

NAME: ESOWE PRINCE DAVID.C.

MATRIC NO: 18/MHS01/154

LEVEL: 200

COURSE NAME: PHYSIOLOGY

ASSIGNMENT

1. Discuss the long term regulation of mean arterial blood pressure.
 - a. Appropriate systemic arterial pressure is the single most important requirement for proper operation of the cardiovascular system. Without sufficient arterial pressure, the brain and the heart do not receive adequate blood flow, no matter what adjustments are made in their vascular resistance by local control mechanisms. In contrast, unnecessary demands are placed on the heart by excessive arterial pressure. Thus, although dramatic changes in peripheral resistance and cardiac function can and do occur normally during the course of our normal daily activities, mean arterial pressure is maintained within a narrow range and is tightly regulated. The elaborate

mechanisms that have evolved for regulating this critical cardiovascular variable are discussed in this chapter.

Arterial pressure is continuously monitored by various sensors located within the body. Whenever arterial pressure varies from normal, multiple reflex responses are initiated, which cause the adjustments in cardiac output, and total peripheral resistance needed to return arterial pressure to its normal value. In the short term (seconds), these adjustments are brought about by changes in the activity of the autonomic nerves leading to the heart and peripheral vessels. In the long term (minutes to days), other mechanisms such as changes in cardiac output brought about by changes in blood volume play an increasingly important role in the control of arterial pressure. The short- and long-term regulations of arterial pressure are discussed in this chapter.

2. Write short notes on the following

a. Pulmonary Circulation

Pulmonary circulation is the system of transportation that shunts de-oxygenated blood from the heart to the lungs to be re-saturated with oxygen before being dispersed into systemic circulation. Deoxygenated blood from the lower half of the body enters the heart from the inferior

vena cava while deoxygenated blood from the upper body is delivered to the heart via the superior vena cava. Both the superior vena cava and inferior vena cava empty blood into the right atrium. Blood flows through the tricuspid valve into the right ventricle. It then flows through the pulmonic valve into the pulmonary artery before being delivered to the lungs. While in the lungs, blood diverges into the numerous pulmonary capillaries where it releases carbon dioxide and is replenished with oxygen. Once fully saturated with oxygen, the blood is transported via the pulmonary vein into the left atrium which pumps blood through the mitral valve and into the left ventricle. With a powerful contraction, the left ventricle expels oxygen-rich blood through the aortic valve and into the aorta: This is the beginning of systemic circulation

b. Circle of willis

The **circle of Willis** (also called **Willis' circle**, **loop of Willis**, **cerebral arterial circle**, and **Willis polygon**) is a circulatory anastomosis that supplies blood to the brain and

surrounding structures. It is named after Thomas Willis (1621–1675), an English physician.

- c. **Splanchnic Circulation:** The splanchnic circulation consists of the blood supply to the gastrointestinal tract, liver, spleen, and pancreas. It consists of two large capillary beds partially in series. The small splanchnic arterial branches supply the capillary beds, and then the efferent venous blood flows into the PV. The PV and hepatic artery supply blood flow to the liver.
- d. **Coronary Circulation:** **Coronary circulation** is the circulation of blood in the blood vessels that supply the heart muscle (myocardium). Coronary arteries supply oxygenated blood to the heart muscle, and cardiac veins drain away the blood once it has been deoxygenated. Because the rest of the body, and most especially the brain, needs a steady supply of oxygenated blood that is free of all but the slightest interruptions, the heart is required to function continuously. Therefore its circulation is of major importance not only to its own tissues but to the entire body and even the level of consciousness of the brain from moment to moment. Interruptions of coronary

circulation quickly cause heart attacks (myocardial infarctions), in which the heart muscle is damaged by oxygen starvation. Such interruptions are usually caused by ischemic heart disease (coronary artery disease) and sometimes by embolism from other causes like obstruction in blood flow through vessels.

- e. Cutaneous Circulation: The cutaneous circulation is the circulation and blood supply of the skin. The skin is not a very metabolically active tissue and has relatively small energy requirements, so its blood supply is different to that of other tissues.

Some of the circulating blood volume in the skin will flow through will flow through **arteriovenous anastomoses (AVAs)** instead of capillaries. AVAs serve a role in temperature regulation. In this article we shall consider the different adaptations of the cutaneous circulation, and its role in body temperature control.

3. Discuss the cardiovascular adjustment that occurs during exercise.

- a. The integrated response to severe exercise involves fourfold to fivefold increases in cardiac output, which are due primarily to increases in cardiac rate and to a lesser extent to augmentation of stroke volume. The increase in stroke volume is partly

due to an increase in end-diastolic cardiac size (Frank-Starling mechanism) and secondarily due to a reduction in end-systolic cardiac size. The full role of the Frank-Starling mechanism is masked by the concomitant tachycardia. The reduction in end-systolic dimensions can be related to increased contractility, mediated by beta adrenergic stimulation. Beta adrenergic blockade prevents the inotropic response, the decrease in end-systolic dimensions, and approximately 50% of the tachycardia of exercise. The enhanced cardiac output is distributed preferentially to the exercising muscles including the heart. Blood flow to the heart increases fourfold to fivefold as well, mainly reflecting the augmented metabolic requirements of the myocardium due to near maximal increases in cardiac rate and contractility. Blood flow to the inactive viscera (e.g., kidney and gastrointestinal tract) is maintained during severe exercise in the normal dog. It is suggested that local autoregulatory mechanisms are responsible for maintained visceral flow in the face of neural and hormonal autonomic drive, which acts to constrict renal and mesenteric vessels and to reduce blood flow. However, in the presence of circulatory impairment, where oxygen delivery to the exercising muscles is impaired as occurs to complete heart block where normal heart rate

increases during exercise are prevented, or in congestive right heart failure, where normal stroke volume increases during exercise are impaired, or in the presence of severe anemia, where oxygen-carrying capacity of the blood is limited, visceral blood flows are reduced drastically and blood is diverted to the exercising musculature. Thus,, visceral flow is normally maintained during severe exercise as long as all other compensatory mechanisms remain intact. However, when any other compensatory mechanism is disrupted (even the elimination of splenic reserve in the dog), reduction and diversion of visceral flow occur.

