RIA, ELISA, It’s Principle, Applications!!

RIA (RADIO IMMUNOASSAY)

DISCOVERY
In 1960, S.A Benson and Rosalyn Yalow introduced radioimmunoassay (RIA) into clinical medicine as a practical method for the quantitation of plasma insulin levels.

REQUIREMENT
- Radio labelled antigen (Gama ray emitting iodine $^{125}$I)
- Unlabeled antigen
- High affinity Ab.

PRINCIPLE
RIA involves the competitive binding of a radiolabelled antigen to a high affinity antibody. the antigen is generally labelled with Gama ray.

PROCEDURE
1. The labelled antigen is mixed with the abs at a concentration that saturated the antigen binding sites of the antibody molecule.
2. Added increasing amounts of an unlabeled antigen of unknown concentration.
3. Labelled and unlabeled antigens compete for the available binding sites on the antibody molecule.
4. With increasing concentration of the unlabeled antigen, more labelled antigen will be displayed from the binding sites.
5. Precipitation of a useful of antigen reaction.
6. Antigen antibody complex precipitate.
7. Separation of free and bound radio labelled antigen.
8. Count of bound radiolabelled antigen by precipitation of radiolabelled antigen antibody complex with an antiserum to the antibody of the complex thus the unbound radiolabelled antigen is left in the supernatant.

**APPLICATION OF RIA**

- RIA is used in the assay drugs like digitoxin, morphin, barbifurate, amphetamine.
- Analysis of vitamins like riboflavin, folic acid.
- Analysis of hormone like aldosteron, insulin, growth hormone, thyroxin.

**ELISA (ENZYME LINKED IMMUNOSORBENT ASSAY)**

**DISCOVERY**

In 1972, Engvall and Perlmann discovered Enzyme Linked Immunosorbent Assay (ELISA).
This method is based on the conjugation of an enzyme covalently to an antibody which is specific for a cellulose or tissue antigen.

**MATERIAL USED**

- Enzyme (alkaline phosphate)
- Antigen (beta galactosidase)
- Primary Antibody
- Enzyme linked secondary antibody.

**PRINCIPLE**

- Use an enzyme to detect the binding of antigen, antibody.
- Enzyme converts a colorless substrate to color product indicating the presence of antigen antibody binding.

**TYPES OF ELISA**

There are three types of ELISA. Which are given below:

1. Indirect ELISA: Detection of antibody.
2. Sandwich ELISA: Detection of

**1. INDIRECT ELISA**

Antibody are quantitatively determined with an indirect ELISA.
PROCEDURE

- Serum or some other sample containing primary antibody (Ab\textsubscript{1}) is added to an antigen coated microtiter.
- Allow them to react with antigen
- Primary antibody washed out
- Presence of antibody bound to the antigen detected by adding enzyme conjugated secondary antibody (Ab\textsubscript{2}).
- Free secondary antibody then washed out.
- Substrate for the enzyme then added.
- Amount of colored reaction product was formed detected by specialized spectrophotometric plate readers.

APPLICATION

It detects serum at antibodies against human immunodeficiency virus (HIV), causative against AIDS.

2. SANDWICH ELISA

In this technique antigen can be detected or measured.

Antibody is immobilized on a microtiter well.

PROCEDURE

- Sample containing antigen is added to immobilized antibody.
- Allow them to react.
- The well is washed out.
- Then second enzyme linked antibody specific for different epitope of antigen is added.
3. COMPETITIVE ELISA

Antigen is measured by competitive ELISA technique.

PROCEDURE

- Antigen is first incubated in solution with sample containing antigen.
- Antigen antibody mixture added to antigen coated microtiter well.
- Added enzyme conjugated secondary antibody.
- Add substrate and color product is measured.

APPLICATION OF ELISA

- Detection of HIV antibodies in blood sample.
- Detection of hepatitis B.
- Detection of rota virus in faces
- Detection of mycobacterium antibodies in tuberculosis.

This is the simple notes on RIA and ELISA.
Antigen-Antibody Reactions, It’s Different Techniques!!

ANTIGEN ANTIBODY REACTIONS

Antigen antibody reaction is a biomolecular, reversible and specific association. Every antibodies are able to specifically recognize a wide variety of antigen molecule for interaction with varying affinities.

Various type of non covalent interaction may contribute to antibody to bind with antigen.

For example:

- Electrostatic forces.
- Hydrogen bonds.
- Vander waals forces.
- Hydrophobic interactions.
Noncovalant interaction involve antigenic determinant or epitope of the antigen and variable region of antibody molecule.

**DIFFERENT TECHNIQUES OF ANTIGEN ANTIBODY REACTION**

1. **AGGLUTINATION REACTION**

**PRINCIPLE**

Agglutination is an antigen antibody reaction in which an antibody interacts with particular antigen to form a visible clumping (agglutination).

**TECHNIQUES**

Agglutination has two step that results in formation stable lactic network.

- **Sensitilazation**
  
  This reaction involves antigen antibody combination through single antigenic determinants on the particle surface.

- **Lactic formation**

  It involves formation of cross links that form the visible aggregates.

  This represents the stabilization of antigen antibody complexes with the binding together of multiple antigenic determinant.
**APPLICATIONS**

- Identification of cultures. Example: Salmonella
- Blood grouping
- Diagnosis of infection diseases.
- Measure levels of certain therapeutic drugs, hormones and plasma proteins.

2. **IMMUNOELECTROPHORESIS**

Immunoelectrophoresis is a technique where antigen mixture is first electrolized to separate its components by charge.

**PRINCIPLE**

On the basis of the difference in surface charge between the different protein molecules of antigens, several antigens can be separated from a mixture by electrophoresis in agar gel.

**TECHNIQUES**

Immunoelectrophoresis combines electrophoresis with immunodiffusion.

This is performed by two stages.

**Stage 1**

- Antigen mixture is placed in a well cut agar gel on slide or plate.
- Electric current is passed through the agar for sometimes.
- Antigen migrate and get separated from each other according to their clearages.

**Stage 2**

- A tough is cut in the gel parallel to the direction of migration of antigen and filled with antibody.
- Allow to diffuse for some time.
- Antigen antibody diffuse and formed precipitation are
where antibodies encounters the antigens in optimal proportion.

APPLICATIONS

- Useful in determination of presence and absence of serum protein.
  Example: Albumin, Immunoglobulin.
  - Useful in detection of useless protein like human myeloma.
  - Detect high antibody concentration.

TYPES OF IMMUNOELECTROPHORESIS

1. ROCKET IMMUNOELECTROPHORESIS

- This is a qualitative method.
- Antigen antibody complexes precipitate to form cone like structure (look like a rocket)
- Length of cone indicator the concentration of antigen.
- Negatively charged antigen are need for electrophoretic movement within agar matrix.
2. COUNTER CURRENT IMMUNOELECTROPHORESIS

PRINCIPLE

Antigen carrying negative charge migrate towards opposite pole and positively charged antibody towards negative pole.

TECHNIQUES

- Antigen and homologus antibody placed in separate agar gel.
- Through which elective current passed.
- Line of precipitation appears where two meat in 30 – 60 min.

APPLICATION

- Useful in detection hepatitis B. Example: abs
- Detection of DNA a in SLE antibodies.

3. WESTERN BLOTING

PRINCIPLE

Western bloting based on the principles of immunochromatography where proteins were separated into poly
acrylamide gel according to their isoelectric point and molecular weight.

**MATERIAL NEEDED**
- SDS polyacrylamide gel (SDS-PAGE)
- Sodium dodecyl sulphate (SOS)
- Protein
- Radiolabeled or enzyme linked polyclonal or monoclonal antibody nitrocellulose membrane.
- Known antigen.

**PROCEDURE**
- Known antigens of well defined molecule.weight are separated by SDS-PAGE.
- Then blotted onto nitrocellulose.
- Separated bonds of known antigens are probed with the sample.
- That contains antibodies specific for one or more of these antigens.
- Reaction of an antibody with band is detected by using radiolabelled enzyme linked secondary antibody,that are specific for the antibodies of test sample.

**APPLICATION**
- Widely used in detection of HIV.

This is the general notes on Antigen Antibody Reactions and Its Different Techniques.

Thank You.
Vaccine Or Vaccination, It’s Types !!

VACCINE

Vaccine the word derived from cowpox (cow means “vacca” in Latin)

Vaccine is biological preparation. It contains an agent that resembles a disease-causing microorganism & is often made from killed forms of microbe, its toxins or one of its surface proteins.

The agent stimulates the body’s immune system to recognize the foreign antigen & destroy it

CHARACTERS OF VACCINE

1. Vaccines should be able to recognize the important difference between activation of the humoral and cell-mediated immune response
2. Vaccines should be able to develop immunological memory
3. Vaccines should be most effective against infection
TYPES OF VACCINE

Most commonly used vaccines are two types

1. Live but attenuated bacterial cells or viral particles
2. Inactivated viral or bacterial vaccines

Attenuated viral and bacterial vaccines

This vaccine is produced by reducing virulence microbe.

Microbe can no longer cause disease but retain their capacity for transient growth within an inoculated host.

Examples

1. Vaccines of tuberculosis was developed from attenuated strains of Mycobacterium bovis
2. Rubella vaccines from attenuated strain of rubella virus
3. Sabin polio vaccine developed from attenuated viral strain

Inactivated viral or bacterial vaccine

Vaccines are produced by using inactive microbes.

Microbes are inactivated by heat or by chemical means so that they are no longer capable of replication in the host.

Examples

1. Whooping cough vaccine
2. Salk polio vaccine
3. HIV vaccine

VACCINATION

N 1796 Edward Jenner used the term vaccination.

Individuals inoculated with cowpox (Variola vaccina) were protected against smallpox.
In 1885 Louis Pasteur created the first successful vaccines against rabies.

**IMMUNIZATION**

Vaccination is a type of immunization

Immunization is a process by which the body is prepared to fight against a specific disease. It is used to induce the immune response that protects the body to a specific disease.

Immunizations are two types

1. passive immunization
2. Active immunization

**PASSIVE IMMUNIZATION**

When immunity is acquired by receipt of preformed antibodies rather than by active production of antibodies after exposure to antigen is called passive immunization.

**Example**

1. Transfer of maternal antibodies across the placenta to fetus.
2. Passive immunization through maternal antibodies to diphtheria, tetanus, mumps, poliovirus, and streptococci give protection to the developing foetus
3. It is also achieved by injecting preformed antibodies to the recipient
ACTIVE IMMUNIZATION

When immunity achieved by natural infection with a microorganism or that can be acquired artificially by administration of a vaccine is called active immunization.

Example

1. Proliferation of T cell & B cell results in the formation of memory cells
2. Child receives active immunization when vaccine prevents an infectious disease by activating the bodies’ production of antibodies that can fight off invading bacteria or virus.

IMPORTANCE OF VACCINATION

1. Vaccine provide protective immunity & immunological memory to individuals against any infectious disease
2. It stimulate both cell mediated & humoral immunities

PRINCIPLES OF VACCINATION

1. The primary goal in vaccination is to provide protective immunity by inducing a memory response to an infectious microorganism using a nontoxic antigen preparation
2. Cell mediated immunity induced by vaccination is important particularly in preventing intracellular bacterial & viral infections & fungal infections
3. Ultimate goal of any immunization program is the eradication of the disease

VACCINATION FOR CHILDREN
This is the general notes on Vaccine and Vaccination.

Thank You.

T Cell,B Cell, It’s Property, Functions!!

Lymphocytes are most important white blood than other white blood cell circulating in the blood and lymph.

The most abundant lymphocytes are

1. B-lymphocytes (b cell)
1. T-lymphocytes (t cell)

PROPERTY OF B LYMPHOCYTE/B-CELL

1. B cells are produced in the bone marrow & matured in the bursa of fabricius in birds and secondary lymphoma in human.
2. Each b cell specific for a particular antigen
3. B cell differentiated into memory b cell & effectors b cell
4. Specific binding site for antigen resides in b cell as BCR
5. Essential component for adaptive immune response
6. Memory b cell remembers the same pathogen for faster antibody production in future infection.

FUNCTIONS OF B-CELL

1. Main function of b cell is to produce antibodies against antigen
2. Perform the role of antigen presenting cell
3. Play important role in humoral immune response

IMPORTANCE OF B-CELL

1. Responsible for the maintenance of cellular & humoral protective memory
2. Provide link between innate & adaptive immunity
3. Promote and maintain abnormal activities in a number of autoimmune diseases
4. Important component of regular immune response

DEVELOPMENT & MATURATION

1. When self reactive b cell receptor is expressed in the bone marrow negative selection of the self reactive immature b cells occurs.
2. The selected cells are deleted by apopthesis to produce non self reacting membrane immunoglobulin.
3. B cells reactive with self antigens encounters in the periphery are rendered anergic.

B CELL ACTIVATION

1. Immunoglobulin on b cell surface recognizes and attach to antigen, which then internalized & processed.
2. Within B cell a fragment of the antigen combines with HLA class II
3. HLA class II antigen fragment complex displayed on B cell surface
4. Receptor on the helper T cell recognizes complex of HLA class II & antigen fragment then activate and producing cytokines which activate the B cell
5. B cell activating by cytokines and begins clonal expansion. some of the progeny become antibody producing cells.
PROPERTY OF T LYMPHOCYTE / T CELL

1. T lymphocyte arises from bone marrow but they migrate to thymus gland to mature.
2. Helps in cell mediated immunity
3. T cell has unique antigen binding molecules called t cell receptor (TCR) on its membrane
4. T cell cannot recognise free antigen only recognize those antigen which are bound with particular cell membrane protein MHC (Major Histocompatibility Complex)
5. T cells includes CD3 & CD4 or CD8, polypeptide complex on their membrane
6. Helper t cell with membrane glycoprotein CD4 are restricted to recognise those antigen bound to class II MHC molecules & cytotoxic t cell with CD8 are restricted to recognise antigen bound to class I MHC molecules on antigen presenting cells.

TYPES OF T CELL

1. Memory T cell: Remain inactive until future exposure to same antigen
2. Killer T cell: combine with antigen, cause lysis of foreign cells, release cytokines
3. Helper T cell: help to activate other T cell or B cell
4. Delayed hypersensitivity/ cytotoxic t cell: Release cytokine

T CELL ACTIVATION

1. Helper t cell activation is initiated by interaction of the TCR–CD3 complex with a peptide–MHC complex on an antigen presenting cell
2. Activation also requires the activity of accessory molecules including co receptor CD4 & CD8
This is the general NOTES ON T Cell & B Cell.

Thank You.

**Structure, Antibody Types !!**

**ANTIBODY**

Antibody is a glycoprotein that is produced in response to the administration of an antigen & can recognize & bind to the specific site of antigen that caused its production.

From the experiment by A. Tiselius & E.A Kibat (1939), it is proved that antibodies contained gamma globulin fraction, so it is called Immunoglobulin.

Site of antibody where epitope of antigen bind is called paratope.
**DISTRIBUTION**

1. In vertebrate antibodies distributed in plasma, mucosal secretion & intestinal fluid of tissues.
2. Within B lymphocytes antibody present in cytoplasm membrane – bound compartments (ER, Golgi complex).
3. Present on surface as integral protein.
4. In blood antibody present in serum.

**TYPES OF IMMUNOGLOBULIN**

1. Monoclonal antibody
2. Polyclonal antibody

**MONOCLONAL ANTIBODY**

Monoclonal antibodies were produced in mice & described by Köhler & Milstein et al.

Monoclonal antibodies are single type antibody they are identical and are directed against a specific epitope, produced by a single hybridoma cell line or by B cell clone of a single parent.

Exhibit greater specificity

May provide lower background since less cross-reaction with other proteins.

**APPLICATION OF MONOCLONAL ANTIBODY**

1. Deep vein thrombosis
2. Location of 1° & 2° metastatic tumors
3. Pregnancy testing kits
4. Detected protein either by blooting or immune flu to science
5. Cardiovascular diseases

**TYPES OF MONOCLONAL ANTIBODY**

1. **Murine MAb:** Rodent MAb with excellent affinities lead to immune complex hypersensitivities or allergic response
2. **Chimeric MAb:** Chimer combines the human constant regions with rodent variable region
3. **Humanised MAb:** Rodent variable region combine with human variable region, contain CDRs of rodents
4. **Human MAb:** Fully human antibody that’s lead to minimized immunogenicity, improved serum half-life

![Types of monoclonal antibodies](img)

**ADVANTAGE OF MONOCLONAL ANTIBODY**

1. Unlimited supply
2. High specificity

**DISADVANTAGE**

1. More time required in development (4-6 months)
2. High cost of development.
POLYCLONAL ANTIBODY

Polyclonal antibodies made by injecting animals with peptide antigens & then after stimulation of secondary immune response antibodies are isolated from whole serum.

It is heterogeneous mix of antibodies that recognize several epitopes.

Produced by different B cell clones

Polyclonal antibody generated in a variety of animal like rabbit, goat, sheep, horse etc. Rabbit is most commonly used animal for generating polyclonal antibodies.

ADVANTAGES OF POLYCLONAL ANTIBODY

1. Inexpensive to produce, require 1 mg of antigen
2. Short turnaround time
3. Multiple host species
4. Broad utility

DISADVANTAGE

1. Limited availability
2. Difficult to reproduce

STRUCTURE OF IMMUNOGLOBULIN

1. The Y shaped structure of immunoglobulin molecule is formed by two kind of polypeptide chain, heavy chain
(70Kd) & light chain (24 Kd) with variable (v) & constant (c) region or domain.

2. Variable parts of one heavy chain & one light chain form antigen binding site.

3. Light chain & heavy chain linked together by disulfide bonds

4. Both light chain & heavy chain have amino terminal. Variable region (100-110 amino residues) and car boxy terminal constant region.

5. Heavy chain & light chain are folded into domain contain 110 amino acid residues

6. Immunoglobulin contains proline rich residues between CH1 & CH2, is called hinge region (10-60 amino acid residues) give flexibility in this region.

7. As per amino acid sequencing, light chain are two types kappa(k) and lamda

8. Heavy chain is five types

**STRUCTURAL DIFFERENCES BETWEEN SECRETED IMMUNOGLOBULIN AND MEMBRANE IMMUNOGLOBULIN**

Membrane bound lg & secreted lg differ from each other by amino acid sequence of the carboxy terminal end of the heavy chain constant region.
In secreted lg, sequence of last constant region of heavy chain terminates with charged & hydrophilic amino acid residues.

In membrane bound lg, carboxyl terminal domain contain

1. An extracellular hydrophilic sequence consist of 26 amino acid residues
2. An hydrophobic Trans membrane sequence
3. A short cytoplasm tail

This is the general note on Immunoglobulin and Its Structure, Types.
Thank You.

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**Antigen, It’s Property, Types !!**

**ANTIGEN**

Antigen is a substance that may be specifically bound by an antibody

A substance that induces specific immune response called antigen or immunogen or complete antigen.

Molecular weight > 100 Kd

Antigen -- bound to antibody-- immune response
IMMUNOGENICITY

Immunogenicity is the ability of an antigen to elicit a humoral or cell mediated immune response.

ANTIGENICITY

It is the ability of a substance to combine specifically with the antibody or cell surface receptor

HAPTEN/INCOMPLETE ANTIGEN

The molecules that may bind to antibodies but can’t elicit immune response. These molecules are called hapten.

Molecular weight <100 KD

Example:

1. Dinitrophenol
2. Cardiolipin
3. Capsular polysaccharides of bacteria

CARRIER MOLECULE

When hapten molecule attached with some macro-molecules & can
elicit immune response, these macro-molecules are called carrier molecule.

Hapten carrier complex can act as an immunogen.

**ANTIGENIC DETERMINANT / EPITOPE**

Whole antigen molecule does not evoke immune response, only a part of it where antibody can bind & induce immune response. These region regions of the antigen are called epitope.

Epitopes are three types:

- **Linear epitope:** Epitopes formed by adjacent amino acid residues.
- **Conformational epitope:** Epitopes formed by amino acid but not in sequence become spatially juxtaposed in the folded protein
- **Neoantigenic epitope**: New epitopes produced by protein modification such as phosphorylation or proteolysis.

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**POLY VALENCY / MULTI VALENCY**

When an antigen have multiple determinants

**NATURE OF IMMUNOGEN**

1. **Protein**: Majority of immunogens are protein.
   
   Example: glycoprotein, lipoprotein.

2. **Nucleic acid**: Single stranded nucleic acids are good immunogenic.

3. **Polysaccharides**: Polysaccharides like oooo polysaccharides are good immunogen.
TYPES OF ANTIGEN

1. **Exogenous antigen**: These antigens enter the body & circulating in the body fluid and caught by macrophages, dendritic cells etc.

   Eg: Bacteria, Virus, fungi etc

2. **Endogenous antigen**: These are the bodies own compounds / fragments/ cell are produced in body are processed by macrophage & later accepted by cytotoxic T cells.

   Eg: Histocompatibility Leukocyte antigens (HLA)

3. **Auto antigen**: these are normally proteins that are recognized by immune system of patient suffering from autoimmune disease.

   Eg: Nucleoproteins. Nucleic acids etc.

PROPERTIES OF IMMUNOGEN

1. Foreignness
2. Molecular weight in between 14000 – 6,00,000 Da
3. Chemical nature: protein, polysaccharides
4. Susceptibility to tissue enzymes
5. Species specificity
6. Auto specificity

ADJUVANT

Latin word means to ‘help’.

A substance, different from antigen but when mixed with an antigen & injected with it increases immunogenicity of that antigen, called adjuvant.

Eg: Alum (Aluminium potassium sulphate), Aluminium hydroxide.

This is the general notes on Antigen, It’s Type and Property.
Thank you.

Immunoglobulin, It’s Types!!

IMMUNOGLOBULIN

Various immunoglobulin & their sub classes have been distinguished by unique amino acid sequences in heavy chain constant region that confer class specific structural & functional properties.

IgG

STRUCTURE

1. IgG is a monomer.
2. It consists of two gamma heavy chain & two kappa or two lambda light chains.
3. IgG have four subclass (IgG1, IgG2, IgG3, IgG4) distinguished by differences in gamma chain constant region sequences.
LOCATION
Present in blood, plasma, tissue fluids, lymph & intestine.

PROPERTIES
1. Most abundant class in serum constitute of 80% of total serum immunoglobulin.
2. It is only immunoglobulin that crosses the placenta.
3. It is secreted during secondary response.
4. Molecular weight 150,000 Da.

BIOLOGICAL FUNCTION
1. Enhances phagocytosis
2. Neutralizes toxins & virus

IgM

STRUCTURE
1. It is a pentamer.
2. IgM consist of five monomer arranged with their Fc region.
3. Have additional constant domain (CH4) in the basic structure.
LOCATION
Present in blood, lymph, B cell surface.

PROPERTIES
1. Consists 5%-10% of total serum immunoglobulin.
2. Molecular weight 900,000 Da.
3. IgM is first immunoglobulin produced in primary response to an antigen.

BIOLOGICAL FUNCTION
1. Effective against microbes & agglutinating antigens.
2. First antibodies produced during an infection.

IgA

STRUCTURE
1. In external secretion exist as a dimer called secretory immunoglobulin

LOCATION
Present in breast milk, saliva, tears, mucous of respiratory tract, digestive tract & genitourinary tract.
PROPERTIES

1. Constitute 10% to 15% of total serum immunoglobulin
2. Molecular weight 365,000Da
3. Half life in serum 6 days

BIOLOGICAL FUNCTION

1. Give protection to mucosal surfaces
2. Provides immunity to infant digestive tract

IgE

1. It is a monomer
2. Found in bound to mast cells & basophils, blood
3. Found very low concentration only 0.002% of total immunoglobulin
4. Molecular weight 200,000 Da
5. Half life in serum 2 days

BIOLOGICAL FUNCTION

1. Protect from allergic reactions
2. Protect against parasitic worms
IgD

1. Monomer
2. Consists 0.2% of total serum immunoglobulin
3. Molecular weight 180,000 Da
4. Half life in serum 3 days
5. Found on B lymphocytes together with IgM

BIOLOGICAL FUNCTION

Acts as a recognition receptor for antigen

This is the general notes on Immunoglobulin and Types of immunoglobulin.
Immunity, It’s Types!!

IMMUNITY

The ability of the body to fight against infection or foreign invaders by producing antibodies or killing infected cells.

TYPES OF IMMUNITY

There are mainly two types of immunity. Innate immunity and adaptive immunity.

- Innate immunity.
- Adaptive immunity.
  1. Naturally acquired immunity.
  2. Artificial acquired immunity.

INNATE IMMUNITY

It is a non-pathogen-specific type of defense mechanism.

Innate immunity inherited from parents and protects the individuals from birth.

COMPONENTS OF INNATE IMMUNITY

- Physical and chemical barrier (epithelial, antimicrobial, substance).
- Phagocytic cell (neutrophils, macrophages).
- NK cells.
- Blood protein.
- Cytokine.

Example: Skin, Mucus, Cilia etc.

**ADAPTIVE IMMUNITY**

Adaptive immunity is the body’s ability to recognize and defend itself against distinct pathogen and their product. It is an immunity that an organism develops during life time.

Develops after the exposure to antigens.

**PROPERTIES OF ADAPTIVE IMMUNITY**

- Specificity
- Diversity
- Immunological memory
- Clonal expansion
- Specialization
- Non reactivity to self.

**NATURAL ACQUIRED IMMUNITY**

It is resistance to disease possessed by an individual. Nature has given this type of immunity to certain individuals, species against certain disease.
Example: some individuals are most resisting to certain infections than other.

**NATURALLY ACQUIRED ACTIVE IMMUNITY**

It occur when a person is exposed to a live pathogen and develops a primary immune response that leads to immunological memory.

Naturally antigens enter into t body which trigger the production of antibodies and specialized lymphocytes.

Example: Chicken Pox.

**NATURALLY ACQUIRED PASSIVE IMMUNITY**

Naturally few antibodies pass mother to infant through placenta or via mother’s milk passively.

Example: IgG can pass through placenta

IgA found in breast milk to the gut of the infant.

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**ARTIFICIAL ACQUIRED IMMUNITY**

This immunity developed during a persons lifetime. It is not inherited. It can acquired actively or passively.
ARTIFICIAL ACTIVE ACQUIRED IMMUNITY

This immunity acquired by intentional exposure to a foreign material.

Example: Vaccination (injection of antigens).

ARTIFICIAL PASSIVE ACQUIRED IMMUNITY

It is acquired by introducing preformed antibodies or lymphocytes produced by one host into another host.

Antibodies premade by other organism such as horse and given to another organism through injection.

Example: Tetanus (Injection of antibodies).

This is the general note on Immunity & It’s Type...

Thank You.
Diseases, Function !!

IMMUNOLOGY

The word immunology derived from the Latin word “immunitias meaning ‘to free’ or ‘exempt’.

Immunology is the study of physiologic mechanisms that allow the body defends and maintains the constancy of self structures against invasion by foreign agents or development of unwanted cells or cell products within itself.

IMMUNE SYSTEM

Immune system is a adaptive defense system against infectious organisms and other invaders.

These systems consist of different specialized cells organs and tissues that work together to protect our body.

Distinguishing the foreign molecules from the self molecules is an important feature of immune system.

PRIMARY LYMPHOID ORGANS OF IMMUNE SYSTEM

- Thymus
- Bone marrow
SECONDARY LYMPHOID ORGANS OF THE IMMUNE SYSTEM

- Lymphoid nodes
- Spleen
- Skin
- Liver
- Tonsils
- Small intestine.

FUNCTION OF IMMUNE SYSTEM

1. Major function of immune system is to protect the host body from environmental invaders such as microbes or chemicals.
2. This system has ability to generate different variety of cell and molecules which have speciality of recognising and eliminating limitless variety of foreign invaders.
3. It can kill cancer cell.
4. Another important function of immune system of prevent tissue transplantation between individuals. These systems also maintain homeostasis by eliminating damaged cells.

DISEASE OF IMMUNE SYSTEM

- Sometimes immune system fails to make distinct host’s cell and react destructively against host’s own molecule this includes autoimmune disease.
Some autoimmune diseases are:

1. Lupus
2. Rheumatoid arthritis
3. Inflammatory bowel disease (IBD)
4. Multiple sclerosis.

Immunodeficiency occurs when immune system not strong as normal and causing recurring and infectious disease.

Some immunodeficiency diseases are:

1. AIDS
2. Viral hepatitis
3. Multiple myeloma (cancer of plasma cell)
4. Leukaemia (cancer of immune system)

• When immune system represent hyper response to foreign/external allergens causing infections.

This includes:

1. Allergy
2. Asthma
3. Eczema

**IMMUNE RESPONSE**

Immune response is that, how our body recognizes and defends
itself against virus, bacteria and molecules that appear foreign and harmful to our body.

**INNATE IMMUNE RESPONSE:** Innate immune response occurs when immune system protects our body from invading pathogen or infectious organisms.

When the pathogens and non self molecules like antigen or foreign particle invades in our body stimulates an immune response.

- Skin which excludes most pathogens from entering the body.
- Cilia in mucous membranes, which sweep out airborne pathogens and duct
- Tears, nasal secretion and saliva which contain bacteria destroying enzymes.
**ADAPTIVE IMMUNE RESPONSE:** Adaptive immune responses are very complex system. It is antigen specific immune response. Here at first antigen are processed then recognized. When antigen recognized then the adaptive immune cells specifically designed to attack that antigen.

Function of adaptive immune response is to destroy the foreign particles and the toxic they produced.

**HUMORAL IMMUNE RESPONSE:** It is mediated by antibody produced by the B-lymphocytes. The humoral immune response involves B-cells that recognize pathogens/antigens that circulating in the blood or lymph.
The response occurred by following ways:

**CELL MEDIATED IMMUNE RESPONSE:** Cell mediated immune response involves mostly T cells and aberrant MHC markers, including cells invade by tumors cells or transplanted cells.

- Antigen presenting cells (APCs) displaying foreign antigens to bind T cell.
- Helper T cell or interleukins helps in activation of T cell.
- T cell proliferate and producing cytotoxic T cells when
it displaying MHC-I and endogenous antigen on plasma membrane. Cytotoxic T cell destroying antigen.

- T cell proliferate and produce helper T cell when it displaying MHC-II and exogenous antigen on plasma membrane. Helper T cells release interleukins that stimulate B cell to produce antibodies that bind to the antigens and stimulate non-specific agents (macrophage and NK cell) to destroy antigen.

This is the general notes on Immune System, Immune System Disease and It’s Function.

Thank You.