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**Level: 200**

1. The mean arterial blood pressure is the average of the arterial pressures measured millisecond by millisecond over a period of time. Mean Arterial Blood pressure (MAP) is the average pressure existing in the arteries (DP+1/3PP). The long term regulation of mean arterial blood pressure or renal mechanism is closely intertwined with homeostasis of body fluid volume, which is determined by the balance between the fluid intake and output. For long term survival, fluid intake and output must be precisely balanced, a task that is performed by multiple nervous and hormonal control and by local control systems within the kidneys that regulate their excretion of salt and water. The renal body fluid system for arterial pressure control acts slowly but powerfully as follows: if blood volume increases and vascular capacitance is not altered, arterial pressure will also increase. The rising pressure, in turn causes the kidneys to excrete the excess volume, thus returning the pressure back toward normal.
2. a.) Pulmonary circulation: Pulmonary circulation is the flow of blood between the heart and lungs. This is a 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 vessels of the pulmonary circulation are the pulmonary arteries and the pulmonary veins.

b.) Circle of Willis: The circle of Willis or loop of Willis is a circulatory anastomosis that supplies blood to the brain and the surrounding structures. The arrangement of the brains arteries into the circle of Willis creates redundancy for collateral circulation in the cerebral circulation. If one part of the circle becomes blocked or narrowed or one of the arteries supplying the circle is blocked or narrowed, blood flow from the other blood vessels can often preserve the cerebral perfusion well enough to avoid the symptoms of ischemia.

c.) Splanchnic circulation: The splanchnic circulation is composed of the blood flow originating from the celiac, superior mesenteric and inferior mesenteric arteries and is distributed to all abdominal viscera. The splanchnic circulation receives over 25% of the cardiac output and contains similar percentage of the total blood volume under normal conditions. Thus, the splanchnic circulation can act as a site of regulation of distribution of cardiac output and also as a blood reservoir. Numerous extrinsic and intrinsic influence the splanchnic circulation.

d.) Coronary circulation: Coronary circulation is a part of the systemic circulatory system that supplies blood to and provides drainage from the tissues of the heart. In the human heart, two coronary arteries arise from the aorta just beyond the semilunar valves during diastole, the increased aortic pressure above the valves forces blood into the coronary arteries and then into the musculature of the heart. Deoxygenated blood is returned to the chambers of the heart via coronary veins and most of these converge to form the coronary venous sinus, which drains into the right atrium.

e.) Cutaneous circulation: 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 arteriovenous anastomoses (AVAs) instead of capillaries. The arteriovenous anastomoses serve as a role in temperature regulation.

3. 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. 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 auto regulatory 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.