Blood flow

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Blood Flow(hemodynamics)

Blood flow is circulation of Blood in the Blood circulatory system (cardiovascular system).

Cardiovascular system consist of:

-Heart: muscular pumping organ. -Arteries(Arterioles): thick vessels carry the blood away from the Heart. -Veins(Venules): thin vessels carry the blood to the Heart. -Capillaries: very small and thin vessels carry from Arteries to Veins. -Blood: liquid connective tissue made up of red blood cells(Erythrocytes), white blood cells(Leukocytes), platelets liquid plasma,it transport protein, hormones, oxygen, carbondioxid, nutrients, cellular waste products.

The rate of blood flow out of the heart (often expressed in L/min) is known as the cardiac output (CO). Average volume: 5l Average density: 1.05 g/cm3 Composition: 40-45 % corpuscular, 55-60 % plasmaBlood pumped out of the heart to the aorta. It then divide into smaller and smaller arteries, then into arterioles, and eventually capillaries, where oxygen transfer. The capillaries connect to venues, and the blood then travels back through the network of veins to the right heart. The other-circulation — the arterioles, capillaries, and venules —constitutes most of the area of the vascular system and is the site of the transfer of O2, glucose, and enzyme substrates into the cells. The venous system returns the de-oxygenated blood to the right heart where it is pumped into the lungs to become oxygenated and CO2 and other gaseous wastes exchanged and expelled during breathing. Blood then returns to the left side of the heart where it begins the process again. In a normal circulatory system, the volume of blood returning to the heart each minute is approximately equal to the volume that is pumped out each minute (the cardiac output). Because of this, the velocity of blood flow across each level of the circulatory system is primarily determined by the total cross-sectional area of that level. This is mathematically expressed by the following equation: v = Q/A where • v = velocity (cm/s) • Q = blood flow (ml/s) • A = cross sectional area (cm2) • Average viscosity: 5 mPas Blood viscosity: is the resistance of blood to flow. Normal adult blood viscosity is 40/100 (forty over one hundred) the Unit is millipoise, symbol: mP, SI unit for dynamic viscosity is the Pascal second and 1pascal second is equal to 10000 millipoise.

Resistance is also related to vessel radius, vessel length, and blood viscosity, as indicated by the Hagen-Poiseuille equation.The equation is as follows:

$$\Delta P = 8\mu lQ/\pi r4$$

• ΔP: pressure drop/gradient • μ: viscosity • l: length of tube. In the case of vessels with infinitely long lengths, l is replaced with diameter of the vessel. • Q: flow rate of the blood in the vessel • r: radius of the vessel

• References:

• http://en.wikipedia.org/wiki/Blood_flow • • http://bloodflowonline.com/content/blood-viscosity • • http://en.wikipedia.org/wiki/Hemodynamics