Special Circulations

Control of blood vasculature function associated with a number of specific tissues and/or organs differs dependent on the circumstance and needs at a given point in time. For example, increased body temperature results in the sympathetic innervation of blood vessels of skin causing vasodilatation. This effect directs blood to the body surface to dissipate heat. In the respiratory system hypoxia causes vasoconstriction and blood is shunted away from poorly ventilated to well-ventilated areas of the lung. The circulation associated with the lung is the only region of the vasculature that responds to hypoxia by vasoconstriction. Other regions of the vasculature respond to hypoxia by vasodilatation. Vasodilatation occurs in blood vessels supplying skeletal muscle during exercise and increased concentrations of lactate, adenosine, and potassium. During rest, sympathetic innervation of smooth muscle cells in the vasculature through norepinephrine release stimulates both -adrenergic and -adrenergic receptors causing vasodilatation in skeletal muscle tissue. The vasculature of the coronary circulation responds to both hypoxia and adenosine (a by product of ATP metabolism from cardiac myocytes) with vasodilatation. Vessels of the cerebral circulation respond to increased Pco_2 or decreased pH with vasodilation.

Arteriovenous Anastomoses

In addition to their capillary connections, arteries and veins may unite by shunts called arteriovenous anastomoses. Generally these arise from side branches of arterioles that pass directly to venules. They are thick-walled, muscular vessels of small caliber that usually are coiled and surrounded by a connective tissue sheath. They are plentiful in the plantar and palmar surfaces, fingertips, toes, lips, and nose and also occur in the thyroid. When open, the anastomoses shunt blood around the capillary bed and thus regulate the blood supply to many tissues. In the skin they function primarily in the regulation of body temperature.