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The circulatory system

The circulatory system carries out many important functions that contribute to homeostasis. It obtains oxygen from the lungs; nutrients from the gastrointestinal tract; and hormones from the endocrine glands; and it delivers these substances to the tissues that need them. Furthermore, it removes metabolic waste products, such as carbon dioxide, lactic acid, and urea, from the tissues. Finally, it contributes to the actions of the immune system by transporting antibodies and leukocytes to areas of infection. Overall, the circulatory system plays a vital role in maintenance of optimal conditions for cell and tissue function . All tissues are perfused, that is, all tissues receive blood flow. The amount of blood that flows through each tissue, however, depends upon that tissue's function. For example, many tissues, such as the heart, brain, and skeletal muscles, receive blood flow sufficient to supply their metabolic needs. When metabolic activity increases, as it does during exercise, blood flow to these tissues increases accordingly. Other tissues, however, receive



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blood flow in significant excess of their metabolic needs. These tissues, including the kidneys, organs of the digestive system, and skin, have important homeostatic functions. Among other vital activities, kidneys filter the blood and remove waste products; the organs of the digestive system absorb nutrients into the blood.

Blood vessels

The walls of blood vessels may contain varying amounts of fibrous tissue, elastic tissue, and smooth muscle. All blood vessels are lined with a single layer of endothelial cells forming the endothelium. The fibrous connective tissue provides structural support and stiffens the vessel. The elastic connective tissue allows vessels to expand and hold more blood. It also allows the vessels to recoil and exert pressure on blood within the vessels, which pushes this blood forward. Most blood vessels contain smooth muscle arranged in circular or spiral



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layers. Therefore, contraction of vascular smooth muscle, or vasoconstriction, narrows the diameter of the vessel and decreases the flow of blood through it. Relaxation of vascular smooth muscle, or vasodilation, widens the diameter of the vessel and increases the flow of blood through it. The smooth muscle of the vessel is innervated by the autonomic nervous system and is, therefore, physiologically regulated. Furthermore, this is where endogenous vasoactive substances and pharmacological agents exert their effects. The endothelium has several important physiological functions, including contributing to the regulation of blood pressure, blood vessel growth, and the exchange of materials between blood and the interstitial fluid of the tissues. The circulatory system is composed of several anatomically and functionally distinct blood vessels including: (1) arteries, (2) arterioles, (3) capillaries, and (4) veins.