Immunologic and Serologic Procedures

Serology: the study of antibodies.

Immunoassays: Procedures that make use of the specificity of binding between antigens and antibodies. So, if we search for a specific antigen (e.g., EBV viral capsid antigen (VCA)), we can do that by developing a specific antibody that will bind only to VCA, allowing us to diagnose acute EBV infection.

So, the serologic and immunologic procedures are useful to detect the presence/absence of certain molecules. Also, serologic and immunologic procedures can help to determine the quantity of these molecules (e.g., the quantity of immunoglobulins in serum which is helpful to diagnose immunodeficiencies (if low quantity of immunoglobulins are detected)).

To sum up, the specificity of immunoassays is related to the specificity of binding between antibodies and their corresponding antigens. If binding occurs, we need to have a system to show this antigen-antibody complex. This system of detection varies between different immunoassays as follows:

1. Precipitation reaction: The detection of antigen-antibody complexes directly. Antigen-antibody binding occurs in transparent media. Once antigen-antibody complexes are formed (these complexes are large in size), the transparent media become turbid indicating the occurrence of reaction.
2. Agglutination reaction: The detection of antigen-antibody complexes by the presence of particles. So, if we look for an antigen, the antibody will be bound to a particle and the reaction will cause aggregation of these particles. If we look for an antibody, the antigen will be bound to a particle and the reaction will cause aggregation of these particles. Particles can be red blood cells (the reaction is called hemagglutination), or particles can be latex (derived from the rubber polystyrene), and the reaction is called latex agglutination.
3. Radioimmunoassay: The detection of antigen-antibody complexes by the presence of radioactive label. Due to health hazards of radioactive materials and its short shelf life, it is rarely used now.
4. Enzyme immunoassays, enzyme-linked immunosorbent assay (ELISA): The detection of antigen-antibody complexes by the presence of an enzyme label. Enzyme labels are cheap, with long shelf life. So, enzyme immunoassays are commonly used in the clinical laboratories.
5. Fluorescent immunoassay: The detection of antigen-antibody complexes by the presence of an fluorochrome label.
6. Flow cytometry: an automated system in which single cells/particles in a fluid suspension are analyzed according to their intrinsic light-scattering characteristics and are for extrinsic properties (i.e., the presence of specific surface proteins) using fluorescent labeled antibodies or probes.