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**MATRICULATION NUMBER: 18/MHS01/072**

**COLLEGE: MEDICINE AND HEALTH SCIENCES**

**DEPARTMENT: MEDICINE AND SURGERY**

**COURSE: PHYSIOLOGY ASSIGNMENT**

1. **Discuss the regulation of mean arterial blood pressure.**

In each cardiac cycle arterial blood pressure fluctuates between diastolic and systolic pressure. However, the body behaves from day to day as if it regulated the mean arterial blood pressure, which is the average between diastolic and systolic pressures. Such regulation is achieved by interdependent adjustments of only 3 parameter: Heart Rate (HR), Ventricular stroke volume (SV) and total peripheral vascular resistance (TPVR). These are related as follows: HR – SV= Cardiac Output (CO): CO – TPVR= Mean Arterial Blood Pressure. The regulatory system includes stretch-sensitive sensors, central nervous integrators/evaluators and neuro-humoral effector mechanisms. Central nervous integration and evaluation of incoming signals occurs mostly in the pons/medulla regions of the midbrain. The most important effector mechanisms are the parasympathetic and sympathetic divisions of the autonomic nervous system, the renin-angiotensin system and vasopressin. Short-term regulation of arterial blood pressure is dominated by the baroreceptor mechanism, whereby pressure is sensed by both cardio-pulmonary nerve endings and stretch -sensitive cells in renal afferent arterioles. 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 to achieve that balance then daily blood pressure regulation occurs around an appropriately higher setpoint.

1. **Write short notes on the following**

* **Pulmonary circulation**
* **Circle of willis**
* **Splanchnic circulation**
* **Coronary circulation**
* **Cutaneous circulation**

**Pulmonary circulation:** 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 pulmonary circulation is readily paired and contrasted with the systemic circulation. The vessels of the pulmonary circulation are the pulmonary arteries and the pulmonary veins.

**Circle of willis:** 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. It is a junction of several important arteries at the bottom part of the brain. It helps blood flow from both the front and back sections of the brain.

**Splanchnic circulation:** The splanchnic circulation consists of the blood supply to the gastrointestinal tract, liver, spleen and pancreas. It consists of two large capillary in series. The small splanchnic arterial branches supply the capillary beds, and then the efferent venous blood flows into the PV.

**Coronary circulation:** Coronary circulation is the circulation of blood in the blood vessels that supplies the heart muscles(myocardium). Coronary arteries supply oxygenated blood to the heart muscle, and cardiac veins drain away the blood once it has been deoxygenated.

**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 requirement, so its blood supply is different to that of other tissues.

1. **Describe the adjustments that occur in the Cardiovascular system during exercise.**

The three major adjustments made by the Cardiovascular system during exercise include

* 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.
* Increased muscle blood flow, blood vessels in muscles dilate, increasing local blood flow to the working muscles.
* Decrease to blood flow to other organs such as the kidneys, liver and guts, thereby redirecting or shunts blood flow to working muscles.

In order to increase cardiac output you increase the heart rate and the stroke volume

Cardiac output= Heart Rate (HR) \* Stoke Volume ( SV)

In the case of exercise we increase both.

The basic ways we can increase heart rate during exercise is

* Reduction of Parasympathetic Nervous System Activity to the heart as parasympathetic nerve activity causes a lowering of heart rate, therefore this reduction will lead to an increase in heart rate
* Increase in the Sympathetic Nervous System Activity to the heart will directly cause an increase in the heart rate, this increase will be a function of the exercise intensity.
* Increase in the circulating hormone Epinephrine circulating in the blood flow.

These adjustments are also part of the fight or flight response you experience when nervous or frightened, it prepares the body for movement.

An increase in the stroke volume happens with increase in exercise intensity but may plateau before reaching max by

* Increased sympathetic activity
* Increased circulating epinephrine