PRINCIPLES OF COMMUNICABLE DISEASES EPIDEMIOLOGY

LECTURE - 4

It is the system of storage and transportation of the vaccine at low temperature (cold condition) from the manufacture till it is consumed.

System that ensures vaccine :

1. Potency
2. Quality
3. Safety

IMPORTANCE OF COLD CHAIN

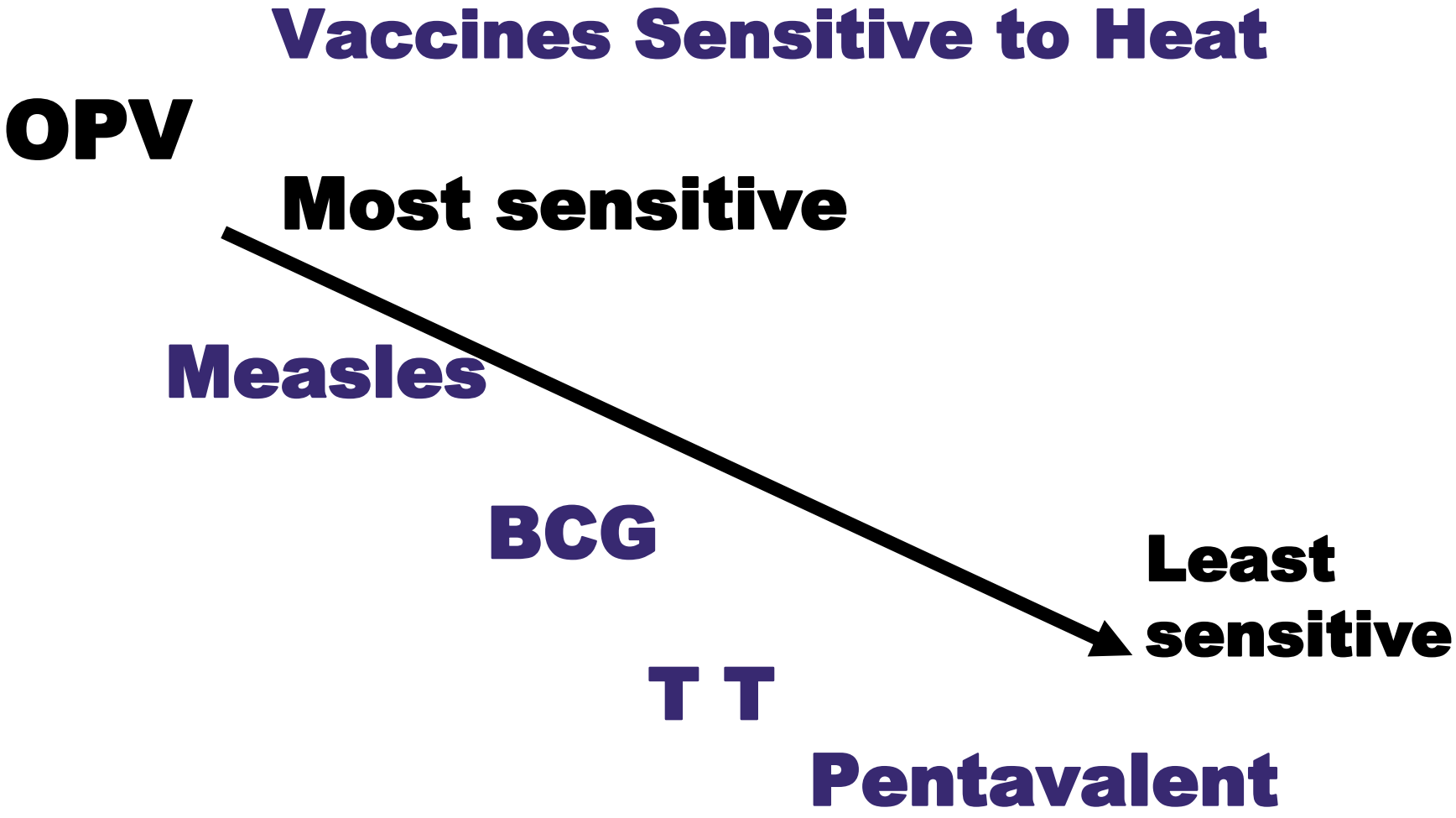
- **The cold chain is standard practice for vaccines throughout the pharmaceutical industry**

- **Maintaining the cold chain ensures that vaccines are transported and stored according to the manufacturer's recommended temp range +2C to +8C until point of administration**

- **Polio vaccine is the most sensitive vaccine to heat.**

- **Live attenuated vaccines are allowed to be frozen (OPV, Measles, MMR and BCG).**

- **Inactivated vaccines must not be frozen (DPT, DT, dT , TT and HB) .**


Vaccines Sensitive to Heat
OPV
Most sensitive
Measles
BCG
T T
Pentavalent
Least
sensitive

Vaccine sensitivity to freezing

Freeze sensitivity

Most sensitive

Vaccine

DTaP

DTaP-hepatitis B-Hib-IPV (hexavalent)

Hepatitis B

Meningitis C (polysaccharide-protein conjugate)

Pneumococcal (polysaccharide-protein conjugate)

Cautions: Never expose these vaccines to zero or subzero temperatures.

 Avoid the use of ice for transport.

These vaccines are not damaged by freezing.

Bacillus Calmette- Guérin

Measles
Measles, mumps, rubella

Oral poliovirus Rabies
Rotavirus
Rubella

Light Sensitive

Sensitive to strong light, sunlight, ultraviolet, fluorescents (neon)

BCG
MMR
Varicella
Meningococcal C Conjugate
Most DTaP containing vaccines

Vaccines should always be stored in their original packaging until point of use to protect them from light.

How long is the cold chain?

- Manufacturer to airport; cold storage at airport
- Transport at the correct temperature from airport to storage in central, regional and district stores and in health centers
- Transported at the correct temperature to outreach sites
- Kept at correct temperature during immunization sessions

The administrative levels of cold chain according to the duration of the storage and the temperature required to keep the vaccine potent

The administrative level	Storage period	Temperature	The vaccines
Central & regional stores	Maximum three months	- 20° to- 30°C	OPV, Measles, MMR,BCG
		+2° to +8°C	DPT, DT, dT, TT& HB,Hib
Districts stores& local immunization centers	Maximum one month	0°C to+8°C	OPV, Measles, MMR, BCG
		+2° to +8°C	DPT, DT, dT, TT& HB,Hib

The components of the cold chain

1-The equipment and tools

2-The health staff

3-The procedures

REFRIGERATION EQUIPMENT

- **Refrigerator**
- **Cold boxes**

- **Vaccine carriers**

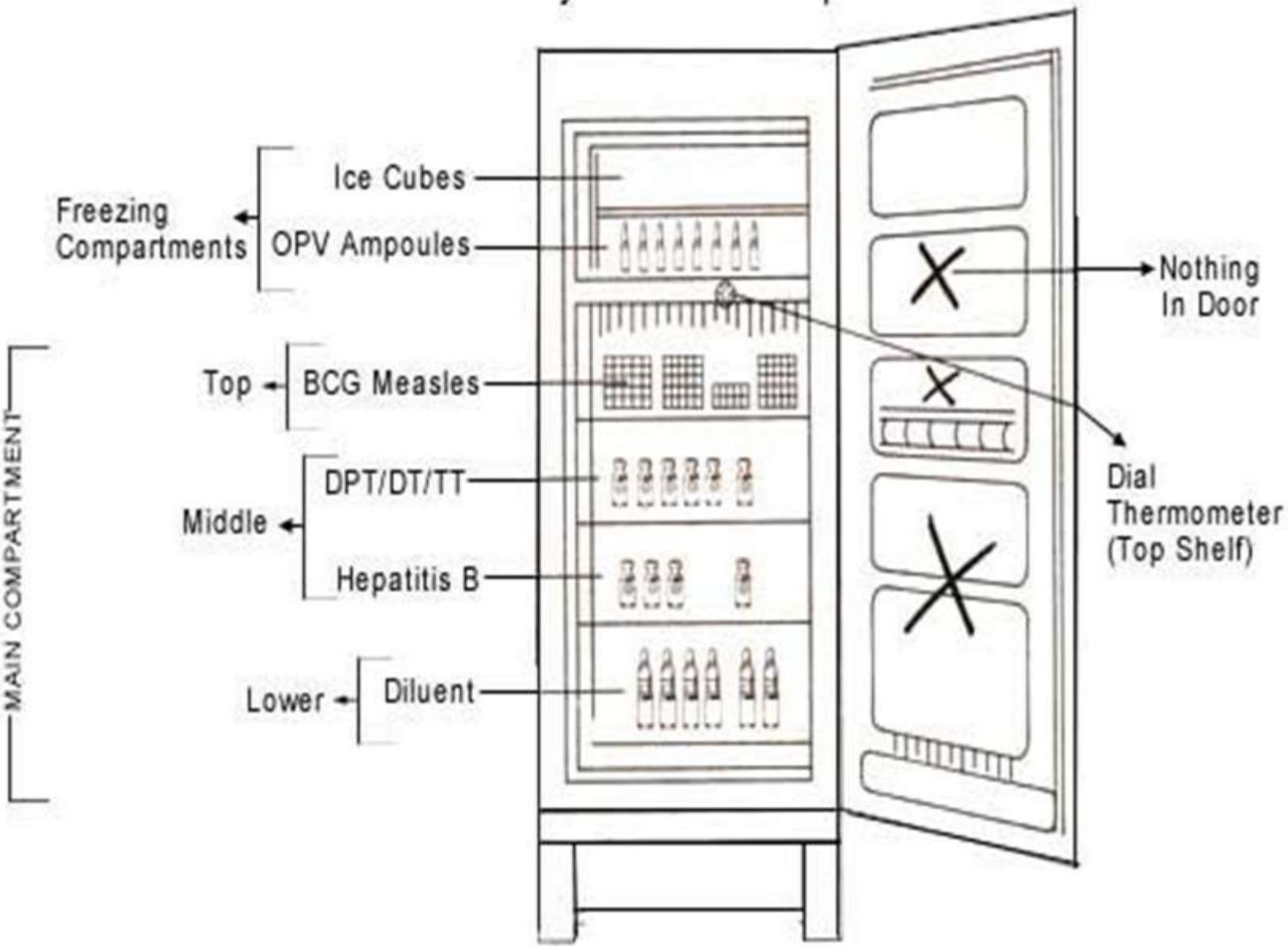
- **The ice packs**

1-The refrigerator :

- Placed in the coolest place of the health centers away from sunlight
- Well ventilated and adequate air circulation around it .
- Kept locked and open only when necessary.
- Defrosted regularly .
- Ice packs are kept in the freezer.

- **Its temperature is recorded twice daily.**
- **Drugs, drinks or food must *not be* stored in the refrigerator.**
- **Both the monitor and thermometer are placed in the refrigerator.**
- **The temperature chart is stuck on the door outside the refrigerator.**
- **The diluents should be kept on the lowest shelf.**

Refrigerator Showing vaccines Stored Correctly in Clinic Setup



Placing Vaccines in Refrigerator

- **Store IPV, MMR on the top shelf · If diluent accompanies MMR, Hib vaccine within vial packaging, the diluent must be removed and stored on the middle or next lower shelf ·**
- **All freezer sensitive vaccines should be stored on the middle shelves ·**
- **Diluent and emergency drugs can be stored on the lower shelves**

- **Vaccines should remain in the refrigerator until immediately before they are administered.**
- **They should be returned to the refrigerator immediately after drawing up each recommended dose.**

What is the optimum Temperature of the refrigerator in the health center?

+2° C to +8°C

Tools for monitoring the cold chain:

1- Cold Chain Monitor Card.

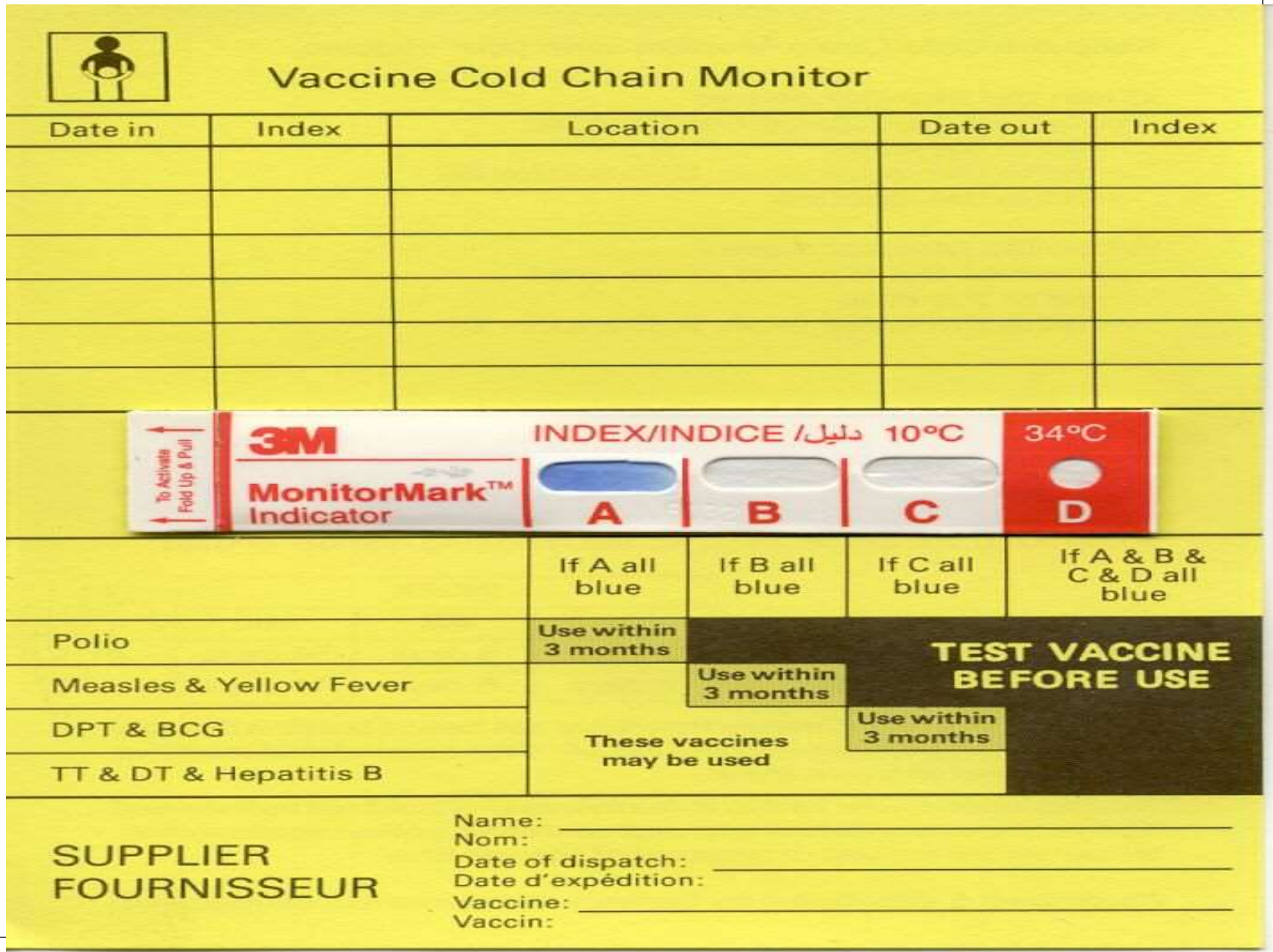
2- Freeze Watch Indicator

3- Cold Chain Refrigerator Graph

4- Vaccine Vial Monitors

5- Shake Test

Cold Chain Monitor (CCM)



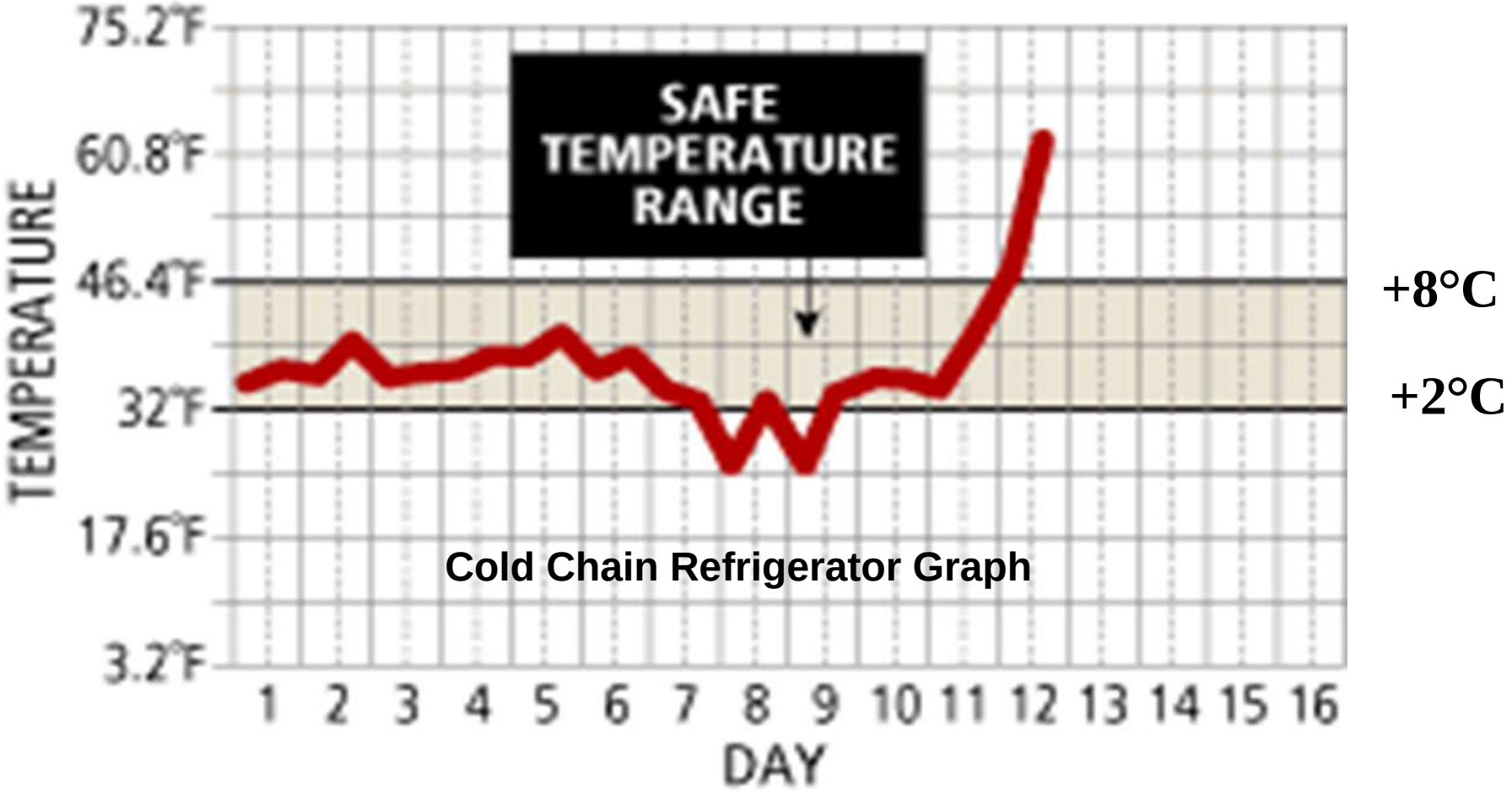
Cold Chain Monitor Card

is used to show cumulative exposure to Temp. above the safe range during storage& transportation .

It has an indicator that responds to two different Temps: the first part marked as ABC, responds to Temp above +10ºC; the 2nd part marked as D responds to Temps. above +34ºC.

Cold Chain Refrigerator Graph

The vaccines are stored in refrigerators, they are monitored twice a day and readings are recorded on a chart to ensure a safe temperature is maintained.
Emergency provisions made.
Vaccines moved to cold storage for 48 hours.



Cold Chain Refrigerator Graph

Vaccine vial monitors:

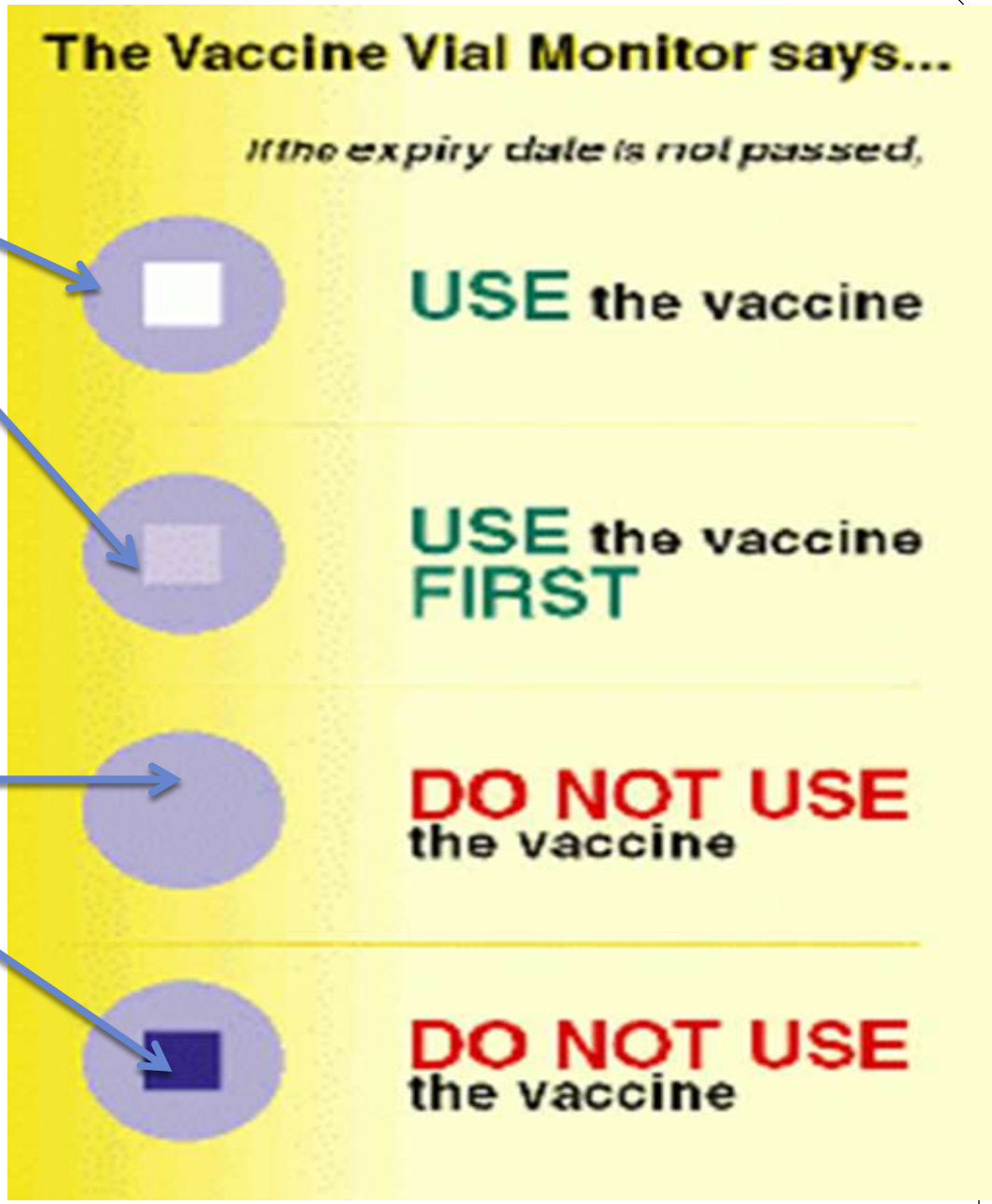
Every vial is also shipped with a temperature-sensitive label, that health workers monitor during vaccination sessions.

SAFE

If the inner square is lighter than the outer ring and the expiration date is valid, the vaccine is usable

SPOILED

If the inner square matches or is darker than the outer ring, the vaccine must be discarded.



THE SHAKE TEST

DPT, hepatitis B and tetanus toxoid vaccines can all be damaged by freezing.

By shaking two vials, side-by-side, one that might have been frozen and one that has never been frozen, health workers can determine if a vaccine has spoiled.


NEVER FROZEN
FROZEN/ THAWED
IMMEDIATELY AFTER SHAKING
Smooth and cloudy
Not smooth, granular particles
30 MINUTES AFTER SHAKING
Starting to clear
No sediment
Almost clear
Thick sediment
USE VACCINE
DO NOT USE VACCINE

WHAT DAMAGE THE VACCINES?

1. Any defect in the cold chain.
2. Out date expiry.
3. Using skin antiseptic at the site of injection (e.g. BCG).
4. Using the reconstituted vaccine (MMR, measles, BCG) after the recommended period (6 hours).
5. Exposure of the vaccine to unacceptable temperature during the immunization session.
6. Exposure of the vaccine to direct sunlight.