

Study Outline Chapter 23

Introduction (p. 602)

- The heart, blood, and blood vessels make up the cardiovascular system.
- Lymph, lymph vessels, lymph nodes, and lymphoid organs constitute the lymphatic system.

Structure and Function of the Cardiovascular System (p. 602)

- The heart circulates substances to and from tissue cells.
- Blood is a mixture of plasma and cells.
- Plasma transports dissolved substances. Red blood cells carry oxygen. White blood cells are involved in the body's defense against infection.

Structure and Function of the Lymphatic System (pp. 602- 603)

- Fluid that filters out of capillaries into spaces between tissue cells is called interstitial fluid.
- Interstitial fluid enters lymph capillaries and is called lymph.
- Vessels called lymphatics return lymph to the blood.
- Lymph nodes contain fixed macrophages, B cells, and T cells.

Bacterial Diseases of the Cardiovascular and Lymphatic Systems (pp. 603- 615)

Septicemia, Sepsis, and Septic Shock (p. 603)

- The growth of microorganisms in blood is called septicemia. Signs include lymphangitis (inflamed lymph vessels).
- Septicemia can lead to septic shock, characterized by decreased blood pressure.
- Septicemia usually results from a focus of infection in the body.
- Gram-negative rods are usually implicated. Endotoxin causes the symptoms.

Puerperal Sepsis (pp. 603- 604)

- Puerperal sepsis begins as a uterine infection following childbirth or abortion; it can progress to peritonitis or septicemia.
- *Streptococcus pyogenes* is the most frequent cause.
- Oliver Wendell Holmes and Ignaz Semmelweiss demonstrated that puerperal sepsis was transmitted by the hands and instruments of midwives and physicians.
- Puerperal sepsis is now uncommon because of modern hygienic techniques and antibiotics.

Bacterial Infections of the Heart (pp. 604- 605)

- The inner layer of the heart is the endocardium.
- Subacute bacterial endocarditis is usually caused by a-hemolytic streptococci, staphylococci, or enterococci.
- The infection arises from a focus of infection, such as a tooth extraction.
- Preexisting heart abnormalities are predisposing factors.
- Signs include fever, anemia, and heart murmur.

- Acute bacterial endocarditis is usually caused by *Staphylococcus aureus*.
- The bacteria cause rapid destruction of heart valves.

Rheumatic Fever (pp. 605- 606)

- Rheumatic fever is an autoimmune complication of streptococcal infections.
- Rheumatic fever is expressed as arthritis or inflammation of the heart. It can result in permanent heart damage.
- Antibodies against group A b-hemolytic streptococci react with streptococcal antigens deposited in joints or heart valves or cross-react with the heart muscle.
- Rheumatic fever can follow a streptococcal infection, such as streptococcal sore throat. Streptococci might not be present at the time of rheumatic fever.
- Prompt treatment of streptococcal infections can reduce the incidence of rheumatic fever.
- Penicillin is administered as a preventive measure against subsequent streptococcal infections.

Tularemia (pp. 606- 607)

- Tularemia is caused by *Francisella tularensis*. The reservoir is small wild mammals, especially rabbits.
- Signs include ulceration at the site of entry, followed by septicemia and pneumonia.
- Humans contract tularemia by handling diseased carcasses, eating undercooked meat of diseased animals, and being bitten by certain vectors (such as deer flies).
- *F. tularensis* is resistant to phagocytosis.
- Laboratory diagnosis is based on an agglutination test on isolated bacteria.

Brucellosis (Undulant Fever) (p. 607)

- Brucellosis can be caused by *Brucella abortus*, *B. melitensis*, and *B. suis*.
- Domesticated animals (cattle, pigs, goats, and camels) constitute the reservoir.
- The bacteria enter through minute breaks in the mucosa or skin, reproduce in macrophages, and spread via lymphatics to liver, spleen, or bone marrow.
- Signs include malaise and fever that spikes each evening (undulant fever).
- A vaccine for cattle is available.
- Diagnosis is based on serological tests.

Anthrax (pp. 607- 608)

- *Bacillus anthracis* causes anthrax. In soil, endospores can survive for up to 60 years.
- Grazing animals acquire an infection after ingesting the endospores.
- Humans contract anthrax by handling hides from infected animals. The bacteria enter through cuts in the skin or through the respiratory tract.
- Entry through the skin results in a pustule that can progress to septicemia. Entry through the respiratory tract can result in pneumonia.
- Diagnosis is based on isolation and identification of the bacteria.

Gangrene (pp. 608- 609)

- Soft tissue death from ischemia (loss of blood supply) is called gangrene.
- Microorganisms grow on nutrients released from gangrenous cells.

- Gangrene is especially susceptible to the growth of anaerobic bacteria such as *Clostridium perfringens*, the causative agent of gas gangrene.
- *C. perfringens* can invade the uterine wall during improperly performed abortions.
- Debridement, hyperbaric chambers, and amputation are used to treat gas gangrene.

Systemic Diseases Caused by Bites and Scratches (p. 609)

- *Pasteurella multocida*, introduced by the bite of a dog or cat, can cause septicemia.
- Anaerobic bacteria such as *Clostridium*, *Bacteroides*, and *Fusobacterium* infect deep animal bites.
- Cat-scratch disease is caused by *Bartonella henselae*.

Plague (pp. 609- 611)

- Plague is caused by *Yersinia pestis*. The vector is usually the rat flea (*Xenopsylla cheopis*).
- Reservoirs for plague include European rats and North American rodents.
- Signs of bubonic plague include bruises on the skin and enlarged lymph nodes (buboes).
- The bacteria can enter the lungs and cause pneumonic plague.
- Laboratory diagnosis is based on isolation and identification of the bacteria.
- Antibiotics are effective in treating plague, but they must be administered promptly after exposure to the disease.

Relapsing Fever (p. 611)

- Relapsing fever is caused by *Borrelia* species and transmitted by soft ticks.
- The reservoir for the disease is rodents.
- Signs include fever, jaundice, and rose-colored spots. Signs recur three or four times after apparent recovery.
- Laboratory diagnosis is based on the presence of spirochetes in the patient's blood.

Lyme Disease (Lyme Borreliosis) (pp. 611- 613)

- Lyme disease is caused by *Borrelia burgdorferi* and is transmitted by a tick (*Ixodes*).
- Lyme disease is prevalent on the U.S. Atlantic Coast.
- Field mice provide the animal reservoir.
- Diagnosis is based on serological tests and clinical symptoms.

Other Tickborne Diseases (p. 613)

- Ehrlichiosis is caused by *Ehrlichia* species.

Typhus (pp. 613- 615)

- Typhus is caused by rickettsias, obligate intracellular parasites of eucaryotic cells.

Epidemic Typhus (p. 613)

- The human body louse *Pediculus humanus corporis* transmits *Rickettsia prowazekii* in its feces, which are deposited while the louse is feeding.

- Epidemic typhus is prevalent in crowded and unsanitary living conditions that allow the proliferation of lice.
- The signs of typhus are rash, prolonged high fever, and stupor.
- Tetracyclines and chloramphenicol are used in treatment.

Endemic Murine Typhus (p. 613)

- Endemic murine typhus is a less severe disease caused by *Rickettsia typhi* and transmitted from rodents to humans by the rat flea.

Spotted Fevers (p. 614- 615)

- *Rickettsia rickettsii* is a parasite of ticks (*Dermacentor* species) in the southeastern U.S., Appalachia, and the Rocky Mountain states.
- The rickettsia may be transmitted to humans, in whom it causes tickborne typhus fever.
- Chloramphenicol and tetracyclines effectively treat Rocky Mountain spotted fever, or tickborne typhus.
- Serological tests are used for laboratory diagnosis.

Viral Diseases of the Cardiovascular and Lymphatic Systems (pp. 615- 617)

Burkitt' s Lymphoma (p. 615)

- Epstein-Barr (EB) virus causes Burkitt' s lymphoma and nasopharyngeal carcinoma.
- EB virus causes cancer in laboratory inoculated monkeys.
- Burkitt' s lymphoma tends to occur in patients whose immune system has been weakened, for example, by malaria or AIDS.

Infectious Mononucleosis (p. 616)

- Infectious mononucleosis is caused by the EB virus.
- The virus multiplies in the parotid glands and is present in saliva. It causes the proliferation of atypical lymphocytes.
- The disease is transmitted by the ingestion of saliva from infected individuals.
- Diagnosis is made by an indirect fluorescent-antibody technique.

Classic Viral Hemorrhagic Fevers (pp. 616- 617)

- Yellow fever is caused by an arbovirus (yellow fever virus). The vector is the mosquito *Aedes aegypti*.
- Signs and symptoms include fever, chills, headache, nausea, and jaundice.
- Diagnosis is based on the presence of virus-neutralizing antibodies in the host.
- No treatment is available, but there is an attenuated, live viral vaccine.
- Dengue is caused by an arbovirus (dengue fever virus) and is transmitted by the mosquito *Aedes aegypti*.
- Signs are fever, muscle and joint pain, and rash.
- Mosquito abatement is necessary to control the disease.
- Dengue hemorrhagic fever (DHF) occurs when a person is reinfected with the same dengue virus.

Emerging Viral Hemorrhagic Fevers (p. 617)

- Human diseases caused by Marburg, Ebola, and Lassa fever viruses were first noticed in the late 1960s.

- Marburg virus is found in nonhuman primates; Lassa fever viruses are found in rodents.
- Rodents are the reservoirs for Argentine and Bolivian hemorrhagic fevers.
- *Hantavirus* pulmonary syndrome is caused by *Hantavirus*. The virus is contracted by inhalation of dried rodent urine.

Protozoan Diseases of the Cardiovascular and Lymphatic Systems (pp. 617- 622)

American Trypanosomiasis (Chagas' Disease) (p. 618)

- *Trypanosoma cruzi* causes Chagas' disease. The reservoir includes many wild animals. The vector is a reduviid, the 'kissing bug.'
- Xenodiagnosis allows for the identification of trypanosomes in the intestinal tract of the reduviid bug, which confirms the diagnosis.

Toxoplasmosis (pp. 618- 619)

- Toxoplasmosis is caused by the sporozoan *Toxoplasma gondii*.
- *T. gondii* undergoes sexual reproduction in the intestinal tract of domestic cats, and oocysts are eliminated in cat feces.
- Oocysts can be ingested by cattle and other animals.
- Sporozoites hatch from an oocyst and invade host cells.
- In the host cell, sporozoites reproduce to form either tissue-invading tachyzoites or bradyzoites.
- Bradyzoites reproduce in tissue cysts.
- Humans contract the infection by ingesting tachyzoites or tissue cysts in undercooked meat from an infected animal or contact with cat feces.
- Subclinical infections are probably common because the disease symptoms are rather mild.
- Congenital infections can occur. Signs and symptoms include severe brain damage or vision problems.
- Toxoplasmosis can be identified by serological tests, but interpretation of the results is uncertain.

Malaria (pp. 619- 622)

- The signs and symptoms of malaria are chills, fever, vomiting, and headache, which occur at intervals of 2- 3 days.
- Malaria is transmitted by *Anopheles* mosquitoes. The causative agent is any one of four species of *Plasmodium*.
- Sporozoites reproduce in the liver and release merozoites into the bloodstream, where they infect red blood cells and produce more merozoites.
- Laboratory diagnosis is based on microscopic observation of merozoites in red blood cells.
- A vaccine is being developed.
- New drugs are being developed as the protozoa develop resistance to drugs such as chloroquine.

Babesiosis (p. 622)

- Babesiosis is caused by the protozoan *Babesia microti* and transmitted to humans by ticks.

Helminthic Diseases of the Cardiovascular and Lymphatic Systems (pp. 622- 624)

Helminthic Diseases of the Cardiovascular and Lymphatic Systems (pp. 622- 624)

- Species of the blood fluke *Schistosoma* cause schistosomiasis.
- Eggs eliminated with feces hatch into larvae that infect the intermediate host, a snail. Free-swimming cercariae are released from the snail and penetrate the skin of a human.
- The adult flukes live in the veins of the liver or urinary bladder in humans.
- Adult flukes reproduce, and eggs are excreted or remain in the host.
- Granulomas are from the host's defense to eggs that remain in the body.
- Observation of eggs or flukes in feces, skin tests, or indirect serological tests may be used for diagnosis.
- Chemotherapy is used to treat the disease; sanitation and snail eradication are used to prevent it.

Swimmer's Itch (p. 624)

- Swimmer's itch is a cutaneous allergic reaction to cercariae that penetrate the skin. The definitive host for this fluke is wildfowl.