Chapter 1: An Introduction to the Human Body

PET3322

EXAM

- Homeostasis: the existence and maintenance of a relatively constant environment within the body.
- Examples of stable conditions are blood glucose, body temperature, and blood pressure
- Small amounts of fluid surround each body cell and for a cell to function normally the volume, temperature, and chemical content of this fluid must remain within a narrow range.
    - Ex. Body temperature increases in a hot environment or decreases in a cold environment
- Our bodies cannot stay perfectly stable, however they fluctuate very little around the set point.
- The organ system helps keep the body's internal environment relatively constant.
- Body fluids:
    - Volume and composition of various fluids within our bodies are carefully regulated
    - Fluids include:
        - Intracellular fluid: fluid inside our cells
    - Extracellular fluid: all body fluids other than the ones inside our cells.
        - Interstitial fluid: fluid between cells in tissues
        - Plasma: the fluid component of blood
        - Lymph: the fluid in our lymphatic vessels
        - Cerebrospinal fluid (csf): the fluid within the cns
        - Synovial fluid: fluid within most joints
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- Negative-Feedback: most of the body is regulated by this and it maintains homeostasis.
- Negative feedback systems act to stabilize the body in the face of changing external and internal conditions. These systems cause an **opposite** response to the initial change, and so are self-limiting.
- Three essential components:

        - Baroreceptors- detect changes in blood pressure and communicate with the brain
        - Brain – interprets info and sends signals to the heart and blood vessels
        - Heart and blood vessels - alter their activities based on signals from the brain
- Three components to negative feedback
    - 1. Receptor: detects changes in controlled conditions
    - 2. Control center: receives information about the changes from the receptor and decides the type and mount of response required
    - 3. Effector: reacts to signals from control center and produces the required response
    - Ex. Maintaining normal blood pressure:
        - 1. Receptors that monitor blood pressure are located within large blood vessels near the heart and head
        - 2. A control center in the brain receives signals sent through nerves from the receptors. The control center evaluates information and sends signals through nerves to the heart
        - 3. The heart is the effector, and the heart rate increases or decreases in response to signals from the brain.
        - If the blood pressure **increases** slightly, receptors detect that change and send the info to the control center in the brain. The control center causes the heart rate to **decrease**, lowering the blood pressure. (OPPOSITE)
        - If the blood pressure **decreases** slightly, receptors detect that change and send the info to the control center in the brain. The control center causes the heart rate to **increase**, which elevates the blood pressure.
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- Positive-Feedback: a stimulus causes a response that reinforces the effect of the stimulus.
    - Ex. During blood loss, a chemical responsible for blood clot formation is thrombin. The body stimulates production of even more thrombin. The body goes back to homeostasis.

    - Ex. Birth: near the end of the pregnancy, the baby's larger size stretches the uterus.
- Two main principles
    - 1. Many disease states result from the failure of negative feedback mechanisms to maintain homeostasis.
    - 2. Some positive feedback mechanisms can be detrimental instead of helpful
        - ex of detrimental positive feedback mechanism: inadequate delivery of blood to cardiac (heart) muscle.
        - Contraction of cardiac muscle generates blood pressure and the heart pumps blood to itself through system of blood vessels on the outside of the heart. Blood pressure must be maintained to ensure adequate delivery of blood to the cardiac muscle
        - Following, extreme blood loss, blood pressure decreases to the point that the delivery of blood to cardiac muscle is inadequate. As a result, the cardiac muscle does not function normally.
        - The heart pumps less blood, which causes the blood pressure to drop even further – a deviation further from the setpoint. The additional decrease in blood pressure further reduces blood delivery to cardiac muscle and the heart pumps even less blood. Which again decreases the blood pressure. This can make the heart stop beating and result in death.