NAME: ADEGBENRO DIEKOLOLAOLUWA OPEMIPOSI

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COURSE: PHS 201 (CARDIOVASCULAR PHYSIOLOGY)

COURSE LECTURER: DR K. S OLANIYI

ASSIGNMENT

1. Discuss the long term regulation of mean arterial blood pressure
   Long-term arterial blood pressure control (over periods of weeks or months) is usually concerned with the balance between extracellular fluid and blood volume on one hand and the renal mechanisms controlling urine output on the other hand. The kidney plays an important role in the long term regulation of arterial blood pressure. When blood pressure alters slowly in several days or months or years, the nervous mechanism adapts to the altered pressure and looses the sensitivity for the changes. It cannot regulate the pressure any more. In such conditions, the renal mechanism operates efficiently to regulate the blood pressure. Therefore, it is called renal regulation. Kidneys regulate arterial blood pressure by two ways:
   a. By regulation of ECF volume
   b. Through renin-angiotensin mechanism: Activation of renin-angiotensin system is a decrease in blood pressure causes the release of renin from the juxtaglomerular apparatus which converts the plasma-borne precursor angiotensinogen into angiotensin I. Angiotensin-converting enzyme (ACE) then converts angiotensin I into the active molecule, Ag II, which is a potent vasoconstrictor. Ag II increases TPR and decreases glomerular filtration rate (GFR). It also stimulates adrenal cortex to secrete aldosterone which causes re-absorption of water and salt from the renal tubules

2. Write short notes on:
   i. Pulmonary Circulation: this is the flow of blood between the heart and the lungs. Pulmonary circulation is also called lesser circulation. Blood is pumped from right ventricle to lungs through pulmonary artery. Exchange of gases occurs between blood and alveoli of the lungs at pulmonary capillaries. Oxygenated blood returns to left atrium through the pulmonary veins. Thus, left side of the heart contains oxygenated or arterial blood and the right side of the heart contains deoxygenated or venous blood.
   ii. Coronary circulation: this is the circulation of blood within the heart. 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.

iii. Splanchnic circulation: this is the flow of blood to the liver from the GIT (GastroIntestinal tract) and spleen through portal system. It is also called visceral circulation and it has three portions: mesenteric (supply of blood to GI tract), splenic (supply of blood to spleen) and hepatic (supply of blood to liver) circulation

iv. Cutaneous Circulation: this is the circulation and blood supply of the skin. The cutaneous tissue has a relatively low metabolic activity compared to other tissues and organs therefore under normal conditions, the circulation to the skin makes up about 4% of the total cardiac output. However, cutaneous circulation plays an important role in regulation of ore body temperature.

v. Circle of Willis: this is formed from branches of basilar artery and internal carotid artery. The circle of willis encircles the stalk of the pituitary gland and provides important communications between the blood supply of the forebrain and the hindbrain. The circle of willis begins to form when the left and the right internal carotid artery enters the cranial cavity and each one divides into two main branches; the anterior cerebral artery and the middle cerebral artery.

3. Discuss the cardiovascular adjustment that occurs during exercise.

   During exercise, there is an increase in metabolic needs of body tissues, especially the muscles. Various adjustments in the body during exercise are aimed at: a. Supply of various metabolic requisites like nutrients and oxygen to muscles and other tissues involved in exercise b. Prevention of increase in body temperature.

   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 sterling's mechanism) and secondarily due to a reduction in end-systolic cardiac size. The full role of Frank Starling's mechanism is masked by concomitant tachycardia. The reduction in end-systolic dimensions can be related to increased contractility, meditated by beta adrenergic stimulation. Beta adrenergic blockade prevents the ionotropic 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 muscle of the heart. Blood flow of the heart increases fourfold to fivefold as well, mainly reflecting the augmented metabolic requirements of the myocardium due to the near maximal increases in cardiac rate and contractility.