

# Microbiology



**ASSIGN  
BUSTER**

1. a. Substances capable of inducing specific immune responses are referred to as antigens. The properties of a good antigen are –

1. Induction of an immune response (immunogenicity)
2. Specific reaction with antibodies or sensitized cells (immunological reactivity)

b.

2. a

b. Immunoglobulins are of 5 classes namely IgG, IgA, IgM, IgD & IgE.

**IgG:** - This is the major serum immunoglobulin constituting about 80% of total serum immunoglobulin. It has a molecular weight of 1,50,000. There are four IgG sub classes in humans, IgG1, IgG2, IgG3, IgG4

**IgA:** - This is the 2nd most abundant class, constituting about 10-15% of serum immunoglobulin. It is a major immunoglobulin of colostrum, serum and saliva. IgA occurs in two forms: serum IgA (monomeric, MW 1,60,000).

Secretory IgA (Dimeric, MW 400,000). Two IgA sub classes-IgA1 & IgA2

**IgM:** - Constitutes 5-10% of Total Immunoglobulin. Monomeric IgM (MW 1,80,000) is expressed as membrane bound antibody on B - cells. IgM is secreted by plasma cells as a pentamer in which 5 monomer units are linked by disulfide bond.

**IgD:** - IgD has a serum concentration of 30 µg/ml and constitutes about 0.2% of total serum immunoglobulin. It is the major membrane bound immunoglobulin expressed by mature B - cells and is involved in the activation of B - cells by antigen.

**IgE:** - Serum concentration is 0.3 µg/ml. IgE antibodies mediate immediate hypersensitivity.

c. B-cells, T-cells

1. Produce antibodiesCell mediated immunity
  2. Directed mainly against bacteriaDirected against viruses and Tumor cells
  3. No Involvement of MHC moleculeInvolvement of MHC Molecule.
  - d. Both B – cells and T- cells have surface receptors which recognize and binds to specific antigens.
  3. a. Using immunoglobulin sequencing we know about splicing. 18 billion possible antibodies are produced by gene rearrangement.
  - b. Active ImmunityPassive Immunity
    1. Produced actively by hosts’s immune received passively. No System. Host participation.
    2. Induced by infectionReadymade antibody transferred.
    3. Durable effective protection. Transient less effective.
    4. Immunity effective only after a lag period. Immediate immunity.
    5. Memory presentAbsent.
  - c. Native Immunity is the resistance to infections which an individual possess by virtue of his genetic and constitutional make up.
  4. a. Hypersensitivity: - Hypersensitivity refers to the injurious consequences in the sensitized host following contact with a specific antigen.
  - b. Both immediate and delayed hypersensitivity cause tissue damage.
  - c. In immediate hypersensitivity antigen binds to IgE on mast cells and basophils. This cross linking leads to degranulation with the release of biologically active substances contained in the granules.
- In delayed hypersensitivity T – cells are involved which on contact with

specific antigen release lymphokines.

5. a. In the Ouchterlony method both antigen and antibody diffuse radially from wells toward each other, thereby establishing a concentration gradient. As equivalence is reached, a visible line of precipitation forms. This simple technique is an effective qualitative tool for determining the relationship between antigens and the number of different Ag-Ab systems present.

ELISA Test: - An enzyme conjugated to an antibody reacts with a colorless substrate to generate colored reaction product. Enzymes used include alkaline phosphates, horseradish peroxidases. ELISA test is used to detect the presence of antibodies and antigen.

RIA: - RIA is a competitive binding assay in which fixed amounts of antibody and radio labeled antigen react in presence of unlabelled antigen. The labeled and unlabelled antigens compete for limited binding sites on the antibody. After reaction, the antigen is separated into free and bound fractions and their radioactive counts measured. The concentration of the unlabelled (test) antigen can be calculated from the ratio of the bound and total antigen labels, using standard dose response curve.

Fluorescent Antibodies: - Antibodies labeled with fluorescent dyes.

Commonly used fluorescent dyes are fluorescein and rhodamine

Agglutinins: - When a particulate antigen reacts with its antibody visible clumps are formed. Antibodies that produce such reactions are called agglutinins.

Precipitins: - The interaction between an antibody and a soluble antigen in aqueous forms insoluble precipitate. Antibodies that thus aggregate soluble antigens are called precipitins.

6. It is difficult to develop a natural system of Bacterial Taxonomy using the

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traditional technique of Taxonomy because bacteria are generally very small and have simple shapes, and hence their classification by shape is not an easy task.

Bacteriologists have attempted to overcome this difficulty by classifying the bacteria according to their Biochemical compositions and also according to the conditions in which they grow.

The revolution in Genomics will affect Taxonomy because with the coming of Molecular Biology it is possible to classify bacteria on the basis of identification of DNA sequence, and this process would revolutionize the notions regarding Bacteria Taxonomy.

## 7. Differences

Bacterial Photosynthesis Eukaryotic photosynthesis

1. Mechanism is simple. Complex
2. Photo systems absent. Photo systems present.
3. Carried out by cyano bacteria Carried out by plants.

## Similarities

1. Require light. Require light.
2. Co<sub>2</sub> is evolved. Co<sub>2</sub> evolved.
3. Chlorophyll & other accessory pigments are Chlorophyll & other involved. accessory pigments involved