

# CHILDHOOD IMMUNIZATION

# IMMUNIZATION

- What is Immunization?

Is the process of inducing immunity against a specific disease.

Types of immunization:

- Passive immunization
- active immunization



# PASSIVE IMMUNIZATION

- Is the administration of preformed antibodies to induce transient protection against an infectious agent.

Natural passive immunity: transplacental transfer of maternal antibodies during pregnancy can provide protection for infants in the first few months.



# PASSIVE IMMUNIZATION

- Indications:
  - Immune deficiency
  - Prophylactically: Post exposure prophylaxis
  - Therapeutically: when a disease already present-suppressing the effect of a toxin or the inflammatory response



# PASSIVE IMMUNIZATION

- Types:
  - Intramuscular IG
  - Intravenous immunoglobulin
  - Hyperimmune globulins
  - Monoclonal antibodies



# INTRAMUSCULAR IG

- It is a concentrated antibody-containing solution prepared from large pools of human plasma.
- Primarily consists of Ig G
- Indications:
  - Prophylaxis for: • Hepatitis A • Measles
  - Immunoglobulin deficiency
- Side Effects:
  - Anaphylaxis
  - Local inflammatory reaction



# INTRAVENOUS IMMUNOGLOBULIN

- Prepared from adult plasma donors.
- Predominantly IgG
- Indications:
  - Prevention of serious bacterial infections in HIV and chronic B-cell leukemia.
  - immune deficiency disorders
  - treatment of Kawasaki disease
  - Immune mediated thrombocytopenia
  - prevention of infection after BM Tx
  - TSS, GBS and anemia caused by B19



# INTRAVENOUS IMMUNOGLOBULIN

- Side effects:
- Infusion rate related: fever, headache, myalgia, chills, nausea and vomiting.
- Anaphylactoid reaction.
- Thromboembolic disorders.
- Aseptic meningitis.
- Renal insufficiency.





# HYPERIMMUNE GLOBULINS

- Prepared from donors with high titers of antibodies to specific agents.
- Available for:
  - Hepatitis B
  - Infant botulism
  - Rabies
  - Tetanus
  - CMV
  - Varicella-zoster



# MONOCLONAL ANTIBODIES

- Antibody preparations against a single antigen.
- Indications:
- Palivizumab: prevention of severe RSV infection in certain high-risk children.
- Side effects: anaphylaxis and hypersensitivity reactions



# ACTIVE IMMUNIZATION

- The administration of all or part of a micro-organism or a modified product of that organism (toxoid or purified antigen) to evoke an immunologic response that mimics that of the natural infection but usually presents little or no risk for the recipient.
- Vaccines: whole or parts of microorganisms administered to prevent an infectious disease.



# TYPES OF VACCINES

- Live vaccines :

- produce active immunity by causing a mild infection. A virulent organism is weakened so that it produces an antigenic response without serious consequences.

- included:
    - BCG
    - Oral Polio
    - MMR
    - varicella
    - Rotavirus
    - flu



# TYPES OF VACCINES

- Killed/Inactivated Vaccines :
- They are prepared from virulent organisms or pre-formed antigens inactivated by heat, phenol, formaldehyde or any other means. Vaccines included:
  - Pertussis
  - Cholera
  - Influenza
  - Injectable Polio
  - Rabies
  - Hep A



# TYPES OF VACCINES

- Toxoid: a modified bacterial toxin made nontoxic but able to induce immune response against the toxin.
- toxoid: tetanus and diphtheria.



# TYPES OF VACCINES

- Parts of the organism: a cellular pertussis, HPV, and Hep B
- Polysaccharide capsules: pneumococcal, meningococcal and salmonella typhi
  - Polysaccharide capsules conjugate to protein carriers: Hib, pneumococcal and meningococcal.



# IMMUNIZATION SCHEDULE IN JORDAN

Age	vaccine
1 <sup>st</sup> contact	BCG
2 month	<b>DaPT1 IPV1+Hib+1HepB1</b>
3 month	<b>DaPT2 IPV2+Hib2+HepB2+OPV</b>
4 month	<b>DaPT3 IPV3+Hib3+HepB3+OPV</b>
9 month	<b>Measles + OPV</b>
12 month	<b>MMR1</b>
18 month	<b>DPTbooster1 +OPV booster1 +MMR2</b>





# RECOMMENDED IMMUNIZATION SCHEDULE AAP AND CDC

**FIGURE 1: Recommended immunization schedule for persons aged 0 through 6 years—United States, 2012 (for those who fall behind or start late, see the catch-up schedule [Figure 3])**

Vaccine ▼	Age ►	Birth	1 month	2 months	4 months	6 months	9 months	12 months	15 months	18 months	19–23 months	2–3 years	4–6 years	
Hepatitis B <sup>1</sup>	Hep B		HepB			HepB								Range of recommended ages for all children
Rotavirus <sup>2</sup>				RV	RV	RV <sup>2</sup>								
Diphtheria, tetanus, pertussis <sup>3</sup>				DTaP	DTaP	DTaP	see footnote <sup>8</sup>		DTaP				DTaP	
<i>Haemophilus influenzae</i> type b <sup>4</sup>				Hib	Hib	Hib <sup>4</sup>		Hib						Range of recommended ages for certain high-risk groups
Pneumococcal <sup>5</sup>				PCV	PCV	PCV		PCV				PPSV		
Inactivated poliovirus <sup>6</sup>				IPV	IPV	IPV							IPV	
Influenza <sup>7</sup>						Influenza (Yearly)								
Measles, mumps, rubella <sup>8</sup>								MMR		see footnote <sup>9</sup>			MMR	Range of recommended ages for all children and certain high-risk groups
Varicella <sup>9</sup>								Varicella		see footnote <sup>9</sup>			Varicella	
Hepatitis A <sup>10</sup>								Dose 1 <sup>10</sup>					HepA Series	
Meningococcal <sup>11</sup>								MCV4 — see footnote <sup>11</sup>						



# IMMUNIZATION GUIDELINES

- Vaccine administration:
  - Volume/ dose: all pediatric doses are 0.5 ml
  - Preferred sites:
- less than 18 month old: anterior lateral thigh
- Toddlers: Anterolateral thigh or deltoid
- Adolescents and young adults: Deltoid
  - Route: IM or SC
  - Simultaneous administration



# BCG(BACILLE CALMETTE GUERIN)

- live, weakened strain of mycobacterium bovis.
- R.O.A: Intradermal.
- Dose: 0.05ml<12 mo 0.01ml>12 mo.
- Site: The recommended site of injection (all age groups) is the deltoid.
- Efficacy: 0-80% for lung TB. 75-86% for Meningitis and Miliary TB.
- Duration of Immunity: 10-15yrs
- Complications :
  - Erythema Nodosum
    - Deep abscess and ulceration
    - Axillary and Supraclavicular lymphadenopathy
    - Koch's phenomenon
- Contraindications :
  - Neonates with an immuno-deficiency.
    - Neonates receiving cortico-steroids.
    - Neonates born to a mother with HIV or suspected HIV
    - Neonates with a significant fever.
    - Neonates with a generalised septic skin condition.
    - Preterm infants.



# POLIO VACCINE

- They are divided into:  
Live Attenuated Oral Polio Vaccine(OPV-Sabin) Injectable Polio Vaccine (IPV-Salk)  
Both vaccines contain type I,II and III strains.
- Efficacy: 95-99%
- Duration of Immunity: Lifelong if boosted.



	OPV	IPV
Potency	Low (needs 4 or more doses)	High (needs 2 or 3 doses)
VAPP	1 case/2.5 million doses	None
Intestinal immunity	High (community protection)	Low (individual protection)
Secondary immunization	Yes	No
Extra injection	No	Yes
Possible combination vaccine	Unlikely	Likely
Risk of escape of wild virus	Non-existent	Possible (if produce with wild virus seeds)
Price	Low	High
Injection safety	No issue	A risk

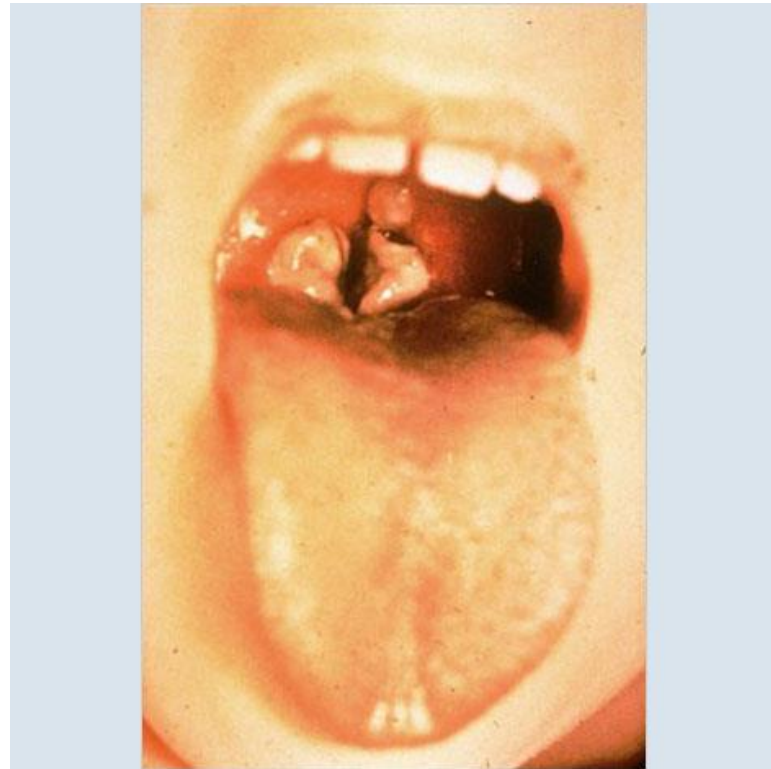
# DPT( DIPHTHERIA, PERTUSSIS, TETANUS)

- The vaccine contains toxoid of diphteria and tetatnus with a suspension of killed whole bacillus pertussis.
- 3 doses of 0.5ml given IM at 4-8 weeks interval starting at 6 weeks. Booster given 1 yr after 3rd dose and another between 4-6 yrs of age.



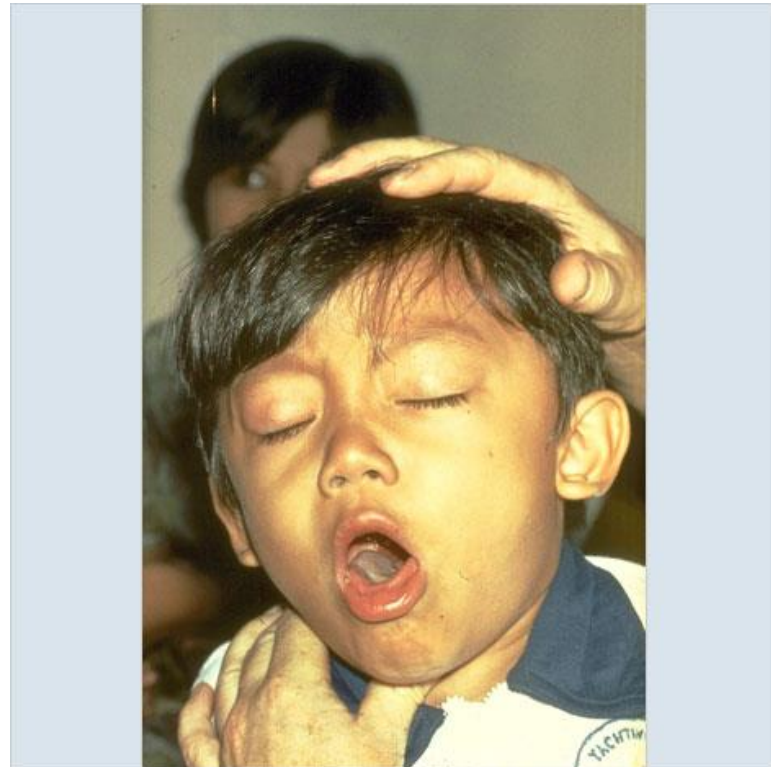
# DIPHTHERIA TOXOID:

- It is prepared by formaldehyde inactivation of diphtheria toxin adsorbed onto aluminum salts to increase its antigenicity. Protects against diphtheria toxin.
  - Dose: 0.5ml Site: IM
  - Efficacy: 87%
  - Duration of Immunity: 5 yrs.
  - Complications: Nil
  - Special Considerations :  
Diphtheria-Tetanus(DT) is used when Pertussis vaccine is contraindicated. Td(Tetanus-Diphtheria) is used in persons 7 years of age or older



# DPT( DIPHTHERIA, PERTUSSIS, TETANUS)

- Pertussis : It is used against Bordatella Pertussis.
- Dose:0.5ml
- Site: IM
- Efficacy: 80%
- Duration of Immunity: Decreases with time
- Complications: Acute Encephalopathy ( 1 in 110,000 )  
Permanent neurological sequelae( 1 in 310,000)
- Contra-indications: Family history of convulsions. Family history of Sudden Infant Death syndrome  
Family history of adverse events following DPT administration
- Acellular vaccine less Local reaction, less Systemic, less Anaphylaxis, less Seizures, less HHE, less Temp 105F, less crying for more than 3 hrs.





# TETANUS TOXOID(TT)

- It is prepared by inactivating the toxin by formaldehyde.
- TT is stable at room temperature and can survive for few weeks at 37 degrees.
- Dose: 0.5ml
- R.O.A: IM
- Efficacy: 95%
- Duration of Immunity: 5 years
- Complications : • Gullian Barre Syndrome(GBS)
  - Anaphylaxis
  - Brachial Neuritis



# HEPATITIS B VACCINE

- The vaccine consists of a purified inactivated sub-unit of the Hepatitis virus. It is non-infectious.
- Dose: 0.5ml < 19yrs 1ml > 19 yrs
- R.O.A: IM
- Site: Deltoid muscle - Children and Adolescents. Anterolateral thigh – Neonates & Infants
- Efficacy: 95%
- Complications: Fever Swelling Headache Weakness
- Contraindications • Severe allergic reactions after previous dose.



# HEPATITIS B VACCINE

- Special Considerations :
- If mother is HBsAg +ve :
  - First dose: 0.5ml Hep B Ig within 12 hrs after birth & Hep B vaccine at a separate site.
  - Second dose: 1-2 months
  - Third dose: 6 months

Infants should be tested for Anti-HBs. If +ve Vaccination effective , If -ve test for HbsAg If +ve infant is chronic carrier, If -ve Repeat tests at 0,1 & 6months followed by anti-HBS 1 month after 3rd dose.



# HEMOPHILUS INFLUENZA TYPE B(HIB)

- It is a conjugated vaccine developed against Hemophilus influenza type B bacteria.
- Given in combination with DPT at 6,10 and 14 weeks. Booster given at 18 months.
- Dose: 0.5ml
- R.O.A: IM
- Efficacy: 95-100%
- S.E: Temporary local inflammatory reaction
- C.I: Anaphylaxis



# PNEUMOCOCCAL VACCINE

- It is the current vaccine against Strep Pneumoniae. Composed of capsular antigens 7,9 & 23 serotypes.
- Types: 1) Conjugated –PCV13(Prevenar) & PCV10(Synflorix)  
2) Polysaccharide- PPSV 23

Dose: 0.5ml

R.O.A: IM or SC

Efficacy: 55-57%

C.I: Severe allergic reaction to previous dose.

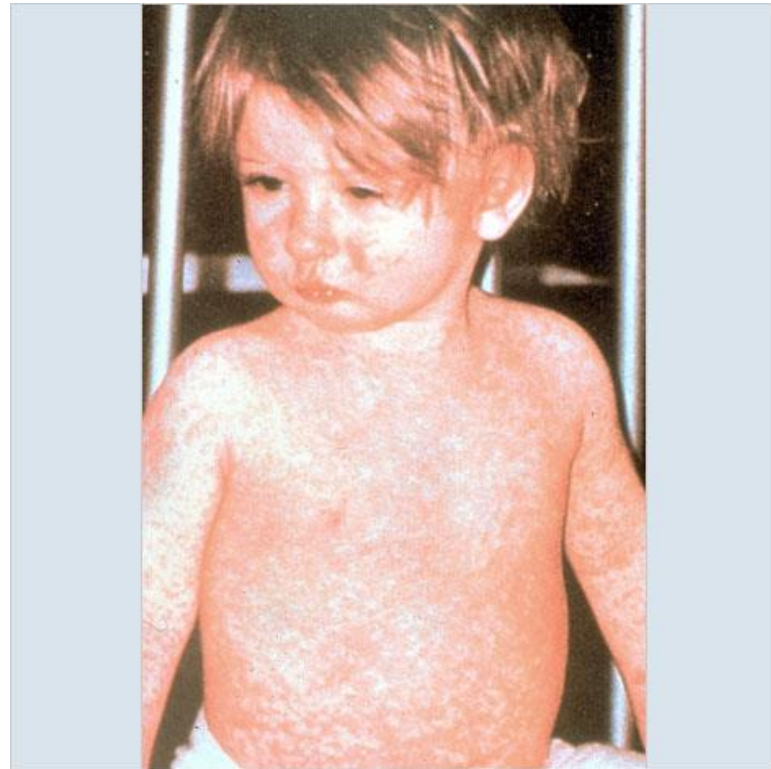


## Comparison between PCV and PPSV

<b>PCV10 &amp; 13</b>	<b>PPSV23</b>
Conjugated	Polysaccharide
Immunogenic from 6 weeks -5 years of age	Immunogenic after the age of 2 years
S.E: Drowsiness Fever Loss of appetite	Muscular pain Inflammatory reaction
Herd immunity +ve	No herd immunity

# MEASLES

- • It is a live, attenuated vaccine prepared from multiple measles strains. It is available as: - Monovalent and in combinations (MMR , MMRV).
- Dose: 0.5ml
- R.O.A: S/C
- Efficacy:>85% at 9 months of age >90% at 12 months of age
- Duration of Immunity: Lifelong
- S.E: Mild febrile illness  
Morbiliform rashes  
Encephalitis
- C.I: Immunodeficiency  
Pregnancy Neomycin  
Resistance





# MMR(MEASLES, MUMPS, RUBELLA)

- live, attenuated , combination vaccine that protects against all three viruses.
- R.O.A: S/C
- Dose: 0.5ml Two doses are recommended, at 1 yr and 4-6yrs of age respectively. Minimum dose interval : 28 days
- Efficacy: 75-90%
- Duration of Immunity: 95% after the first dose, life long long after the second.
- Complications:
  - 10% of children will develop fever, malaise & rashes 5-21 days after vaccination.
  - 3% develop joint pain lasting 18 days on average.
  - Aseptic meningitis is a rare complication.
- Contraindications :Severe Allergic reaction after previous dose, Immunodeficiency , long term immunosuppressive therapy and Pregnancy





# MMR(MEASLES, MUMPS, RUBELLA)



# ROTAVIRUS

- It is a live attenuated oral vaccine.
- Available as Rotarix and Rotateq
- Min age for 1st dose: 6wks-14wks & 6 days Dose Interval: 4 weeks.
- Max age for 2nd dose: 8 months
- R.O.A: Oral
- Efficacy: 61.2%
- Complications: Hypersensitivity to previous dose
- C.I: Intussusception



# INFLUENZA VACCINE

- Available as a shot or nasal spray.
- Two types: -Seasonal inactivated flu vaccine -Seasonal live attenuated intra-nasal vaccine
- Min age: 6 months 2 doses in a 4 wk interval for first time vaccinators under 3 yrs of age, followed by 1 dose each year.
- Efficacy: 60%
- S.E: Local inflammatory reaction, Rhinorrhea, wheezing (for Nasal spray) Dyspnea Weakness
  - **Contraindications** : severe allergy to chicken eggs
  - severe reaction to the vaccine in the past
  - Guillain Barre Syndrome (GBS) after a prior dose of flu vaccine
  - People with moderate or severe illness



# INFLUENZA VACCINE

- Who should not get vaccinated with the nasal spray? (They should get the flu shot instead.)
  - Adults 50 years of age and older or children from 6 through 23 months of age.
  - Children younger than 5 years with asthma or one or more episodes of wheezing within the past year.
  - Pregnant women.
  - People who have certain long-term health problems, muscle or nerve disorders, or a weakened immune system.
  - Anyone in close contact with someone whose immune system is so weak they require care in a protected environment.
  - Children or adolescents on long-term aspirin treatment.



# MENINGOCOCCAL VACCINE

- Composed of quadrivalent A,C,W-135 and Y capsular polysaccharides.
- Given after the age of 2 years.
- Dose: 0.5ml
- R.O.A: S/C
- Duration of Immunity: 5 years
- S.E: pain , redness , swelling , Fever for 1-2 days .
- Can be given as 2 doses 3 months apart at 3 months of age in endemic areas.
- Contraindications : Sensitivity to mercury and history of GBS



# VARICELLA VACCINE

- It is a live attenuated virus administered to protect against Chicken Pox caused by Varicella Zoster virus.
- 1st dose at 12-15 months and 2nd dose 4-6 years
- Dose: 0.5ml
- R.O.A: S/C
- Efficacy: 98% after 2 doses.
- S.E: Inflammatory Reaction Mild Rash
- C.I: Pregnancy Gelatin allergy High dose steroid users Chemotherapy



# HEPATITIS A VACCINE

- Inactivated Hep A
- Doses: At 1 year and 2nd dose 6 months after 1st dose
- Doses are 720 ELU 1 -18 year of age • And 1440 ELU 19 years and older
- For post exposure prophylaxis. IG(0.02ml/kg) given within 2 weeks after exposure and is effective up to 85% in preventing Hep-A up to 3 months  
Available as Twinrix (Hep A+Hep B) for age 18 years and above

