chapter **50**

Physiology of the Cardiovascular System

Objectives

AFTER STUDYING THIS CHAPTER, THE STUDENT WILL BE ABLE TO:

1. Review the functions of the heart, blood vessels, and blood in supplying oxygen and nutrients to body tissues.
2. Describe the role of vascular endothelium in maintaining homeostasis.
3. Discuss atherosclerosis as the basic disorder causing many cardiovascular disorders for which drug therapy is required.
4. List cardiovascular disorders for which drug therapy is a major treatment modality.
5. Identify general categories of drugs used to manage cardiovascular disorders.

OVERVIEW

The cardiovascular or circulatory system is composed of the heart, blood vessels, and blood. The general functions of the system are to carry oxygen, nutrients, hormones, antibodies, and other substances to all body cells and to remove waste products of cell metabolism (carbon dioxide and others). The efficiency of the system depends on the heart's ability to pump blood, the patency and functions of blood vessels, and the quality and quantity of blood.

HEART

The heart is a hollow, muscular organ that functions as a two-sided pump to circulate five to six liters of blood through the body every minute. Major components and characteristics are described in the following sections.

Chambers

The heart has four chambers: two atria and two ventricles. The *atria* are receiving chambers. The right atrium receives deoxygenated blood from the upper part of the body by way of the superior vena cava, from the lower part of the body by way of the inferior vena cava, and from veins and sinuses within the heart itself. The left atrium receives oxygenated blood from the lungs through the pulmonary veins. The *ventricles* are distributing chambers. The right ventricle sends deoxygenated blood through the pulmonary circulation. It is small and thin walled because it contracts against minimal pressure. The left ventricle pumps oxygenated blood through the systemic circuit. It is much more muscular and thick walled because it contracts against relatively high pressure. The right atrium and right ventricle form one pump, and the left atrium and left ventricle form another. A muscular wall called the septum separates the right and left sides of the heart.

Layers

The layers of the heart are the endocardium, myocardium, and epicardium. The *endocardium* is the membrane lining the heart chambers. It is continuous with the endothelial lining of blood vessels entering and leaving the heart, and it covers the heart valves. The *myocardium* is the strong muscular layer of the heart that provides the pumping power for circulation of blood. The *epicardium* is the outer, serous layer of the heart. The heart is enclosed in a fibroserous sac called the *pericardium.*

Valves

Heart valves function to maintain the one-way flow of blood and prevent backflow. The *mitral* valve separates the left