04/07/2014

Physiology Exam 11 Study Guide

<u>Cardiovascular conditions</u>

-**Hypotension** = low blood pressure

- Hemorrhage: large loss of plasma fluids (n □ → P □) - requires medical intervention (IV needed to increase back to normal)
- Shock: □□□ blood flow
  - Sufficient damage → visceral pain → □ BP to prevent bleeding out
  - Spreads to other organs → □ BP there too (less blood flow) → they now feel pain → □ BP even more
    - Positive feedback cycle
  - Major change over in ER system (70s) → Triage system
  - How to help: warm them, lay down, raise feet

-**Hypertension** = chronic high BP

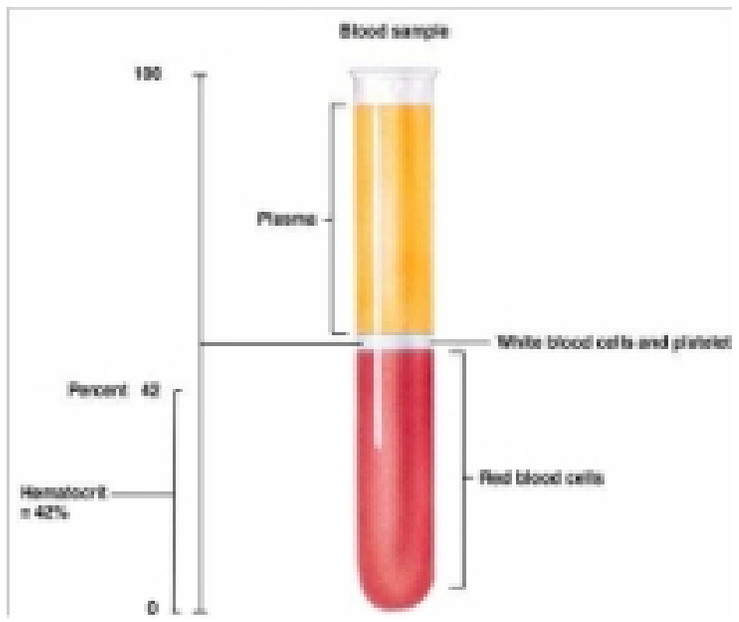
- Usually due to increased peripheral resistance → heart must work harder
  - Narrow vessels → BP must □ to push blood through
- Cause often unknown → millions of places resistance could be occurring
  - Majority of people with HBP – can't treat cause so treat symptoms
  - Sometimes due to problems in kidneys (can treat cause)
- Leads to **ventricular hypertrophy**
  - Ex: ice cream scoopers → 1 arm is muscular and not the other
  - If squeeze must always be harder, need more muscles in heart (bigger ventricle)

- Increases size of the heart → if it becomes too big = harder to squeeze properly
    - 3D shape – muscle gets in the way (massive biceps – can't touch shoulder/face) → lose ability to do contraction
    - Heart getting too big → less lung space (can't expand fully)

Blood Component Overview

*Like a plumbing system in house → need enough liquid/solids (50/50 ratio) to move through

-Plasma (at least 50%) – liquid portion of our blood (needed to move solids)



- Components: Water (90%), plasma proteins:
    - 1. Albumin – important for pH/pressure maintenance
    - 2. Immunoglobulins – proteins of immune system (antibodies)
    - 3. Fibrinogen – helps seal damage in vasculature system
- Transport materials and heat (move temperature with plasma around in body)
- Maintain BP and pH
- Provide immunity and clotting

-Blood cells

- **Leucocytes** (white) = WBCs → immune system
- **Erythrocytes** (red) = RBCs → bigger, higher amount

Platelets – participate in **hemostasis** → solving openings in vasculature system to keep blood within the vessels and not leaking out

Erythrocytes

- Small (5-7 micrometers) → determines size of the smallest vessel (capillary)
    - Want capillary to be small as possible
- Lack nucleus and organelles (trying to make small as possible)

    - Get energy only via glycolysis
    - No repair capacity – not able to survive/do as much as other cells
- Biconcave ellipse (pushed in in middle on both sides)
    - Maximizes surface area (helps with diffusion)
    - Minimum width to "shimmy" through capillaries
- Primary function = transport oxygen to/ carbon dioxide away from cells
    - But oxygen is nonpolar → stays inside cell by attaching to hemoglobin (protein inside RBCs) → oxygen now can't leave RBC through walls
    - Hemoglobin has capacity to hold 4 oxygen at a time, impact/bind with CO_2, H^+ and carbon monoxide
- ***NO nucleus – no direction to repair Hb if damaged → shelf life 120 days

-**Erythropoiesis** – process of replacing RBCs (trigger to make more)

- Where: bone marrow
- Rate: 2-3 million RBCs per second
- Needs: (like all the ingredients needed to make brownies)
    - Iron → needed for hemoglobin
    - Vitamin B12
    - Folic acid (issue for pregnant women – need enough for 2)

****Need a trigger to begin production of more RBCs

- **Erythropoietin**: endocrine associated with kidney → components monitored by chemoreceptors (main determining factor = amount of O_2 present in flow)
    - □ $[O_2]$ → □ release of EPO by kidneys → binds to receptors in bone marrow → □ RBCs → □capacity for blood to carry O_2 due to more hemoglobin (more O_2 binding sites) → □ $[O_2]$ in blood → □ $[O_2]$ in tissues
        - Negative feedback process
    - *Athletes take EPO to □ # of RBCs to stay aerobic longer → perform better