

Chapter 17 Applications of Immune Responses

Summary Outline

- 17.1 Principles of immunization
- A. **Immunity** is either **natural** or **artificial**, **passive** or **active**.
 - B. **Passive immunity** occurs naturally from mother to fetus and artificially by transfer of preformed antibodies, as in hyperimmune globulin.
 - C. **Active immunity** occurs naturally in response to infections or other natural exposure to antigens and artificially in response to vaccine administration.
- 17.2 Vaccines and immunization procedures
- A. A **vaccine** is a preparation of living or inactivated microorganisms or viruses or their components used to **induce active immunity**.
 - B. **Attenuated immunizing agents** are antigenic and can replicate, but are modified to be incapable of causing disease under normal circumstances.
 - C. **Inactivated vaccines** may contain inactivated whole agents or subunits of the agent.
 - D. **Recombinant vaccines** are genetically engineered.
 - E. **Adjuvants** increase the intensity of the immune response to the antigen in a vaccine.
 - F. Routine childhood immunizations have prevented millions of cases of disease and many deaths during the past decades. Universal immunization is essential to eradicate some diseases and to preserve herd immunity against others.
- 17.3 Principles of immunological testing
- A. **Serology** uses antibodies, usually in serum or other body fluids, to detect and identify antigens, or conversely, uses known antigens to detect antibodies.
 - B. **Seroconversion** is the change from negative to positive for specific antibodies during an infection.
 - C. A rise in **titer** is characteristic of an active infection.
 - D. **Serial dilution** of specimens permits **quantification of antibodies** in the sample.
- 17.4 **Precipitation reactions** occur when **soluble antigens** interact with **antibodies** in optimal proportions to cause cross-linking into a large **insoluble lattice**.
- A. **Immunodiffusion tests** are precipitation tests done in gels.
 - B. **Immunoelectrophoresis** is a test in which mixtures are separated by electrophoresis before adding antibodies to identify the separated antigens.
- 17.5 **Agglutination reactions** depend on cross-linking of particulate antigen by antibody molecules to form readily visible clumps.
- A. **Direct agglutination tests: Particulate antigen** reacts directly with antibodies.
 - B. **Indirect agglutination tests: Soluble antigen** is coated onto **particles** to give indirect agglutination.
 - C. **Hemagglutination inhibition: Antibodies interfere with viral agglutination of red blood cells.**
- 17.6 **Immunofluorescence tests:** Fluorescent dyes are used to visualize antibodies under the fluorescence microscope
- A. **Direct fluorescent antibody test: Antibodies tagged** with fluorescent dyes react directly with antigen.
 - B. **Indirect fluorescent antibody test: Antigen and antibody** interact and the **complex** is detected with **fluorescent-labeled antibodies** against the immunoglobulin in the complex.
- 17.7 **Radioimmunoassay (RIA), Enzyme-linked immunosorbent assay (ELISA) and Western blot**

- A. **Radioimmunoassay (RIA)** is based on competition for specific antibody in a test sample between known amounts of radioactively labeled antigen and unknown amounts of unlabeled antigen.
- B. **Enzyme-linked immunosorbent assay (ELISA):** Enzymes that give a color reaction are used as labels in the ELISA test.
- C. **Western blot** combines electrophoresis with ELISA to separate and identify protein antigens in a mixture.

17.8 The **complement fixation test** and **neutralization tests**

17.9 **Tests used in cellular immunology**

- A. **Fluorescent-labeled monoclonal antibodies** are used to identify subsets of lymphocytes by microscopy or by separation in a cell sorter.
- B. **Lymphocyte response to mitogens** can distinguish subsets of lymphocytes.
- C. **Cytotoxic T cell function**
- D. **Cell-mediated immunity to infectious agents:** Lymphocyte proliferation in response to specific antigens is measured by incorporation of radioactive thymidine into DNA.