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COURSE: PHYSIOLOGY

DEPT: MEDICINE AND SURGERY

LEVEL: 200

Assignment

1. Discuss the long-term regulation of mean arterial blood pressure?
2. Write short notes on the following:

a. Pulmonary circulation

b. Circle of willis

c. Splanchnic circulation

d. Coronary circulation

e. Cutaneous circulation

3. Discuss the cardiovascular adjustment that occurs during exercise?

1. Long-term regulation involves mainly the regulation of extracellular fluid volume by pressure natriuresis mechanisms residing in the kidney

and by widespread actions of angiotensin 2. Studies in hypertensives have suggested that the long-term-controlled variable is not arterial blood pressure, but the balance between intake and output of fluid and electrolytes. If the kidney requires a higher perfusion pressure to achieve that balance then daily blood pressure regulation occurs around an appropriately higher setpoint.

2. The pulmonary circulation is the portion of the circulatory system which carries deoxygenated blood away from the right ventricle, to the lungs, and returns oxygenated blood to the left atrium and ventricle of the heart. The term pulmonary circulation is readily paired and contrasted with the systemic circulation.

The **pulmonary circulation begins** at the **pulmonary** valve, marking the vascular exit from the right side of the heart, and extends to the orifices of the **pulmonary** veins in the wall of the left atrium, which marks the entrance into the left side of the heart.

A. The **Circle of Willis** is the joining area of several arteries at the bottom (inferior) side of the brain. At the **Circle of Willis**, the internal carotid arteries branch into smaller arteries that supply oxygenated blood to over 80% of the cerebrum. The **circle of Willis** is a part of the cerebral circulation and is composed of the following arteries: Internal carotid artery (left and right) Posterior cerebral artery (left and right) Posterior communicating artery (left and right). It helps blood flow from both the front and back sections of the brain. The **circle of Willis** gets **its** name from the physician Thomas **Willis**, who described this part of the anatomy in 1664.

C. **splanchnic circulation** describes the blood flow to the abdominal gastrointestinal organs including the stomach, liver, spleen, pancreas, small intestine, and large intestine. It comprises three major branches of the abdominal aorta; the coeliac artery; superior mesenteric artery

(SMA); and inferior mesenteric artery. The hepatic portal circulation delivers the majority of the blood flow to the liver.

D. **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. Coronary arteries supply blood to the heart **muscle**. Like all other tissues in the body, the heart **muscle** needs **oxygen**-rich blood to function. Also, **oxygen**-depleted blood must be carried away. The coronary arteries wrap around the outside of the heart.

E. 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.

3. The three major **adjustments** made by the **cardiovascular** system **during exercise** include one, an increase **in cardiac** output or the pumping capacity of the heart, designed to enhance the delivery of oxygen **and** fuel to the working muscles. 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 and secondarily due to a reduction in end-systolic cardiac size. The reduction in end-systolic dimensions can be related to increased contractility, mediated by beta adrenergic stimulation. 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.