

# *The Vaccine Cold Chain*



*Maintaining Cool Links*

# Cold chain system

- *Immunization programs are widely recognized as one of the most effective types of health interventions.*
- *However, for many countries, the delivery of safe injection practices and quality vaccines is a significant challenge.*
- *The cold chain system, when implemented properly, can help overcome this challenge.*



# *Cold chain system*

- *The cold chain system can enhance the on-going :*



*Quality, Safety, and Efficacy*

*of an immunization program.*

# *The cold chain system*

- *Vaccines are sensitive biological substances that, with time, lose their potency, especially when exposed to heat, sunlight or fluorescent light and, in some cases, when cold.*
- *Once potency has been lost, it can't be restored.*
- *To provide protection against disease, vaccines need to be distributed, stored and administered at recommended temperatures*

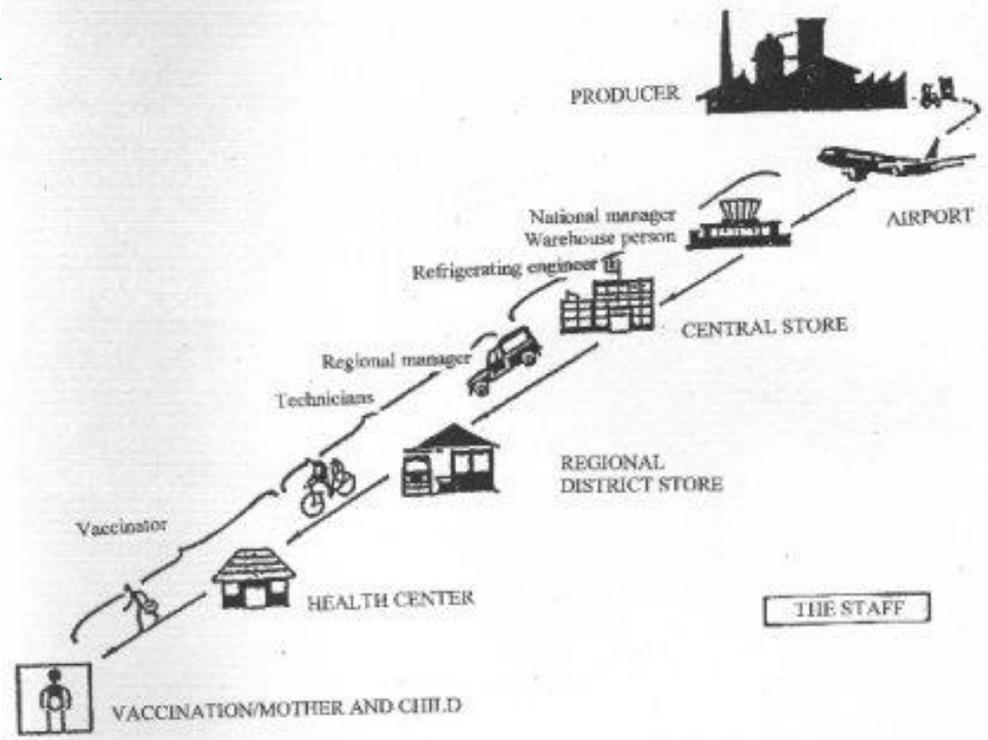
# The cold chain system

The cold chain system is means of delivering **effective vaccinations in children.**

The common elements of all cold chain systems are **a series of storage and transport links through a network of:**

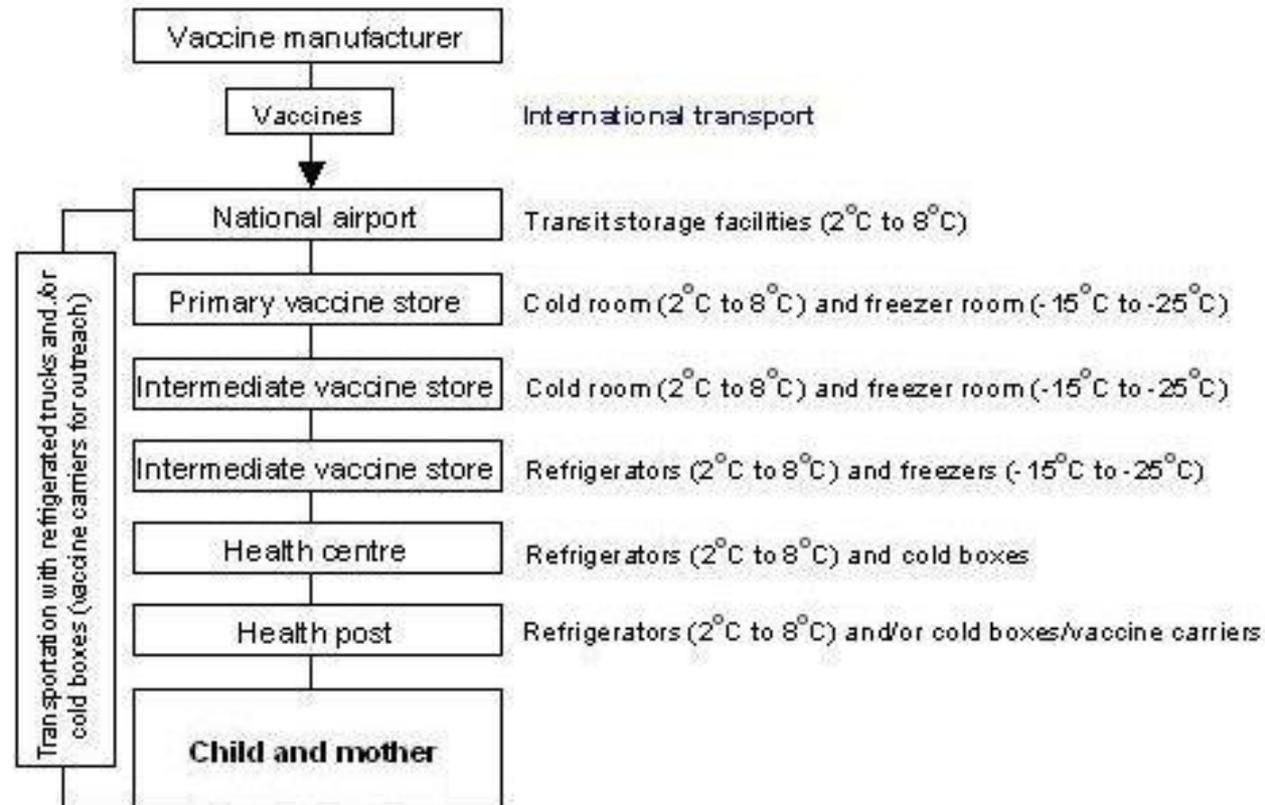
- fridges,
- freezers and
- cold boxes

that keep vaccines at a **safe temperature** throughout their journey.



# Typical cold chain system

*As shown in the diagram, a typical cold chain system begins when vaccine is manufactured and ends with the child being immunized.*



## *Storage conditions for vaccines and diluents*

- *All vaccines are sensitive to heat; however, some are more sensitive than others.*
- *WHO, EPI recommends the safe temperature range  
+2° C to +8° C,  
for storing most EPI vaccines.*
- *OPV is the most heat-sensitive vaccine and must be kept between -15° C and -25° C.*

## *Storage conditions for vaccines and diluents*

- ❑ *The WHO no longer recommends that freeze-dried vaccines such as BCG, measles and Yellow fever be kept frozen at -20° C.*
- ❑ *Storing them at this temperature is not harmful to the vaccines but takes up unnecessary deep-freeze storage space.*
- ❑ *Instead, they should be stored between +2° C to +8° C.*
- ❑ *All freeze-dried vaccines become more heat-sensitive after they have been reconstituted*

# *Storage conditions for vaccines and diluents*

- ❑ *BCG, measles, MR, MMR and rubella vaccines are not only sensitive to heat but also to light.*
- ❑ *Normally, these vaccines are supplied in dark brown glass vials to protect them against light damage.*
- ❑ *Nevertheless, they should always be covered and protected from strong light.*
- ❑ *Hepatitis B, Hib (liquid), DTP, DT, Td and TT vaccines are sensitive to both heat and freezing (i.e., below 0° C), and should be protected accordingly*

# *Storage conditions for vaccines and diluents*

- ❑ *Freeze-dried vaccines and their diluents should always be distributed together.*
- ❑ *Each type of freeze-dried vaccine requires a specific diluent.*
- ❑ *A diluent made by one manufacturer should not be reconstituted with a vaccine produced by another manufacturer.*
- ❑ *Reconstituted vaccines do not contain preservatives and thus become an ideal environment for growing dangerous organisms.*
- ❑ *Reconstituted vials should therefore be used in one immunization session, or within 6 hours of reconstitution*

# Cold Chain Equipment

*All cold chain equipment has to comply with a set of performance standards defined by the WHO EPI program and United Nations Children's Fund (UNICEF), or national policy.*

❑ *The recommended equipment typically used for vaccine storage are :*

- *cold rooms,*
- *refrigerators and*
- *freezers.*

❑ *For transporting vaccines equipment such as*

- *cold boxes,*
- *vaccine carriers and*
- *international containers*  
*are commonly used.*

# *Cold chain equipment*

## *“for transporting vaccine”*



Cold box



Vaccine carrier



Ice bags

# *Cold chain equipment*

*“For vaccine storage”*



*refrigerators*



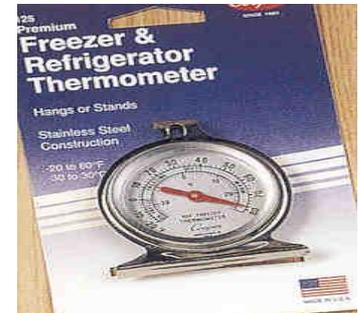
*Freezer*



*Cold room*

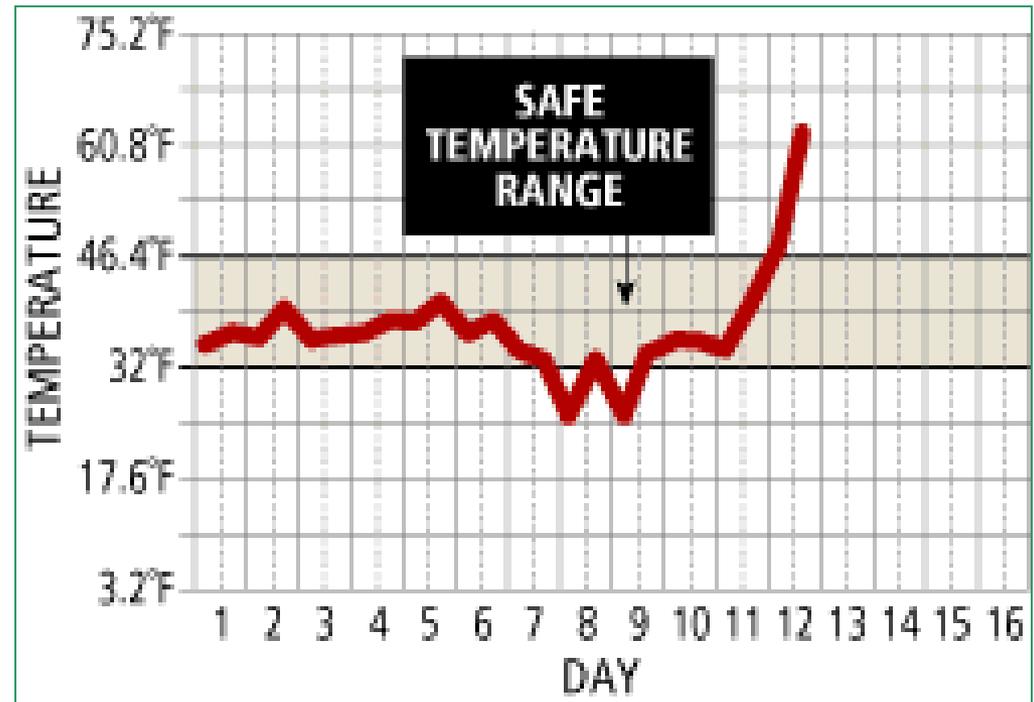
# Controlling and monitoring temperatures

- *There are different types of monitoring devices for measuring, controlling and recording storage temperature of vaccines.*
- *Refrigerators, freezers and cold boxes normally have thermometers that measure the internal temperature.*
- *Most refrigerators and freezers are fitted with an adjustable thermostat to control and correct storage temperature.*



# Controlling and monitoring temperatures

- *A designated person in charge of cold chain equipment should read and record storage temperature on a record sheet at least twice daily or according to policy*





# Controlling and monitoring temperatures

- *FreezeWatch indicators are CCMs used to monitor storage conditions of cold-sensitive vaccines.*
- *Stop! Watches comprise of CCM and FreezeWatch devices to monitor high and low storage temperatures in a refrigerator.*

## 3M™ Freeze Watch™ Indicators



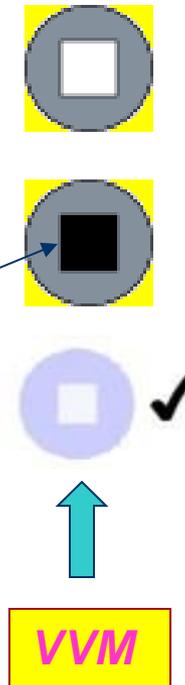
Non-Activated

Activated

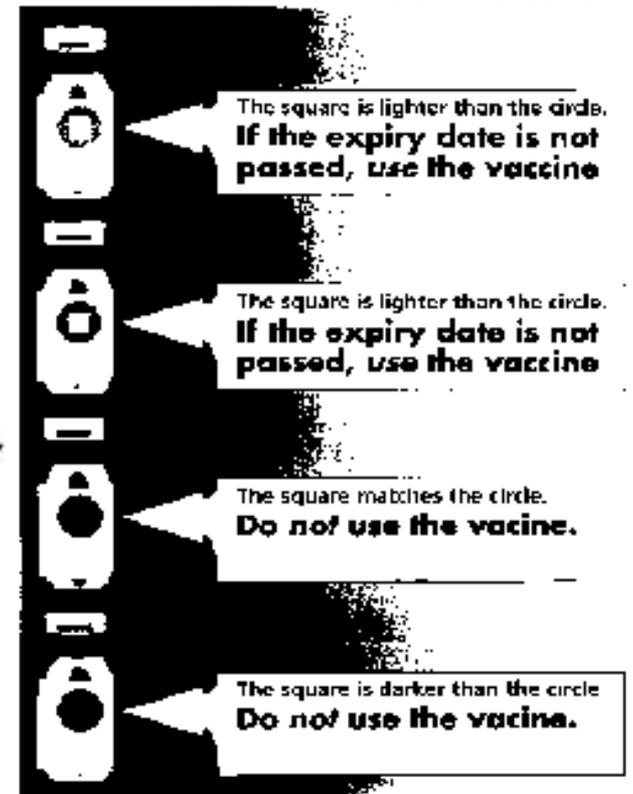
When exposed to sub-freezing temperatures, the liquid in the ampule freezes, causing the ampule to fracture and stain the indicator paper.

# Controlling and monitoring temperatures

- A Vaccine Vial Monitor (VVM) is a label on a vaccine vial that is marked by a circle with a small square inside.
- A heat-sensitive material on the label registers cumulative heat exposure of each individual vaccine vial over time.
- When the inner square matches or is darker than the outer circle, it indicates that the vaccine has lost its potency and must be discarded.
- VVMs are **NOT** substitutes for expiry dates.
- Vaccines must never be used after their expiry dates.



## Vaccine Vial Monitor



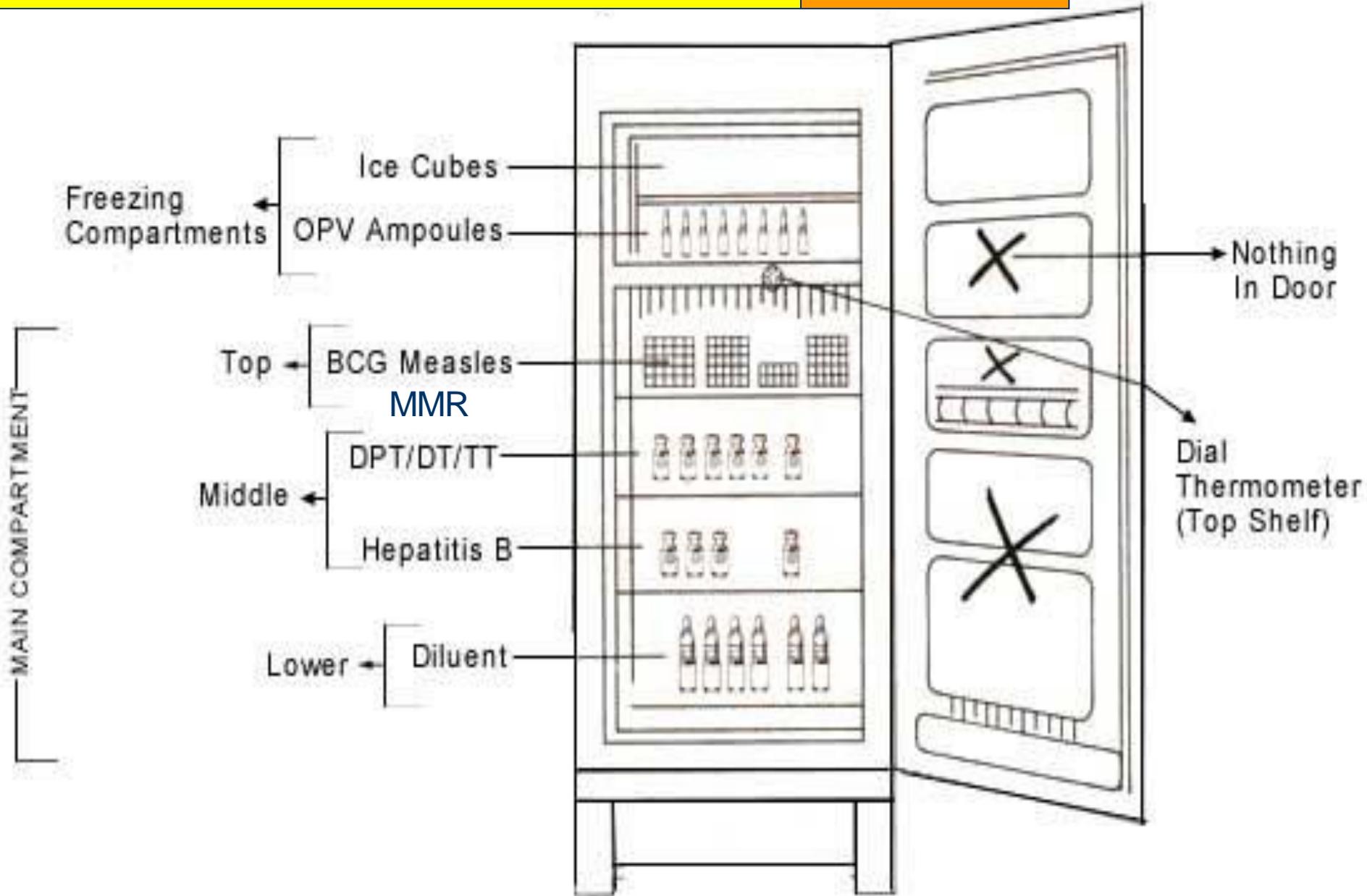
# *Keeping vaccines in the domestic refrigerator at health center*



- 1. The refrigerator must be placed in the coolest place away from direct sunlight with adequate air circulation around it (12 – 15 inches away from the wall)*
- 2. It must be kept locked and opened only when necessary*
- 3. It must be defrosted regularly*
- 4. Its temperature must be recorded twice daily*
- 5. Both monitor and thermometer are placed in the refrigerator, while temperature chart is stuck on the outer-surface of the refrigerator door*



# Arrangement of vaccines in the refrigerator



# Shake test

DPT, DT, dT, TT  
These vaccines are damaged by freezing

- *Shake test should be performed on a sample of vaccine vial in question and on the sample of the same batch/manufacture which is known to have been frozen.*
- *The two vials should be shaken vigorously for few minutes, and observed for the rate of sedimentation*

