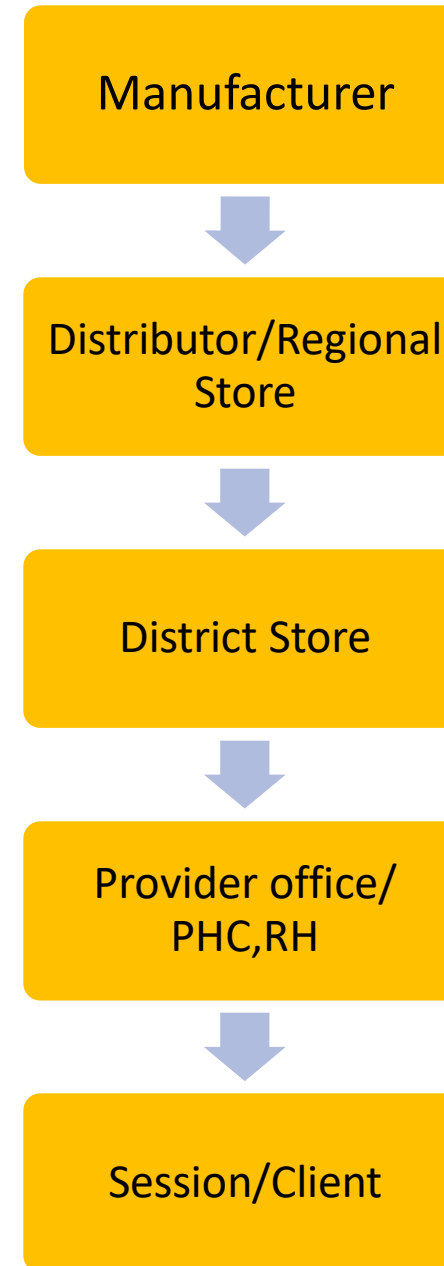


Cold Chain

# Cold Chain

- The system of
  - transporting and storing vaccines
  - at recommended temperature
  - from the point of manufacture to the point of use.
- 
- Success of UIP is highly dependent on function of Cold Chain System.



## **Six Rights:**

- Right vaccine
- Right quantity
- Right place
- Right time
- **Right condition of temperature**
- Right cost

# Temperature requirement for vaccine

- Vaccines are sensitive **biological products**.
- Some are sensitive to **freezing**, some to **heat** and some to **light**.
- **Potency of the vaccine**: Ability to adequately protect vaccinated person.
- Potency of vaccine can diminish if exposed to inappropriate temperature.
- Process irreversible and accelerated if proper storage conditions are not adhered to.
- Wastage of resources.

# Sensitivity to heat and freezing

Group A	OPV
Group B	Influenza
Group C	IPV, JE(Freeze dried), Measles, MR, MMR
Group D	Cholera, Pentavalent, Hib (Liquid), Rota Virus (Liquid & Freeze dries), Rubella (Freeze dried)
Group E	BCG, HPV, Tetanus, TD and Td
Group F	Hepatitis B, Hib(Freeze dried), Meningococcal A Pneumococcal

**Most Heat Sensitive**



**Least Heat Sensitive**

- Most freeze dried vaccines rapidly lose potency after reconstitution.
- Multi dose vials should be kept at temperature between 2 °C to 8°C during immunization session.

# Vaccines sensitive to freezing

- Cholera
- Pentavalent
- Hexavalent ( IPV added)
- Hib ( Liquid)
- H P V
- IPV
- Influenza
- Pneumococcal
- Tetanus, DD, Td
- Rota virus ( Liquid and Freeze dried)

**All such vaccines should be protected from sub- zero temperature**

# Sensitivity to Light

- Some vaccines are very sensitive to light.
- Such vaccines lose their potency when exposed to light.
- **BCG, Measles, MR vaccine, MMR vaccine and Rubella vaccine**
- Such vaccines are supplied in **dark glasses** which give them some protection.

# Cold Chain Equipments

## Storage

### Electrical :

- Walk in Cooler(WIC)
- Walk in Freezer(WIF)
- Ice Lined Refrigerator (ILR)
- Deep Freezer(DF)
- Domestic refrigerator

### Solar :

- Solar refrigerator battery drive
- Solar refrigerator direct drive

### Non electrical :

- Cold Box
- Vaccine carrier

## Transportation

- Refrigerated Vaccine Van
- Insulated vaccine Van
- Cold Box
- Vaccine Carrier
- Day Carrier



# Walk in Cooler (WIC)

- Installed at govt. state and regional level vaccine stores.
- Two identical cooling units, a standby generator with auto start and stop function.
- Provided with alarm system.
- Stores large quantities of UIP vaccines .
- Can store vaccines for 3 to 4 months.



# Walk in Freezer

- Installed at national, state and regional level vaccine stores.
- A cold room with two identical refrigeration units with a standby generator for uninterrupted power supply.
- Maintains temperature between - 15 °C to – 25 °C .
- Used for bulk storage of **OPV** and preparation of frozen ice pack for vaccine transportation.



# Deep Freezers

- At district 300 L and at PHC level 140 L.
- Temp :-  $-15^{\circ}\text{C}$  to  $-25^{\circ}\text{C}$
- Only for the preparation of ice packs at PHC.
- OPV can be stored from district and above.
- Little or low holdover time than ILR In case of power failure.
- 20-25 icepack can be prepared by at PHC with continuous electric supply of 8 hour.



## C. Ice Lined Refrigerators(ILR)

- Both at district 330 L and Sub district levels 140 L
- Temp :- +2°C to +8°C
- ILR's are **top opening**, can hold cold air inside better than front opening refrigerators.
- **Lined by tubes or ice packs** filled with water which freeze and keep internal temp at safe level .
- It can keep vaccine safe with 8 hours of continuous electric supply in a 24 hours period.

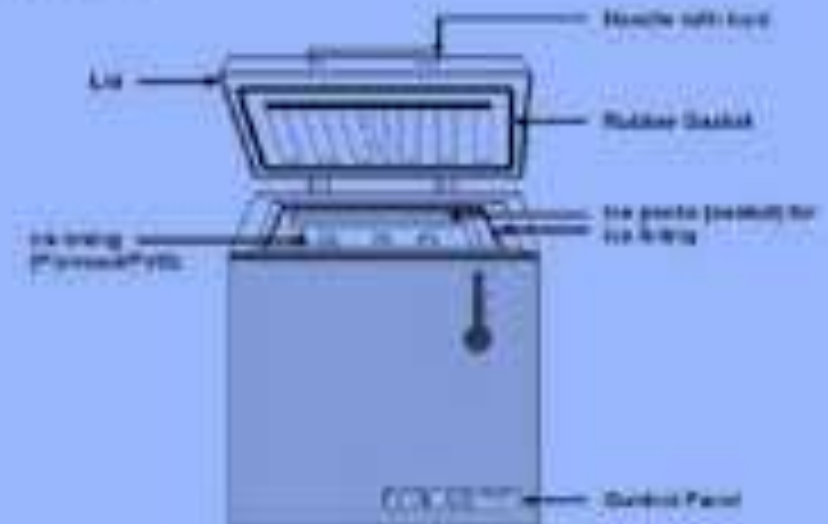


# ILR



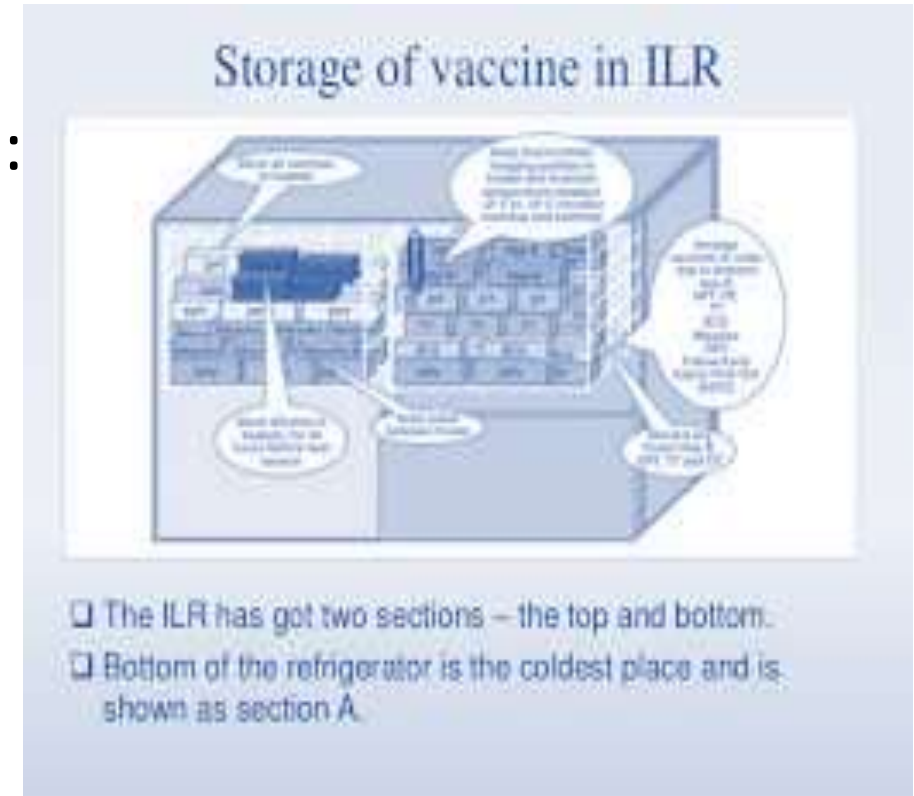
## Ice lined refrigerator(ILR)

- Both at district and PHC levels
- Temp  $\approx$  +2°C to +8°C



# Vaccine arrangement in ILR

- Vaccines are kept in baskets.
- Arrangement of vaccine order top to bottom:
  - Hepatitis B
  - Pentavalent, DPT, TT
  - BCG with diluents
  - Measles with diluents
  - OPV



- Discard any frozen Hepatitis B, Pentavalent, DPT and TT vaccines.
- Keep spaces between boxes.

# Holdover Time of ILR/DF

- Defined in the event of power failure.
- Time taken by the equipment to raise the inside cabinet temperature from its temperature at power cut to the maximum temperature limit of its recommended use.
- In case of ILR, if  $+4^{\circ}\text{C}$  is temp at power cut , then time taken to raise temp at  $+8^{\circ}\text{C}$ .
- Depends on ambient temp, frequency of opening of lid, quantity of vaccines inside and condition of icepacks inside.

# Dial Thermometer

- It is kept inside of ILR and DF
- Temperature is recorded twice a day.
- At the time transport of vaccines it is kept in cold box.
- Nowadays these equipment come with digital thermometers.
- Temperature can be recorded without opening ILR/DF.

Dial Thermometer for using deep Freezer/ILR under Cold Chain system



Confirm WHO-Unicef standard



# Dos and Donts for the use of ILR/ DF

## DOs:

- Keep the equipment in cool room away from direct sunlight and at least 10 cms away from the wall.
- Keep the equipment levelled and fix it through voltage stabilizer.
- Keep vaccines neatly with space between the stacks for circulation of air.
- Keep the equipment locked and open only when necessary.
- Defrost periodically.
- Supervise the temperature record.
- If vaccines are kept in cartons, make holes on the sides of the cartons for cold air circulation.

## DON'Ts :

- Do not keep any object on these equipments
- Do not store any other drug
- Do not keep drinking water or food in them
- Do not keep more than one months requirements at PHC level
- Do not keep date expired vaccines.

# Transporting Equipment

```
graph TD; A[Transporting Equipment] --> B[Cold boxes]; A --> C[Vaccine carriers]; A --> D[Day carriers];
```

*Cold  
boxes*

*Vaccine  
carriers*

*Day  
carriers*

# Vaccine Van

- Transportation of vaccines from Regional centers to districts
- From districts to PHCs



# Cold Box

- Used for transport of vaccines.
- Fully frozen ice packs are placed at bottom and sides.
- DPT, TT, DT should not be kept in direct contact with frozen ice packs.



# Vaccine Carrier

- Used to carry small quantity of vaccines(16 to 20 vials)
- For out of reach sessions.
- 4 fully frozen icepacks are used.
- Temp is + 2°C to + 8°C
- Vaccines are kept in a plastic bag.
- Lid is closed tightly.



# Ice Packs

- It contains water & no salt should be added to it.
- The water should be filled up to the level marked on the side.
- If there is leakage such icepack should be discarded.



## Vaccine Vial Monitor(VVM)

**VVM** is a label containing heat sensitive material that is placed on a vaccine vial to register heat exposure over time



***Vaccine vial  
monitor***



### Stage 1

- Inner square lighter than outer circle

### Stage 2

- Inner square still lighter than outer circle

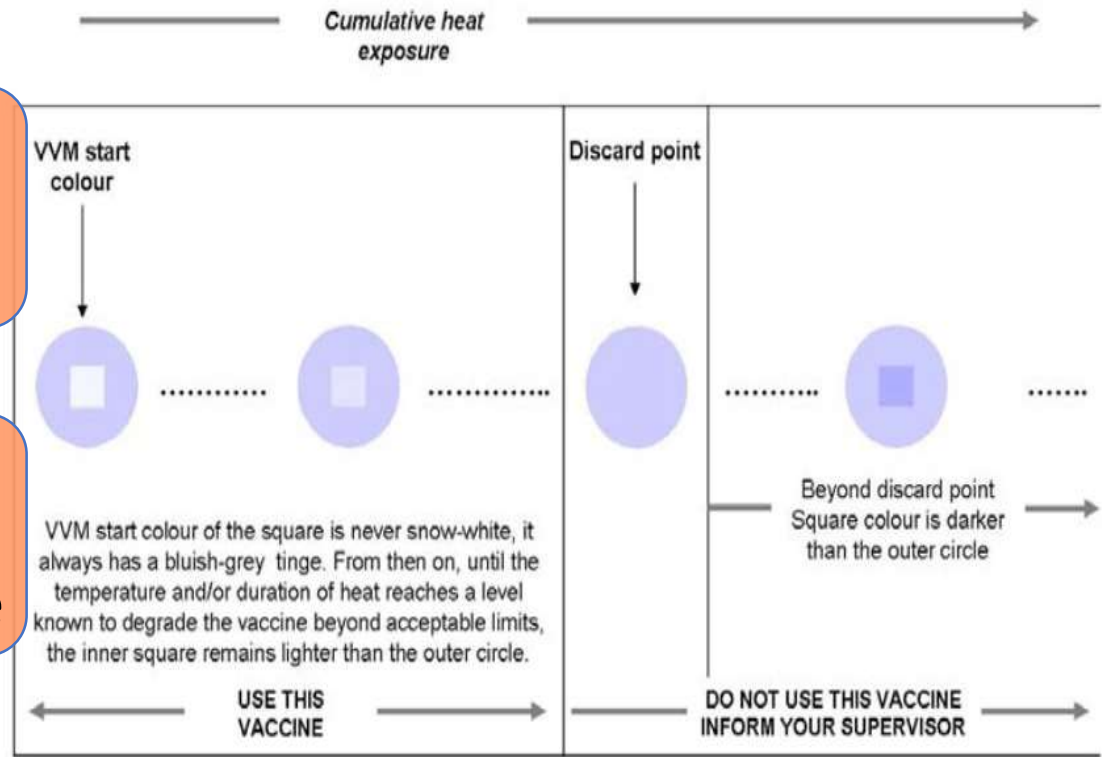
### Stage 3

- Color of inner square matches the outer circle

### Stage 4

- Color of inner square darker than outer circle

✓ Combined effects of time and temperature cause the inner square to darken gradually and irreversibly  
✓ VVM does not directly measure the vaccine potency but gives info about the main factor that affects potency



# Shake test

For cold injury

VACCINE  
NEVER FROZEN

VACCINE FROZEN  
AND THAWED

Immediately after shaking

smooth  
and  
cloudy



Not smooth  
You can see  
granular  
particles



30 minutes after shaking

starting to  
clear

no sediment



almost  
clear

thick  
sediment



USE THIS VACCINE

DO NOT USE  
THIS VACCINE

# Open Vial Policy

- It allows reuse of partially used mult idose vails in subsequent sessions up to 4 weeks.
- To reduce the wastage of vaccines.
- Since 2015
- Applies only for DPT , TT, Hepatitis B, OPV and liquid Pentavalent vaccines.
- Does not apply to BCG, Measles and JE vaccines.
- Previously opened vials were discarded at the session site only.

# Precautions in Open Vial Policy

- At the end of session , all open vials should be returned to cold chain point (PHC).
- Vaccines are stored strictly at appropriate temperature both during transport and storage point.
- At storage point, open vials should be segregated from other vaccines.
- Expiry date has not passed.
- VVM has not reached discard point.
- Aseptic precautions while withdrawing all remaining doses.
- All open vials of BCG, Measles and JE should be discarded after 48 hours or before next session , whichever is earlier.

# Adverse Events Following Immunization

- Any untoward medical occurrence which follows immunization and which does not necessarily have a causal relationship with the usage of the vaccine.
- Any unfavorable or unintended sign, abnormal laboratory finding, symptom or disease.
- Common, minor reactions (Local reaction : pain, swelling, redness)
- Rare, more serious reactions.

# Cause Specific Types of AEFI

- Vaccine product-related reaction
- Vaccine quality defect-related reaction
- Immunization error-related reaction (formerly "programme error")
- Immunization anxiety-related reaction
- Coincidental event

# Rare Serious Adverse Events

Vaccine	Reaction
BCG	Suppurative adenitis, BCG Osteitis, Disseminated BCG infection
Hib	None known
Hep B	Anaphylaxis
Measles/MMR	Febrile Seizures, Thrombocytopaenia, anaphylaxis
OPV	Vaccine associated paralytic polio
Tetanus	Brachial Neuritis, anaphylaxis, sterile abscess
DPT	Persistent (>3 hrs) inconsolable crying, seizures, hypotonic hypo-responsive episode, anaphylaxis/shock
Japanese Encephalitis	Serious allergic reaction, neurological event