

## CHAPTER – 2 Social Pharmacy

### Topic: VACCINE

#### 2.1

#### INTRODUCTION

Vaccine is an antigenic substance prepared from the causative agent of a disease or a synthetic substitute, used to provide immunity against one or several diseases. The administration of vaccine capable of evoking an immune response against specific antigen thereby making the individual immune to it and protected from contracting the disease. This practice is known as vaccination/ Immunization.

Generally, vaccine contains the resemble microorganism or chemical substances (toxins, surface protein etc.) in inactive/killed form.

During the vaccination, vaccines are injected in the body, after that it behaves as an antigen or foreign substance to the body, so our body work against this substance and produced the antibodies create an immunity. It is called that **primary response** against disease.

After that immunity are developed and stored in the memory cells of the brain regarding to the previous infections. In future any similar infections are cause then our immune system give rapid response and fight against disease this is called **secondary response** by producing antibodies.

#### 2.2

#### ROLE OF VACCINES

Vaccines play a major role in prophylactic and therapeutic role in many diseases.

**1. Antigen:** — Antigen are those substances that stimulate the immune system to produce antibodies (protective body). It behaves like foreign particles (bacteria, virus) for recipient body and cause undesirable changes, then recipient body protects itself by producing the antibodies.

**2. Antibody:** —Antibody is the proteinaceous protective modification produced by the immune system in response to the presence of the foreign substances like bacteria, viruses etc and neutralize their activities. It is also called immunoglobulin and each molecule contains four peptide chains, two small called light chains and two heavy chain/longer chain (H2L2)

#### 2.3

#### HISTORY OF VACCINE

The term vaccine derives from Edward's Jenner 1796 use of the term cow pox (Latin: Vacca – Cow) which, when administered to humans, provided them protection against small pox. Louis Pasteur- 1885, generalised Jenner's vaccines idea by developing a rabies vaccine.

The development of more effective and even safer vaccines as well as developing vaccines for more diseases that are serious is always ongoing. Vaccine formulations affect how they are used, how they are stored, and how they are administered.

There are four types of vaccines, categorized by the antigen (inactive microbes, toxins, surface protein) used in their preparation.

**1. Live attenuated vaccine (LAV):** -- Live attenuated vaccines (LAV) is prepared by pathogens (virus or bacteria) which causes the infections or disease, that have been weakened under laboratory condition. Live microorganisms provide continual antigenic stimulation giving sufficient time for memory cell production. Due to their weak activity it cause no or very mild disease.

Example-- Tuberculosis (BCG), Oral polio vaccine (OPV), Measles, Rotavirus, Yellow fever.

**2. Inactivated vaccine (Killed vaccine):** -- Inactivated vaccines are prepared by the method of killing antigens through the physical or chemical processes. These killed organisms cannot cause risk of inducing the disease and they are also considered more stable than LAV vaccines.

Example-- Whole cell pertussis, Inactivated polio virus (IPV)

**3. Subunit vaccine (Purified antigen):** —Subunit vaccines contains the antigenic parts (disease causing portion) of antigen. Like inactivated vaccine it also not contains the live components of antigen, it is only contains the antigenic parts like surface protein, conjugated chemicals, polysaccharide etc. Example-- Acellular pertussis, Haemophilus influenza type b Pneumococcal, Hepatitis B.

**4. Toxoid vaccine (Inactivated Toxoid):** -- Toxoid vaccines are based on the toxin produced by certain bacteria (e.g. tetanus or diphtheria). Released toxin is used to prepare the vaccine and these parts are necessary to elicit a protective immune response and produce antibody. Example-- Tetanus Toxoid (TT), Diphtheria Toxoid.

On the basis of components vaccine are also divided into two parts: —

**a) Monovalent and polyvalent vaccine:** A monovalent vaccine contains a single strain of disease causing specific antigen. **Example:** Measles vaccine while, Polyvalent vaccine contains two or more strains/serotypes of disease-causing specific antigen. Example — OPV

**b) Combination vaccine:** In combination vaccine many antigen are combined in the single injection that can prevent different diseases or that protect against multiple strains of infectious agents causing the same disease. **Example:** Combination vaccine DPT (Diphtheria, Pertussis and Tetanus antigens)

**2.5****IDEAL CHARACTERISTICS OF VACCINE**

- Not cause any allergic reaction.
- Easily administrable without any harm.
- Easy to store not shows any incompatibility with storage materials.
- Easily available and low economic value.
- Not cause any disease condition and rapidly produces antibody effects.

**2.6****IMPORTANCE OF IMMUNIZATION PROGRAMMES**

- Each year vaccines prevent more than 2.5 million child deaths globally. An additional 2 million child deaths could be prevented each year through immunization with currently available vaccines.
- For example, between 2000 and 2008, vaccination reduced global deaths from Measles by 78% (from 750 000 deaths to 164 000 deaths per year)
- There are now over 30 vaccine preventable diseases of the more than 400 known pathogens that are harmful to man.

S.No	Vaccine	Prevents	Minimum Age for Dose 1	Interval Between Dose 1 & Dose 2	Interval Between Dose 2 & Dose 3	Interval Between Dose 3 & Dose 4	Interval Between Dose 4 & Dose 5
1	BCG	TB & bladder cancer	Birth				
2	HepB	Hepatitis B	Birth	4 weeks	8 weeks		
3	Poliovirus	Polio	Birth	4 weeks	4 weeks		
4	DTP	Diphtheria, Tetanus & Pertussis	6 weeks	4 weeks	4 weeks	6 months (Booster 1)	3 years (Booster 2)
5	Hib	Infections caused by Bacteria	6 weeks	4 weeks	4 weeks	6 months (Booster 1)	
6	PCV	Pneumonia	6 weeks	4 weeks	4 weeks	6 months (Booster 1)	
7	RV	Severe Diarrheal Disease	6 weeks	4 weeks	4 weeks		
8	Typhoid	Typhoid Fever, Diarrhea	9 weeks	15 months (Booster 1)			
9	MMR	Measles, Mumps & Rubella	9 weeks	6 months			
10	Varicella	Chickenpox	1 year	3 months			
11	HepA	Liver disease	1 year	6 months			
12	Tdap	Diphtheria, Tetanus & Pertussis	7 years				
13	HPV	Some Cancers & Warts	9 years	For Child aged 9-14 years: 6 months. For Child aged 15 or more: 1 month	For Child aged 15 or more: 5 months		