12.2E: Agglutination Reactions

Agglutination reactions are used to assess the presence of antibodies in a specimen by mixing it with particulate antigens.

Learning Objectives

• Describe how agglutination reactions can be used to assess the presence of antibodies in a specimen

Key Points

• Agglutination reactions produce visible aggregates of antibody – antigen complexes when antibodies or antigens are conjugated to a carrier.
• Carriers used in agglutination methods could be artificial (e.g., latex or charcoal) or biological (e.g., erythrocytes).
• There are various methods of agglutination reactions that follow the same principle, but they differ in the elements they employ based on the desired endpoint and the main purpose of the test.

Key Terms

• avidity: The measure of the synergism of the strength of individual interactions between proteins.
• erythrocytes: Red blood cells.
• agglutination: The clumping together of red blood cells or bacteria, usually in response to a particular antibody

Agglutination is the visible expression of the aggregation of antigens and antibodies. Agglutination reactions apply to particulate test antigens that have been conjugated to a carrier. The carrier could be artificial (such as latex or charcoal).
particles) or biological (such as red blood cells). These conjugated particles are reacted with patient serum presumably containing antibodies. The endpoint of the test is the observation of clumps resulting from that antigen-antibody complex formation. The quality of the result is determined by the time of incubation with the antibody source, amount and avidity of the antigen conjugated to the carrier, and conditions of the test environment (e.g., pH and protein concentration). Various methods of agglutination are used in diagnostic immunology and these include latex agglutination, flocculation tests, direct bacterial agglutination, and hemagglutination.

In latex agglutination, many antibody molecules are bound to latex beads (particles), which increases the number of antigen-binding sites. If an antigen is present in a test specimen, it will bind to the antibody and form visible, cross-linked aggregates. Latex agglutination can also be performed with the antigen conjugated to the beads for testing the presence of antibodies in a serum specimen.

Flocculation tests are designed for antibody detection and are based on the interaction of soluble antigens with antibodies, producing a precipitate of fine particles that can be seen with the naked eye.

Direct bacterial agglutination uses whole pathogens as a source of antigen. It measures the antibody level produced by a host infected with that pathogen. The binding of antibodies to surface antigens on the bacteria results in visible clumps.

Hemagglutination uses erythrocytes as the biological carriers of bacterial antigens, and purified polysaccharides or proteins for determining the presence of corresponding antibodies in a specimen.

**Figure: Hemagglutination assay:** Red blood cells are used as carriers to detect antibodies from a patient’s serum.

Agglutination tests are easy to perform and in some cases are the most sensitive tests currently available. These tests have a wide range of applications in the clinical diagnosis of non-infectious immune disorders and infectious disease.