Anatomy and Physiology Cheat Sheet Chapters 18-20 Cheat Sheet

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Elements

Hemocytoblasts (Stem Cell)	Hematopoiesis (Production in bone	Chemical/Hormone	Location
Erythrocytes (RBCs)	Erythropoiesis	Erythropoietin (EPO)	1. Kidneys 2. Liver
Leukocytes (WBCs)	Leukopoiesis	Cytokines	Macrophages & T-Lymphocytes
Thrombocytes (Platelets)	Thrombopoiesis	Thrombopoietin	1. Liver 2. Kidneys

Blood

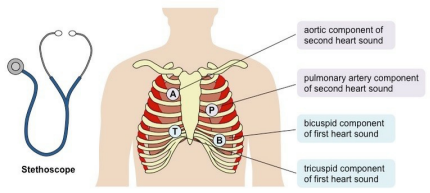
Blood (cont)

Blood (cont)

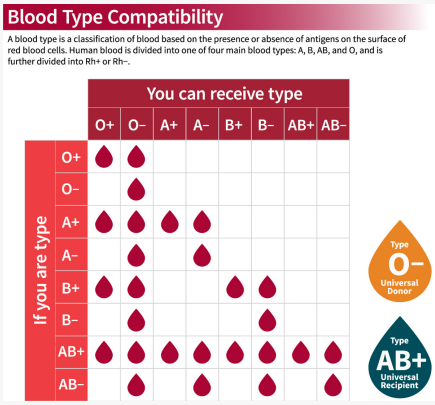
Albumin

> Most abundant protein

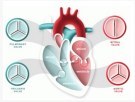
APTM Heart sounds



Blood Types



Heart Valves



Heart

Systole/ Diastole	**Systole~** Contraction of the heart muscles. **Diastole~** Relaxation of the heart muscles
Papillary Muscles	Contract & generate tension on chordae tendineae
Cardiac Reserve	Difference between resting and maximal cardiac output

Function of the Spleen

> Graveyard. Dying RBCs are recycled in the spleen, liver, and red bone marrow by macrophages.

White Blood Cells

> Never Let Monkeys Eat Bananas. Neutrophils, Lymphocyctes, Monocytes, Eosinophils, Basophils. **Leukocytes** ~ There are 5 types of leukocytes organized into two classes. those are **Agranular** , which consists of lympho-cytes (20-25%) & monocytes (3-8%). **Granular**, which consists of basophils (.5-1%) neutrophils (60-70%) & eosino-phils (2-4%)

Neutrophils

> Nucleus 2-5 lobes / Our bodies "Bacteria Slayers" / Initiate **respiratory bursts** to kill bacteria / Produce antibotic-like proteins called **defensins**

Lymphocytes

> Large single, dark purple, mostly made of lymph tissue. **T**-cells- Ac**T** against virus-infec**T**ed cells & **T**umor cells. **T**hymus- immunocompetence/mature. **B**-cells- **B**ecome plasma cells which produce anti**B**odies ; **B**one marrow-immunocompetence/mature

Monocytes

> Dark purple *kidney* or U-shaped nuclei. Largest leukocyte. Leave circulation and enter tissue- turn to **macrophages**. Activate lymphocytes from immune response by releasing cytokines.

Eosinophils

> Red-staining, bi-lobed. Digest parasitic worms. Lessen the severity of allergies.

Basophils

> Rarest WBCs. U or S-shaped. Contain large purplish-black granules. Histamine (vasodilator) & heparin (anticoagulant) attracts other WBCs to inflamed sites & **bronchoconstriction**

Normal ph range for blood

> **7.35-7.45**

Response to injury/hemostasis

> Stoppage of bleeding. 1~Vascular Spasm 2~ Platelet Plug 3~Coagulation

Thrombocytes (Platelets)

> Megakarayocyte-Cytoplasmic cell fragments. Form a temporary plug to seal vessels

Leukocytes (WBC's)

> Are complete cells (They have a nucleus and organelles)

Erythrocytes (RBC's)

> Mature RBC's have no nuclei or organelles (live approx. 120 days)

Hypoxia

> Too few RBCs (anemia)

Erythropoietin (EPO)

> Direct stimulus for erythropoeisis Released by kidneys in response to "hypoxia"

Hematopoiesis (Hemopoiesis)

> is the proliferation and differentiation of the formed elements of blood originating from a **Hemocytoblast** (stem cell).

Polycythemia

> excess RBCs > inc blood viscosity > heart attack or stroke. **Polycythemia vera**~Bone marrow cancer due to a gene mutation. **Secondary polycythemia**~less O2 available or inc EPO. **Blood doping**~ (excess blood transfusions)

Leukemia

> cancerous conditions of abnormal production (increased #) Leukemias are named according to the abnormal WBCs involved **Myelocytic leukemia**~involves myeloblasts **Lymphocytic leukemia**~involves lymphocytes (Acute: quickly developing; primarily affects children Chronic: slow to develop; more prevalent in older people)

Location of Hematopoiesis

> Red Bone Marrow

Heart (cont)

Angina Pectoris	Pain due to deficient blood supply to the myocardium. Caused by transient stress-induced spasms of coronary arteries, increased physical demands on the heart or arteriosclerosis. Cells are weakened.
Myocardial Infract	**Hear Attack**. Prolonged coronary blockage= prolonged lack of oxygen to the heart muscles= cardiac muscle cell death. These cells are AMITOTIC; replaced with non-contractile scar tissue. May be repairable depending on the extent of the damage and time

Heart (cont)

Layers of the Heart	**Epicardium** aka visceral pericardium- visceral layer of the serous pericardium. **Myocardium**- Spiral bundles of cardiac muscle cells held together by elastic & collagen fibers that form a dense network called the *Fibrous Skeleton* of the heart. **Endocardium** innermost- Endothelial layer of the inner myocardial surface that is continuous with blood vessel linings. Creates a smooth surface for easy blood flow.
Contraction of the Heart	**Sinoatrial node (SA Node-Pacemaker)** 60-100 beats/min. **Atrioventricular node (AV Node)** 40-60 beats/min. **Atrioventricular (AV) bundles (Bundle of His)** 0-40 beats/min **Right and Left bundle branches** 0-40 beats/min **Ventricular Purkinje Fibers** 0-40 beats/min

Heart (cont)

Lub/Dub sounds	Caused by the closing of heart valves. **First Sound~** occurs as AV valves close and signifies beginning of systole (contraction). **Second Sound~** occurs when SL valves close at the beginning of ventricular diastole (relaxed)
Pathway of blood through Heart (Pulmonary circuit)	Right atrium-tricuspid valve--right ventricle-pulmonary semilunar valve-pulmonary arteries-Lungs-pulmonary veins-left atrium
Pathway of blood through Heart (Systemic circuit)	Left atrium-bicuspid (mitral) valve-Left ventricle-aortic semilunar valve-aorta-to the body-vena cavas-right atrium

Heart (cont)

Isovolumetric contraction/-relaxation	**isovolumetric Contraction~** All 4 valves are closed. Atria relax; ventricles contract (0.3 seconds) **Isovolumetric Relaxation~** All 4 valves are closed. Occurs in early diastole. Ventricles relax. Backflow of blood in aorta and pulmonary trunk closes semilunar valves. Quiescent period (0.4 seconds)
Ventricular Filling	Takes places mid-to-late diastole. Atrial contraction (0.1 seconds). AV valves are open. 80% of blood passively flows into ventricles. Remaining 20% delivered with atrial systole. Heart blood pressure is low as blood enters atria and flows into ventricles.

Heart (cont)

Development aspects of the heart	Fetal heart structures that bypass pulmonary circulation. **Forman Ovale~** connects the two atria. After birth this closes and becomes the **Fossa Ovalis**. **Ductus Arteriosus~** connects pulmonary trunk and the aorta. After birth this closes and becomes the **Ligamentum Ateriosum**
Cardiac Output Equation	CO= SV (Stroke Volume) X HR (Heart Rate) **If HR or SV goes up so does CO; same is true for going down**
Stroke Volume Equation	SV= EDV (End Diastolic Volume) - ESV (End Systolic Volume) **EDV~ amount of blood collected in a ventricle during diastole (120ml) ESV~ amount of blood remaining in a ventricle after contraction (50ml)** *Average Stroke Volume~ 70ml*
Norepinephrine	Sympathetic neuron activation releases **Norepinephrine**

Heart (cont)

Acetylcholine	Parasympathetic fibers in the vagus nerves release **Acetylcholine**. If vagus nerves are cut= inc HR by ~ 25 bpm (**THIS IS CALLED VAGAL TONE**)
Congestive Heart Failure (CHF)	The heart is a "double pump" and each side can initially fail independently of the other. **LEFT SIDE~** Pulmonary congestion~ blood backing up into the lungs > pulmonary edema. Can lead to suffocation. **RIGHT SIDE~** Peripheral Congestion~ blood backs up at the tissue level > edema in the extremities. Can lead to tissue hypoxia.

Heart (cont)

Commotio Cordis	Often lethal disruption of heart rhythm that occurs as a result of a blow to the area directly over the heart, at a critical time during the cycle of a heart beat causing cardiac arrest. It is a form a ventricular fibrillation, not mechanical damage to the heart muscle or surrounding organs, and not the result of heart disease.
Normal blood pressure in Pulmonary Trunk	24/8 mmHg

Blood Vessels

Arteries/Arterioles

> Always carry blood away from the heart; oxygenated **except** for pulmonary circulation and umbilical vessels of fetus. **ARTERIOLES**~Smallest arteries; lead to capillary beds. Control blood flow into capillary beds via sympathetic nervous system vasoconstriction (increased release of norepinephrine) and vasodilation (decreased release of norepinephrine)

Veins/Venules

> Always carry blood toward the heart; deoxygenated **except** in pulmonary circulation and umbilical vessel of fetus

Blood Vessels (cont)

Veins

> Special adaptations to ensure return blood: Large-diameter lumens: offer little resistance to blood flow Valves prevent backflow of blood Varicose veins and hemorrhoids are the result of incompetent valves (valve failure).

Capillaries

> Contact tissue cells and directly serve cellular needs. Smallest blood vessels (microscopic). Walls consisting of thin tunica intima, one cell thickness. Diameter only allows a single RBC to pass at a time. Function: exchanges of gases, nutrients, and metabolic wastes between tissue and blood.

Neurotransmitter released by Sympathetic and Parasympathetic

> **Sympathetic**~ NE-Norepinephrine
> **Parasympathetic**~ACH-Acetylcholine

Antidiuretic Hormone (ADH) effects of blood pressure

> released when BP falls very low causes intense vasoconstriction >> inc BP Also stimulates kidneys to conserve water

Mean Arterial Pressure (MAP) Equation

> pressure that propels blood through tissues. MAP=Diastolic+ Pulse Pressure/3 (Example BP of 110/70 MAP=70+110-70/3)

Blood Vessels (cont)

Renin-angiotensin and effects of Angiotensin II and Aldosterone

> **Renin-angiotensin** has a major effect on the cardiovascular system. Renin is an enzyme, although some sources identify it as a hormone. Renin converts the plasma protein angiotensinogen which is produced by the liver, into its active form **angiotensin I**. **angiotensin I** circulates in the blood and is then converted into **angiotensin II** in the lungs. **Angiotensin II** is a powerful vasoconstrictor, greatly increasing blood pressure. It also stimulates the release of ADH and **aldosterone**. (Angiotensin II~ released in low renal prefusion (decreased BP). Kidney are stimulated to release of renin which generates angiotensin II. Initially creates vasoconstriction (short term)>->inc BP. Long term >> *stimulates aldosterone and ADH release*>>inc blood volume>>inc BP)

Blood pressure Equation

> BP= CO (Cardiac Output) X PR (Peripheral resistance)

Blood Pressure Chart

Blood Comp