Childhood Immunization

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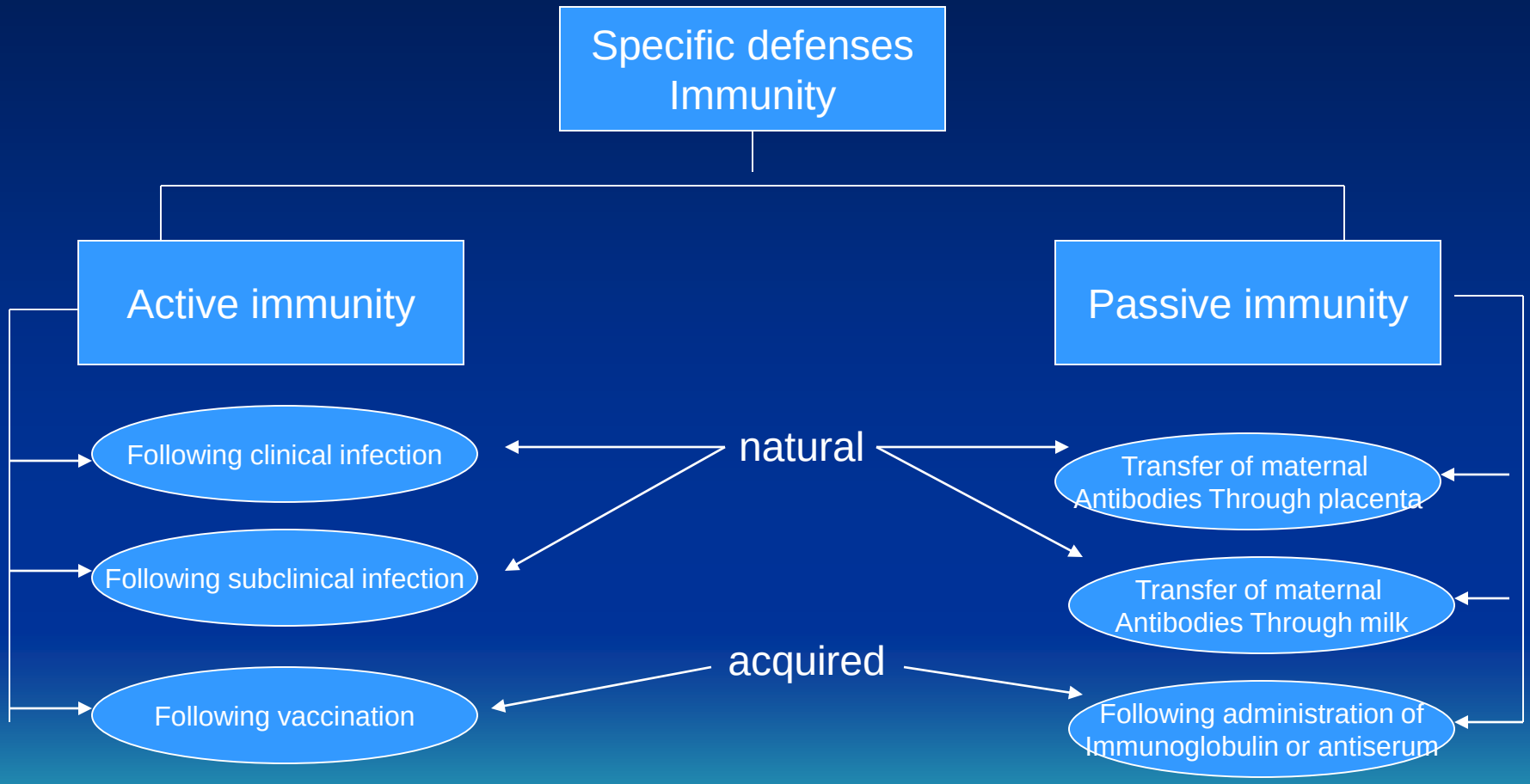
Childhood Immunization

- Definitions & General Concepts
- Safety of Immunization
- Standards for immunization practices.
- Cold chain and hazards of immunization

Definitions

- Vaccination : means having a vaccine – that is actually getting the injection
- Immunization: The process of inducing immunity artificially. means both receiving a vaccine and becoming immune to a disease, as a result of being vaccinated

Immunity


Specific defenses
Immunity
Active immunity
Passive immunity
Following clinical infection
Following subclinical infection
Following vaccination
natural
acquired
Transfer of maternal
Antibodies Through placenta
Transfer of maternal
Antibodies Through milk
Following administration of
Immunoglobulin or antiserum

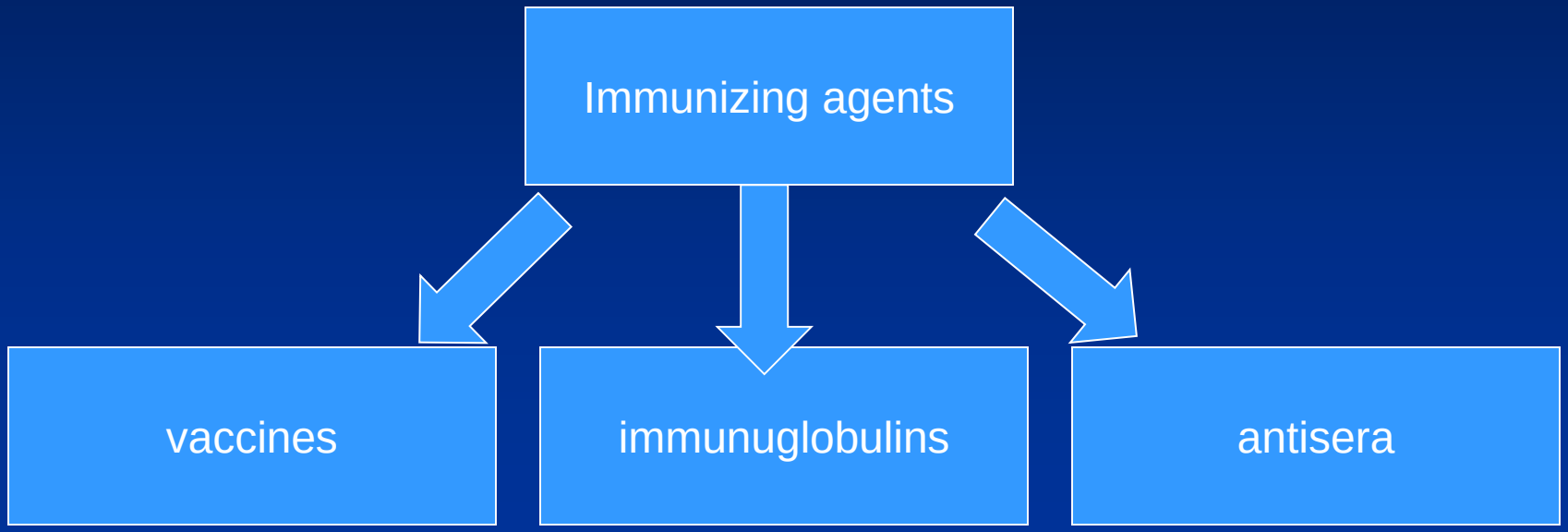
Active immunity

- Resistance developed in response to stimulus by an antigen (infecting agent or vaccine) and is characterized by the production of antibodies & cellular elements by the host.

Passive immunity

- Immunity conferred by an antibody produced in another host. It may be acquired naturally (Transplacental transmission) or artificially (through an antibody-containing preparation).

Immunizing agents



Immunizing Agents:

- Vaccine: A preparation of proteins , polysaccharides, or nucleic acids that are delivered to the immune system as single entities, part of a complex,or by live attenuated agents to induce specific responses that inactivate , destroy or suppress the pathogen.

Immunizing Agents

- Toxoid : A modified bacterial toxin that has been made non-toxic but retains the capacity to stimulate the formation of antitoxin like DT vaccines.

Antitoxin : An antibody derived from the serum of humans or animals after stimulation with specific antigens ,used to provide passive immunity like Diphtheria ,Tetanus

Immunoglobulins

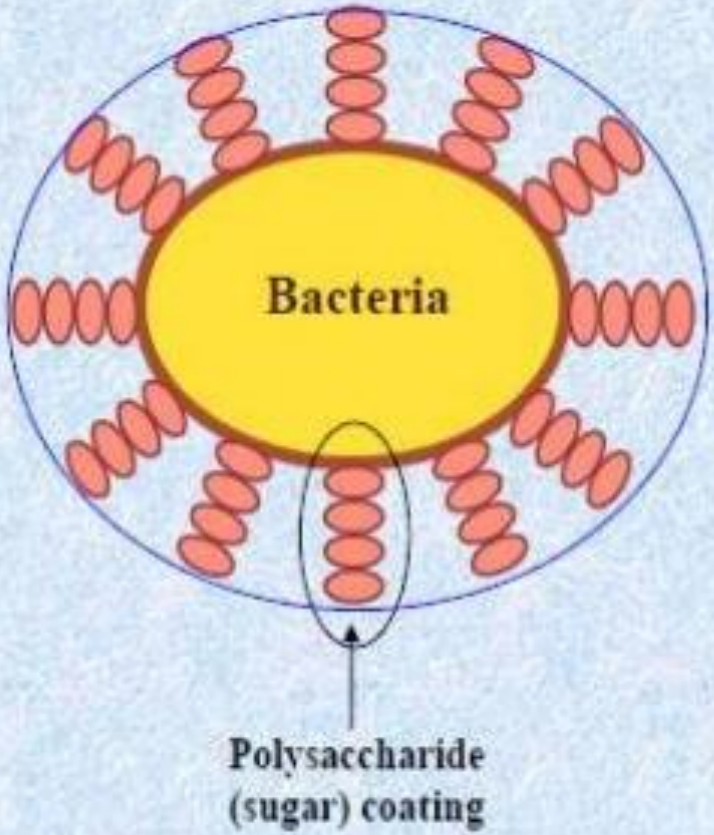
- There are 5 major classes: IgM, IgA, IgG, IgE, IgD.
- Two types of human immunoglobulin preparations are available for passive immunization:
  - Normal human immunoglobulin e.g. hepatitis A , measles Ig (IM) , and Botulism (IV)
  - Specific (hyper-immune) human Ig i e.g. hepatitis B and Varicella

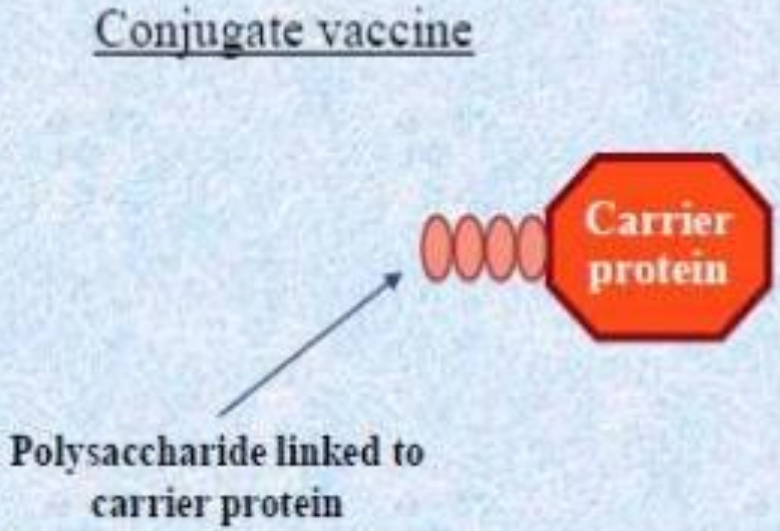
What is the other use of Igs ?

Types of vaccines

- Attenuated live vaccines
- Inactivated (killed vaccines)
- Toxoids
- Polysaccharide and polypeptide (cellular fraction) vaccines
- Surface antigen (recombinant) vaccines.
- Conjugate vaccines

Conjugation





Conjugation is the process of attaching (linking) the polysaccharide antigen to a protein carrier (e.g. diphtheria or tetanus) that the infant's immune system already recognises in order to provoke an immune response

Types of vaccines

Live Attenuated vaccines	Killed Inactivated vaccines	Toxoids	Cellular fraction vaccines	Recombinant vaccines	Conjugate vaccines
•BCG •Typhoid oral •Plague •Oral polio •Rota v •Yellow fever •Measles •Mumps •Rubella •Varicella •Intranasal Influenza	•Hepatitis A •Typhoid •Cholera •Pertussis •Plague •Rabies •Salk polio •Intra-muscular influenza •Japanise encephalitis	Diphtheria Tetanus	•Meningococcal polysaccharide vaccine •Pneumococcal polysaccharide vaccine •Hepatitis B polypeptide vaccine	•Hepatitis B vaccine	•Haemophilus Influenza b, pneumococcal, meningococcal vaccines •Vi conjugate typhoid v

Safety of Immunization:

- Vaccine administration:
  - Disposable syringes vs.reusable glass syringes.
  - 70% alcohol solution
  - All vaccines containing an adjuvant should be given IM to avoid granuloma or necrosis.
  - Given in the antlat. Of thigh < 18 months, deltoid or triceps in older children
  - Aqueous vaccines may be given IM , SQ , ID

Vaccine factors

- It is safe to administer many combinations of vaccines simultaneously.
- Inactivated vaccines can be given together or at any time after different vaccines.
- Live-virus vaccines, if not on the same day , should be given at least 30 days apart.
- Ig does not interfere with killed vaccines.
- Ig can interfere with the immune response to measles & varicella vaccines, it should be administered at least 2 wk after measles vaccine.

Time intervals between vaccine doses

- 2 or more killed vaccines No minimum interval . Doses of same killed vaccine 4 weeks apart, 8 weeks for PCV
- Killed and live vaccines No minimum interval . 2 or more live vaccines 4 week minimum interval if not administered simultaneously
- Immunoglobulin and live vaccines 3 months or more

Host Factors:

- Healthy Children:
  - Minor acute illnesses, with or without fever , are not contraindications to vaccination.
  - Moderate to severe febrile illness may be a reason to postpone vaccination - can be giving with precaution
  - Routine P/E and Taking Temp are not necessary in healthy children.

Catch-up vaccination:

- vaccine series does not need to be restarted, regardless of the time that has elapsed
- Depend on type of vaccine , age and the level of acquired protection
- If level of protection is inadequate following HBV a series of 3 doses should be repeated

Children with Chronic Illnesses

- Most chronic diseases are not contraindications to vaccination
- Premature Infants should be immunized according to their chronological age ,not gestational age. (except birth dose of hepatitis B, if mother is HB -ve & infant < 2 kg at birth defer until 30 days of age)
- Vaccine doses should not be reduced for preterm or LBW infants.
- Pertussis v. can be giving with precaution in those with a progressive CNS disorder.

Immunodeficient Children

- Congenital Immunodeficient children: may not be vaccinated with live vaccines
- Other vaccines may be safe , yet they may fail to evoke a proper immune response.
- Children with cancer, on steroids ,or Immunosuppressive agents are not to receive live vaccines.
- HIV : MMR are recommended except in severe immunodeficiency ,OPV & BCG are not (? Rota v), other vaccinations in Libyan schedule should be giving.

Periods of maintained immunity due to vaccines

- Short period (months): cholera vaccine
- Three to five years: DPT vaccine
- Five or more years: BCG vaccine
- Ten years : yellow fever vaccine , hep. A
- Solid immunity: measles, mumps, rubella .

Levels of effectiveness

- Absolutely protective(100%): yellow fever vaccine
- Almost absolutely protective (99%): measles, mumps, rubella , hep. A , diphtheria and tetanus toxoids.
- Highly protective (80-95%): polio, BCG, Hepatitis B, and pertussis vaccines.
- Moderately protective (40-60%) cholera vaccine, and influenza killed vaccine.

previous Vaccination schedule of Libyan children

Visit No.	Age	Vaccines (dose)
First	At birth	BCG HBV polio
Second	At two months	• OPV • DPT+ Hib v + HBV (penta)
Third	At four months	• OPV • DPT+ Hib v + HBV (penta)
Fourth	At sixth months	• OPV • DPT+ Hib v + HBV (penta)
Fifth	At 12 months	• MMR
Sixth	At 18 months	• DPT (Booster1) • OPV (Booster1) • MMR
Seventh	At school entry (6 years)	• DT (Booster2) • OPV (Booster2) • ACYW135 (meningococcal v)
eighth	12 years	•OPV
Ninths	15 years	•Td

The DPT + Hib + HBV vaccine is a penta vaccine and is given in one dose.

New Vaccination schedule of Libyan children

Visit No.	Age	Vaccines (dose)
First	At birth	BCG HBV OPV
Second	At two months	IPV + HBV + DTaP+ Hib + Rota + PCV
Third	At four months	IPV + HBV + DTaP+ Hib + Rota + PCV
Fourth	At sixth months	IPV + HBV + DTaP+ Hib + Rota
Fifth	At nine months	OPV A,C,Y,W135 (meningococcal)
Sixth	At 12 months	MMR PCV A,C,Y,W135 (meningoc.)
Seventh	At 18 months	DTaP OPV MMR
Eighth	At school entry (6 years)	Td + OPV + meningococcal v
Ninths	15 years	Td + OPV+ HPV(3 doses)

The DTaP + Hib + HBV+IPV vaccine is a Hexa vaccine and is given in one dose.

Haemophilus Influenza b, pneumococcal, and meningococcal vaccines are conjugated vaccines

Routes of administration

- Deep subcutaneous or intramuscular route (most vaccines)
- Oral route (sabine vaccine),Rota v
- Intradermal route (BCG vaccine)
- Intranasal route (live attenuated influenza vaccine)

Certain available vaccines and their routes of administration

Vaccine	Type	Route
BCG	Live-attenuated mycobacterial	Intradermal
DTaP	D&T = Toxoids aP = detoxified components from *Bordetella* pertussis	Intramuscular
Hep. B (HBV) , hep A	Inactivated viral antigen	Intramuscular
Hib , peumococcus & meningiococcus	Polysaccharide	Intramuscular
MMR & varicella	Live attenuated viruses	Subcutaneous
OPV & Rota v	Live attenuated virus	Oral

BCG = Bacillus Calmette – Guerin vaccine (tuberculosis).
DTap = Diphtheria, tetanus and acellular pertussis vaccine.
MMR = Live measles, mumps and rubella viruses in a combined vaccine.
OPV = Oral Poliovirus vaccines containing attenuated poliovirus types 1,2 and 3
Hib = Haemophilus Influenza b

Contraindications to vaccinations:

- **Absolute**
- **Temporary**

Contraindications to vaccines

Absolute

1- general contraindication for all vaccines is anaphylactic reaction to a prior dose.

2-Contraindication of subsequent pertussis vaccines are: encephalopathy (e.g., coma, decreased level of consciousness, prolonged seizures) not attributable to another identifiable cause within 7 days of administration of a previous dose pertussis v.

Contraindications to vaccines

Temporary:

1. Severe illness that needs hospitalization,and usually deferred in children with moderate to severe acute illnesses

2. Some Immunosuppression disorder.

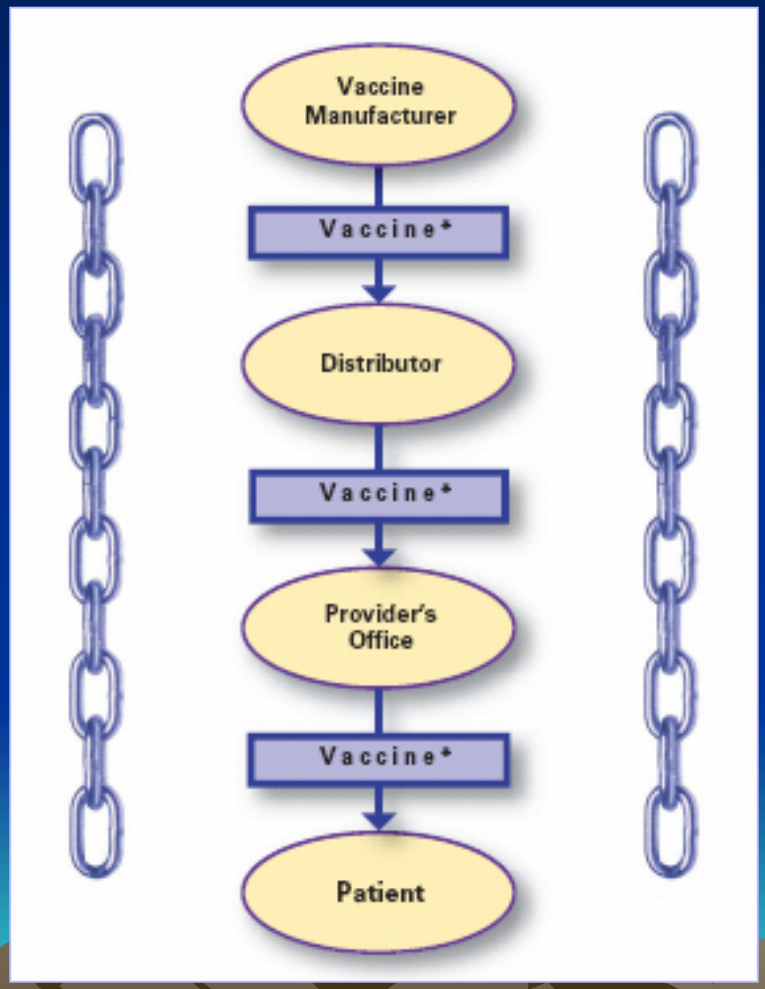
3. Recent receipt of blood or immunoglobulin.

4. Pregnancy.

The Cold Chain

- The "cold chain" is a system of storage and transport of vaccines at low temperature from the manufacturer to the actual vaccination site.
- The cold chain system is necessary because vaccine failure may occur due to failure to store and transport under strict temperature controls.

Cold Chain



Vaccines must be stored properly from the time they are manufactured until they are administered to your patients

Manufacturer to distributor
Distributor to office
Office to Child

Cold Chain Equipment

- *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 vaccine storage"

refrigerators

Cold room

Freezer

Cold chain equipment

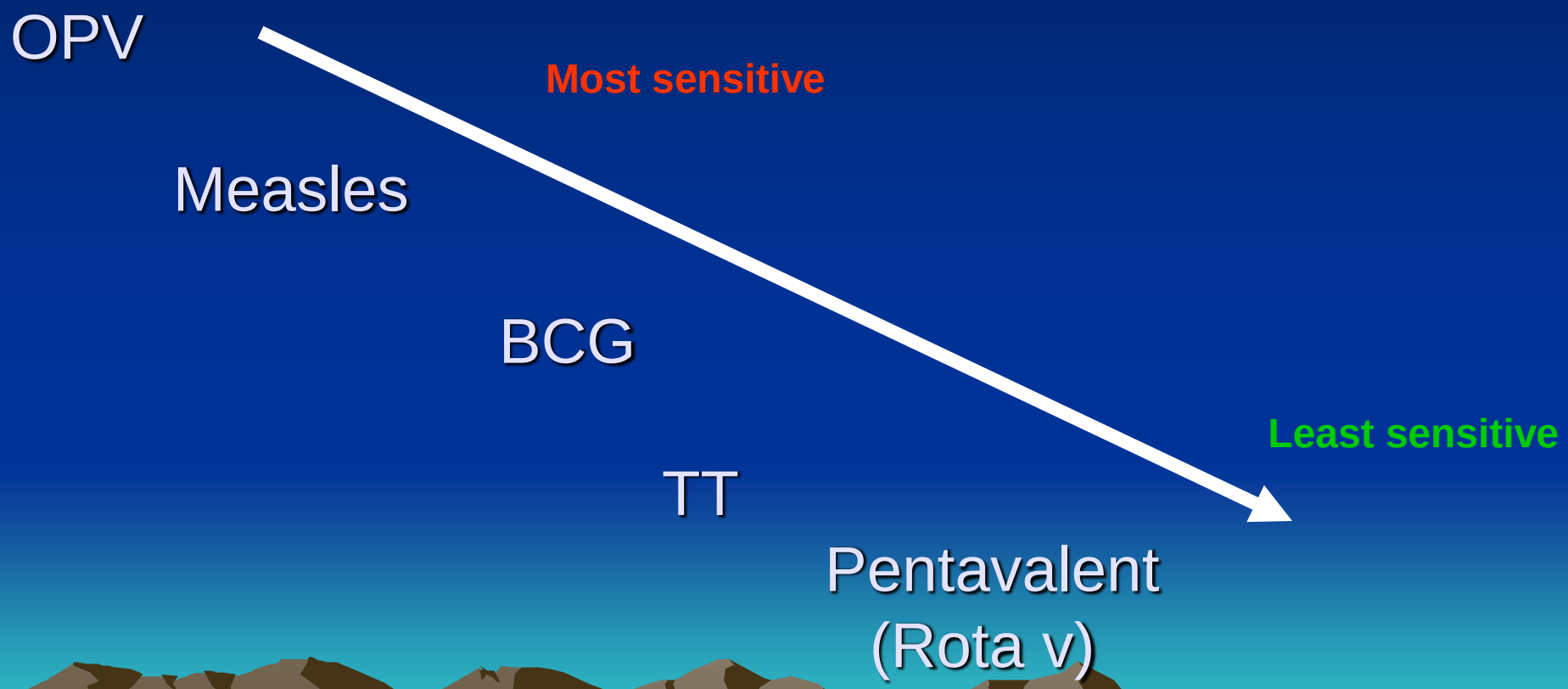
"for transporting vaccine"

Cold box

Vaccine carrier

Ice bags

Vaccines sensitive to heat



HAZARDS OF IMMUNIZATION

- No immune response is entirely free from the risk of adverse reactions or remote squeal. The adverse reactions include:

1. *Reactions inherent to inoculation*
2. *Reactions due to faulty techniques*
3. *Reactions due to hypersensitivity*

1. ***Reactions inherent to inoculation:***

- local reactions: pain, swelling, redness, tenderness and development of a small nodule or sterile abscess at the site of injection.

- General reactions :fever, malaise, headache and other constitutional symptoms. Most killed bacterial vaccines (e.g., typhoid) cause some local and general reactions. Diphtheria and tetanus toxoids and live polio vaccine cause little reaction.

- ***2. Reactions due to faulty techniques:***

Faulty techniques may relate to

- faulty production of vaccine (e.g. inadequate inactivation of the microbe, inadequate detoxication),
- Unproper dose,
- improper immunization site or route,
- vaccine reconstituted with incorrect diluents,
- wrong amount of dilute used,
- vaccine prepared incorrectly for use (e.g., an adsorbed vaccine not shaken properly before use),
- vaccine or dliluent contaminated,
- vaccine stored incorrectly,
- contraindications ignored (e.g. a child who experienced a severe reaction (like anapmylaqxis) after a previous dose of vaccine is immunized with the same vaccine),
- reconstituted vaccine of one session of immunization used again at the subsequent session.

- ***3. Reactions due to hypersensitivity:***

- Administration of antisera (e.g., ATS) may occasionally give rise to anaphylactic shock and serum sickness.

- The symptoms may appear within a few minutes of injection or may be delayed up to 2 hours.

Immunization : *WHY IT IS IMPORTANT ??*

- Immunization is a remarkably successful & very cost effective means of preventing infectious diseases.
- A leading achievement of public health
- It is either to prevent primary infection or secondary consequences of infection

THANK YOU