16-20% with the capsular polysaccharide.
- Local erythema and induration can occur.

### 6.17.4 Typhoid vaccine contraindications

- Oral typhoid vaccine should not be given in pregnancy and other immunosuppressed states.
- History of allergy to typhoid vaccine.

### 6.17.5 Typhoid vaccine precautions

- Vaccination with oral typhoid should be delayed by 72 hours after the use of antibiotics.
- Simultaneous use of immunoglobulins or other live viral vaccines along with typhoid vaccine is not contraindicated.

## 6.18 HPV vaccine

HPV remains the most common sexually transmitted infection all over the world. It is caused by Human Papilloma Virus. In the majority of persons, infection is transient, asymptomatic and resolves spontaneously. But in a minority of people, it causes genital warts, abnormal pap smears and various forms of anogenital cancers including cervical, rectal, and anal cancer. There are more than 100 serotypes of papilloma virus, but types 6 and 11 cause more than 90% of all genital warts. Types 16 and 18 cause more than 70% of all cervical cancers.

### 6.18.1 HPV vaccine, storage and administration

HPV vaccine is attenuated virus-like particles, made with recombinant L1 capsid protein of the virus; as such it is not a live virus.. There are two types of HPV vaccines currently approved.

A quadravalent vaccine (HPV 4- Gardasil) protects against types 6, 11, 16 and 18. It is approved for ages 9-26 years in girls and women as well as males. Because it attacks the non-oncogenic as well as oncogenic types, this vaccine is approved for protection from genital warts as well as cervical cancer.

The other vaccine is a bivalent vaccine (HPV 2- Cervarix), that is approved for protection against types 16 and 18 only.

It can be given to females 10 – 25 years of age.

HPV 4 (Gardasil) is approved for protection from cervical cancer as well as genital warts in both males and females. HPV2 (Cervarix) is approved for cervical cancer. Both vaccines are also effective for preventing pre-cancer cervical lesions. Persons who already have genital warts or pre-cervical lesions are still recommended to receive the vaccine because they may get infected with a different serotype in future. However, they should be advised that vaccine will have no therapeutic response on an existing infection or lesion.

It is administered as 0.5 ml intramuscularly, preferably in the deltoid.

### 6.18.2 HPV immunization schedule

- HPV immunization consists of 3 dose series of either type of vaccines.
- The current recommendation from AHD is to start vaccination of all girls at age 11- 12 years. The first dose should be administered at age 11, second after 1-2 months, and the third dose after 6 months.
- HPV vaccine can be started as young as 9 years of age and completed before sexual contact.
- Any missed doses can be completed at any time.

### 6.18.3 HPV vaccine side effects

- Injection site symptoms were common and included pain, redness and swelling.
- Other systemic effects include myalgia, headache and fatigue. Syncope has been noted especially in adolescents.



### 6.18.4 HPV vaccine contraindications

- HPV4 is produced in *Saccharomyces cerevisiae* (baker's yeast) and is contraindicated for persons with a history of immediate hypersensitivity to yeast.
- Prefilled syringes of HPV2 have latex and should not be used in persons with anaphylactic latex allergy. HPV2 single dose vials contain no latex.
- HPV vaccines are not recommended for use in pregnant women.

### 6.18.5 HPV vaccine precautions

- Syncope can occur after vaccination and has been observed among adolescents and young adults. To avoid serious injury related to a syncopal episode, vaccine providers should consider observing patients for 15 minutes after they are vaccinated.
- Vaccination of persons with moderate or severe acute illnesses should be deferred until after the patient improves.

## 6.19 Rabies Vaccine

Rabies is a severe form of encephalomyelitis caused by neurotropic viruses called Rhabdoviridae. The clinical illness progresses from a non-specific prodrome to paresis or paralysis; spasms of swallowing muscles can be initiated by sound, sight or perception of water (hydrophobia), convulsions develop, followed rapidly by coma and death.

The disease is endemic in all continents except Antarctica and is transmitted by an animal bite. In developing countries, dogs are the most common reservoirs, but monkeys that live around temples,

bats and indeed all mammal bites need evaluation and treatment.

### 6.19.1 Rabies vaccine, storage and administration

Rabies vaccine is made from a killed, inactivated virus. It is formulated either in human diploid cells or purified chick embryo cells. Both types are safe and effective.

Each dose is 1.0 ml administered intramuscularly, generally in the deltoid muscle.

Doses and number of injections vary with whether vaccine is a pre-exposure schedule or post-exposure.

When given in a pre-exposure setting, a total of three injections are given using either vaccine. This does not eliminate the need of post-exposure vaccination is someone who gets an animal bite wound, but the number of injections will be only two and no Rabies immune globulin will be needed. The main indications for pre-exposure vaccination are traveler to high risk areas and activities including non-structured safaris, treks through jungles, cave exploration and prolonged rural stays. In addition, lab workers and persons who work with animals, for eg. zoo keepers should be vaccinated.

If pre-exposure vaccine is not given, in the event of a possible virus exposure, the patient will need post-exposure immunization. This includes 20 IU/kg of Rabies immune globulin and a series of five injections over a period of one month.

Prevention of rabies is best achieved by education to avoid contact with stray animals. Once an exposure has occurred, immediate and adequate medical care is critical.



## 6.19.2 Rabies Immunization Schedule

### Pre-exposure Vaccination:

A three dose series of 1.0 ml given at 0, 7 and 21 or 28 days intramuscularly is recommended for prophylactic purposes. Both types of vaccine are given in the same schedule.

### Post-exposure vaccination schedule:

If pre-exposure vaccinations are not given, the patient will need rabies immune globulin as well as a 5 part series of the rabies vaccine, 1.0 ml given intramuscularly at 0,3,7,14 and 28 days. The rabies immunoglobulin dosage is 20 IU / kg body weight , given as local infiltration at the bite site, if possible and the rest to be given intra-muscular.

## 6.19.3 Rabies vaccine adverse effects

- Local reactions such as erythema, pain, swelling or itching at the injection site are common. Mild systemic effects like headache, nausea, and myalgia can also happen.
- Approximately 6% of persons requiring boosters can get an immune-like reaction characterized by urticaria, pruritus or malaise.
- The older animal –brain derived rabies vaccine has a very high rate of anaphylaxis. It is no longer used in most developed countries.

## 6.19.4 Rabies vaccine contraindications

- History of allergy to the vaccine and anaphylaxis to egg or chicken proteins (for the chick embryo vaccine only) are contraindications.
- Pregnancy is not a contra-indication to immunization.

## 6.19.5 Rabies vaccine precautions

Care should be taken that children be given the same amount of vaccine as adults.

## 6.20 Yellow fever vaccine

Yellow fever belongs to the family of vector-borne hemorrhagic fevers acquired in parts of Africa and South America. It presents as influenza –like illness with fever, headache, myalgia, prostration, nausea and vomiting. Approximately 15% of all patients develop a more serious form of the disease with jaundice, hemorrhagic symptoms and multi-organ failure. For these patients, fatality rate is 20-50%.

### 6.20.1 Yellow fever vaccine, storage and administration

All yellow fever vaccines are live, attenuated viral vaccines. Yellow fever vaccination is a requirement for entry into several countries in the sub-Saharan Africa. In addition, it is highly recommended when traveling to certain countries in South America including Brazil, Colombia, parts of Venezuela and Peru as well as Panama. These countries are endemic for this disease.

Yellow Fever vaccine should be given to all traveler aged > 9 months of age who are visiting any of the above countries and are at risk of acquiring the disease. The vaccine is only available at internationally certified centers that carry an official “Uniform Stamp” which can be used to validate the standardized yellow card, called an International Certificate of Vaccination or Prophylaxis. The same card can be used as proof of waiver of the vaccine, if the physician deems vaccination a contra-indication for a certain individual.

It is administered subcutaneously as a single injection of 0.5 ml.

### 6.20.2 Yellow fever vaccine immunization schedule

For all eligible persons, a single dose of 0.5ml of reconstituted vaccine is given subcutaneously. WHO regulations recommend re-vaccination at 10 year intervals.

It should be remembered that countries in South America where Yellow fever is endemic do not require proof of vaccination for entry. However, any traveler who will be exposed to mosquitoes in these areas must get vaccinated.

### 6.20.3 Yellow fever vaccine side effects

Common adverse reactions include mild systemic complaints including low grade fever, headache and myalgia in 10% -30%. They may last 5-10 days.

Rarely, severe adverse effects can also happen. They include anaphylaxis in 1.8 cases per 100,000 doses, yellow fever associated neurologic disease and yellow fever associated viscerotropic disease.

Yellow fever associated neurologic disease was historically seen in infants, though newer reports include adults as well. It may present as meningoencephalitis, Guillian- Barre syndrome, Bulbar Palsy or Bell's palsy. It is rarely fatal. All cases were in first time vaccinees.

Yellow fever associated viscerotropic disease is a severe illness, similar to a wild type viral disease with acute dissemination in all organs, often leading to multisystem organ failure and death. Incidence of this complication is 0.4 cases per 100,000 doses and increases with age over 60 years.

### 6.20.4 Yellow fever vaccine contraindications

- Infants < 6 months of age should never be vaccinated. Vaccination of infants between 6-9 months can be considered, if benefits outweigh the risk. A history of hypersensitivity to gelatin, eggs or chicken proteins are contraindications. No persons on immunosuppressive drugs (corticosteroids, alkylating agents, antimetabolites etc.) or suffering from any underlying immunosuppressive disorder should be given this vaccine. This includes HIV, history of thymectomy or patients with malignancy. Since this is a requirement for entry into several countries, a documentation of medical contraindication is necessary on the International Certificate. However, such waivers do not guarantee entry into the destination country.

- Pregnancy is also a contraindication, however if the risks of travel outweigh the risk from vaccine, it should be given.

### 6.20.5 Yellow fever vaccine precautions

- Adults over age 60 years have a higher risk of serious side effects, hence risk and benefits of vaccination should be discussed and documented. In HIV positive people with laboratory verified CD4 counts over 200, who do not have AIDS or opportunistic infections AND who are at high risk of exposure to yellow fever virus, the vaccine should be given. Similarly, pregnant persons who cannot postpone or avoid travel to such a country, may, in special circumstances, be given the vaccine because the risk of contracting the illness is much greater than the risk from the vaccine.
- It is recommended to avoid conception for 4 weeks after vaccination.

# 7 School Health Vaccination

## 7.1 Routine Immunization Schedule

School vaccination requirements are widely thought to serve important public health purposes. Incidents of

communicable disease (for which there are vaccines) among children have significantly declined since the introduction and regular enforcement of the national immunization program including the standard school immunization schedule.

Vaccines	Child Age	Interval
DPT/OPV 2nd booster	5-6	2 ½ years interval from the first booster
MMR 2nd dose	5-6	5-6 4 Years
Td /OPV 3rd booster	10	5 Years from 2nd booster
Td 4th booster	15	5 Years interval
HBV 1st dose	5-12	
HBV 2nd dose	5-12	1-2 months
HBV 3rd dose	5-12	4 month

Table 10: Summary of the Standard School Immunization Schedule Adopted by DHA.

## 7.2 Delayed Immunization Schedule

This is shall be implemented when the Standard Immunization Schedule is not

followed and the child was not vaccinated at all.

- If the child was never vaccinated from birth, the delayed immunization schedule can be followed after the age of 5 years as follows:

- Mantoux test to be done, if reading after 3 days is Negative:
  1. Give BCG, and 1st dose OPV, DPT & MMR
  2. After 6 Weeks, give 2nd dose OPV, DPT, & 1st dose of HBV
  3. After 6 Weeks, 3rd dose of OPV, DPT & 2nd dose HBV
  4. After 6 Months from 1st dose of HBV give, the 3rd dose of HBV
  5. After one year interval from the 3rd dose of OPV & DPT give the 1st booster dose of OPV & DPT.
  6. After 4 years interval from the 1st booster of OPV & DPT give the 2nd booster of OPV & Td.
  7. After 4 years interval from the 2nd booster of OPV & Td give the 3rd booster of OPV & Td.
- If Mantoux reading is positive: > than 10 mm which may result from latent infection with the TB germ, the action is to refer the child to physician for further evaluation.

### 7.3 Delayed schedule for children who had discontinued or interrupted immunization

Note that there will be no re-initiation of primary doses so that whatever OPV and DPT received before school age is/are considered primary doses & Immunization schedule will be as follow:

- Give the 3rd dose of OPV and Td.
- After 1 year interval from 3rd dose of OPV & Td give 1st booster OPV and Td.

- After 2 ½ years interval from the 1st booster of OPV & Td give 2nd booster OPV and Td.
- After 5 years interval from 2nd booster of OPV and Td give 3rd booster of Td.

### 7.4 Important notes

- If the child was never vaccinated (up to 15 years) give Mantoux test.
- If Mantoux Reading is Negative give BCG and one dose of MMR, Td & OPV.
- Td & MMR can be given up to 18 years of age.
- NO OPV after 15 years of age.
- NO DPT after 6 years of age.
- NO DPT for children with epilepsy or febrile convulsion. DT can be given.
- 3 doses of HBV should be finished before 12 years of age.
- NO Vaccination shall be planned utilizing photocopy of vaccination records. The original vaccination card should be available or a letter signed by parent stating the **original** vaccination card was lost.
- Mantoux test shall be done only for children who did not receive BCG since birth.
- If the child was born before the year 2000, and he was vaccinated up to five years of age consider that 2nd dose MMR was not given so you have to give it with the 3rd booster.

# 8

## Adult Immunization

As the UAE catches up to the developed countries in providing quality care, there must now be two components of good health care. One is provision of appropriate, evidence-based care for acute illnesses, and two is an increasing emphasis on preventive care. Vaccine preventable communicable illnesses must become an important pillar in the overall wellbeing of the entire social structure.

Adult vaccination is one of the most important tools for reducing morbidity and mortality not just in the elderly, but in other members of the society by increasing herd immunity, reducing severe clinical outcomes and helping in eradication of a disease.

The WHO Global Immunization Vision and Strategy (GIVS) 2006-2015 was written in response to the challenges of a rapidly changing and globally interdependent world. One of the goals is more people protected against more diseases. This goal can only be fulfilled by expanding the reach of immunization to populations beyond infancy to include adolescents as well as adults.

As per WHO specific goals directed at adults immunization include elimination of diphtheria, measles, mumps, rubella, and tetanus, at least a 75 percent reduction in

the number of cases of hepatitis A and B, and 90 percent compliance with routine administration of pneumococcal and influenza vaccines.

There are several studies showing that vaccinating one segment of society can have far reaching results not only on that sub-population but on those who are in immediate contact. For example vaccination of pregnant women against influenza protects not only the vaccinees, but results in decreased in hospitalization due to Influenza in neonates; although no influenza vaccine is licensed for infants less than 6 months.

### 8.1 Recommended adults immunization schedule

#### Td/ Tdap Vaccine

A primary course for adults is a 3 dose series of tetanus and diphtheria containing vaccines; usually Td, at 0, 4 and 12 weeks. For adults who have not received a dose of Tdap previously, one dose of Td should be replaced by Tdap.

#### Varicella

All adults lacking immunity to varicella should receive two doses of varicella vaccine, 4 weeks apart, unless contraindicated.

All pregnant women should be assessed for immunity and if non-immune first dose after delivery.

### Herpes zoster vaccine

Given the severe morbidity associated with post-herpetic neuralgia in the elderly, a single dose of herpes zoster vaccine is indicated for all adults over 60 years of age. Dose should be given regardless of prior episode of Zoster. Live attenuated vaccine.

### Rubella

All women of child bearing age should have documentation of rubella immunity status. If not immune, only 1 dose of rubella containing vaccine should be given and counseling should be provided

regarding congenital rubella syndrome. If already pregnant, vaccination should be provided at the completion of pregnancy before hospital discharge.

### Measles and Mumps

Adults who were born before 1957 are considered immune. Those born after should have either documented evidence of immunity or a history of clinical disease. If neither present, 1 or more doses of MMR is recommended.

### Seasonal Influenza Vaccine

All international regulatory bodies recommend vaccination of all adults with influenza vaccine annually. Care should be taken to take only the parenteral, inactivated vaccine if any immunocompromised state exists.

Age groups	Recommended Vaccines	Comments
19- 59 years	Td/ Tdap	Replace one dose of Td with Tdap, then booster every 10 years
	MMR	1-2 doses (if born after 1957)
	Varicella	2 doses
	Influenza	Seasonal
	HPV	Optional
> 60 years	Td/ Tdap	
	Varicella	2 doses
	MMR	
	Zoster vaccine	One dose
> 65 years	Td/ Tdap	
	Influenza	
	Varicella	
	Pneumococcal vaccine	Polysaccharide only

*Table 11: Recommended adults immunization schedule.*

## 8.2 Vaccines for adults with risk factors

All adults should be evaluated for medical conditions that place them in the

high risk groups and their immunization status should be assessed and updated. Recommended vaccines for high risk groups are summarized in [Table 12](#)

Condition	Recommended vaccines	Comments
Diabetes, chronic heart disease ( except hypertension), chronic alcoholism, smoking	Pneumococcal (PPSV) Influenza vaccine	Consider Varicella and Zoster
Chronic Renal Failure including Dialysis patients	Pneumococcal Influenza Hepatitis B	Consider Varicella and Zoster
Chronic Liver disease	Hepatitis A Hepatitis B Pneumococcal Influenza	Consider Varicella and Zoster
Asplenia; including functional asplenia due to hemoglobinopathies, splenectomy, and terminal complement deficiencies	Meningococcal Pneumococcal Influenza	If < 5 yrs, Hemophilus Influenzae type b. > 5 yrs, no definite recommendation.
Healthcare personnel	Hepatitis B Influenza Age appropriate vaccines MMR	Consider varicella Consider PPD testing.
Prison inmates and employees	Hepatitis A Hepatitis B	Consider PPD testing
Transplant recipients, immunosuppressive therapy	Pneumococcal Influenza	Do NOT give varicella, zoster or MMR. Intranasal flu vaccine contraindicated.

*Table 12: Recommended vaccinations in high risk groups.*

### 8.2.1 Immunizations in Pregnancy

Maternal immunization protects both the mother and fetus from the morbidity of certain infections. It can also provide the infant passive protection against infections acquired after birth. Ideally,

immunizations are given prior to conception, but administration during pregnancy is indicated in only two situations; Td and influenza vaccination.

#### Influenza vaccine

All women who will be pregnant in the flu season need to be vaccinated

with Influenza. Ideally this should be delayed till after the first trimester, but the complications of influenza can be so severe, that the vaccine is indicated even in the first trimester. Intra nasal influenza vaccine is a live attenuated vaccine and is contraindicated in pregnancy.

### **Tetanus and Diphtheria vaccine**

If there is history of incomplete primary vaccination or if the last booster was more than 10 years ago; tetanus and diphtheria vaccinations are indicated to prevent neonatal tetanus and diphtheria. Newer guidelines favor giving two doses of Td at least 4 weeks apart during pregnancy, followed by a single shot of Tdap to include pertussis after delivery.

## **8.3 Vaccines for travelers**

International travel may be done for business, study, or vacation. Travelers are exposed to a large number of parasitic, bacterial and viral diseases.

Travel advice regarding immunization varies with the exact location of visit, duration of stay and activities involved in any given trip, along with the patient's health status. Updated information can be easily obtained from the CDC website, [wwwnc.cdc.gov/travel/content](http://wwwnc.cdc.gov/travel/content).

### **8.3.1 Required vaccines for traveling**

#### **Meningococcal vaccine**

Immunization against meningococcal disease is required when traveling to Saudi Arabia for Hajj.

#### **Yellow fever vaccine**

Immunization against yellow fever is

required when traveling to areas of Sub-Saharan Africa and South America where it is endemic.

### **8.3.2 Recommended vaccines for traveling**

#### **Typhoid**

Typhoid immunization is recommended for travelers to Southeast Asia, Mexico, and other developing countries.

#### **Hepatitis A**

Hepatitis A immunization is recommended for all travelers to susceptible countries.

#### **Hepatitis B**

Hepatitis B vaccination is recommended traveler anticipating prolonged stay in an endemic country, any international travel in the medical field, and when occupations or activities where contact with blood or body secretions is likely.

#### **Rabies**

Specialized circumstances in endemic countries where contact with wild animals is likely e.g. game reserves.

#### **Special Vaccines**

In special circumstances, other vaccines may be needed including Japanese Encephalitis, Lyme disease vaccine, anthrax, small pox etc. These are beyond the scope of this document.

## **8.4 Immunization in post bone marrow transplant patients**

Vaccination of patients who underwent bone marrow transplant is summarized in [Table 13](#).



Vaccine	Dose	Interval after transplant
IPV	1st dose	12 months
	2nd dose	14 months
	3rd dose	16 months
Hep B	1st dose	12 months
	2nd dose	14 months
	3rd dose	16 months
Diphtheria/Tetanus (Td)	1st dose	12 months
	2nd dose	14 months
	3rd dose	16 months
Pertussis (<7years of age)	1st dose	12 months
	2nd dose	14 months
	3rd dose	16 months
Haemophilus influenza b	1st dose	12 months
	2nd dose	14 months
	3rd dose	16 months
Pneumococcal vaccine	1st dose	12 months
	2nd dose	14 months
Influenza vaccine	1st dose	12 months
	2nd dose	14 months
Measles, mumps, & rubella	2 years after transplant; but patient should be off immunosuppressive therapy	
Meningococcal vaccine		

*Table 13: Recommendations for immunizations post bone marrow transplant.*

### Vaccine Administration Record

Child Name: \_\_\_\_\_

Birth Date: \_\_\_\_\_

ID Number: \_\_\_\_\_

Vaccine	Dose	Date Given (mm/dd/yy)	Size	Vaccine		Remarks	Next Appt	Signature / Initials of vaccinator
				Let	Mfr			
BCG								
Hepatitis								
Diphtheria, Tetanus, Pertussis (DTaP, DT, Td)								
Haemophilus, Influenza Type b								
Polio / OPV / IPV								
Pneumococcal								
Measles, Mumps, Rubella								
Varicella								
Rotavirus (Rota)								
Hepatitis A (HepA)								
Meningococcal								
Human Papilloma Virus								
Influenza								
Other								



### Daily Tally Sheet For Immunization

Name of Health Facility: \_\_\_\_\_

Health Facility Address: \_\_\_\_\_

Date Of Session: \_\_\_\_\_

Number Of Doses Of Vaccines Administered By Age Group					
VACCINE	<1 YR	1 - 6 YRS	7 - 18 YRS	> 18 YRS	TOTAL
DTaP					
DT					
Td					
Hib					
IPV					
OPV					
MMR					
Measles					
Varicella					
Pneumococcal					
Hepatitis A					
Hepatitis B					
Flu					
Pneumococcal/ Adult Vaccine					
Rota					
HPV					
Typhoid Vaccine					

## Adverse Drug Reaction Reporting Form

Ref No.	
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Patient Data									
Name				Gender	<input type="checkbox"/> M <input type="checkbox"/> F	Nationality		PID	
Diagnosis				Age/DOB:			Weight		
H/O Allergy	<input type="checkbox"/> NO <input type="checkbox"/> YES, specify:								
History of pre existing medical problem									
History of ADR									
Event Details									
Health center				Location			ADR reported by		
Event Date / Time	/      hrs				<input type="checkbox"/> In HC <input type="checkbox"/> Outside HC				
Drug / vaccine (Name)				Manufacturer					
Route		Dose		Frequency		Duration			
List of Drug / Vaccines taken (past 3 months)	1)								
	2)								
	3)								
	4)								
	5)								
Adverse Reaction Summary (to be filled by Physician)									
Description of Adverse Drug / Vaccine Reaction									
Suspected cause									
<input type="checkbox"/> Overdose					<input type="checkbox"/> Medical Device				
<input type="checkbox"/> Idiosyncrasy					<input type="checkbox"/> History of ADR				
<input type="checkbox"/> Metabolic enzyme defects					<input type="checkbox"/> Concomitant Drug Therapy				
<input type="checkbox"/> Abnormal patient factors					<input type="checkbox"/> Unknown				
<input type="checkbox"/> Other (specify)									
Immediate action taken to treat ADR									
Preventive measures taken to prevent reoccurrence									
Outcome	<input type="checkbox"/> Recovered			<input type="checkbox"/> Not Recovered					

Seriousness of the Reaction				
<input type="checkbox"/> Death		<input type="checkbox"/> Life threatening		
<input type="checkbox"/> Hospitalization		<input type="checkbox"/> Disability		
<input type="checkbox"/> Congenital anomaly		<input type="checkbox"/> Required intervention to prevent impairment /damage		
<input type="checkbox"/> Other (specify):				

Personnel Involved (check all applicable)				
<input type="checkbox"/> Nurse	<input type="checkbox"/> Pharmacists	<input type="checkbox"/> Physician	<input type="checkbox"/> Patient (himself)	<input type="checkbox"/> Other (specify)

Name of Attending Physician		Staff No.	
Position		HC / Section	

**All Staff are encouraged to report Adverse Drug Reactions of Drugs**  
**Blame Free Culture is maintained in DHA**

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Enquiries concerning this guideline and its reproduction should be directed to:

Public Health & Safety Department, Health Policy & Strategy Sector – Dubai Health Authority

P.O Box: 4545, Dubai, United Arab Emirates

Fax: +971 43113234

Email: [phsd@dha.gov.ae](mailto:phsd@dha.gov.ae), Website: [www.dha.gov.ae](http://www.dha.gov.ae)