Bio 250
Anatomy & Physiology
The Human Organism

Dr. Tom Rachow “Rock-o”
Office: Agenstein Hall 201E

Introduction to A & P

- Check out the A & P Website at:
  - http://academic.missouriwestern.edu/rachow/
  - Office Hours
  - Grading Policy
  - Sample Quiz
  - Sample Exams
  - Academic Honest & Attendance Policy
  - Basic Notes for Class
  - Notes are available in pdf format
  - How to register your “clickers” for CPS

Why Anatomy & Physiology?

- Anatomy is the study of structure
- Physiology is the study of function
- Why not study anatomy one semester and physiology another?
- Since form (anatomy) typically determines function (physiology), it makes sense to describe what a body part looks like and discuss what it does at the same time not different semesters.
Terminology

- All disciplines have their own special words
- Thousands of terms to describe the body, its parts and their functions
- **Anatomy** is a very old discipline – terms are mostly Latin and Greek – often named things after something they were already familiar with (e.g. cauda equina = horse tail)

Just a thought.

- “It’s hard to say what something is…if you can’t say what it’s like.”
- Example: The eye compared to camera, or
- The heart compared to a water pump, or
- The muscles compared to engines, or
- The brain compared to a computer
- **Physiology** is a much newer science – a greater understanding of how the world “worked” was required before we could begin to understand the functioning of the body’s parts.

Analyzing Medical Terms

- Medical terminology based on word elements (A lexicon of common word elements can be found in the back of your textbook)
- Scientific terms are composed of the following elements
  - at least one root (stem) that bears the core meaning
  - combining vowels that join roots together
  - prefix that modifies the core meaning of the word
  - suffix that modifies the core meaning of the word
- acronyms – words composed of the first few letters of a series of words, e.g. CNS, DNA, ATP
Anatomy (study of structure)

- Gross anatomy
  - Regional anatomy
  - Systematic anatomy

- We are going to study the human body one system at a time and then try to relate the systems to one another
Anatomy (study of structure)

- Microscopic anatomy
  - cytology
  - histology
Anatomy (study of structure)

- Microscopic anatomy
  - cytology
  - histology
- Developmental anatomy
- Radiographic anatomy

Physiology (study of function)

- Human physiology
  - neurophysiology
  - renal physiology
- Animal physiology
- Plant physiology
- Bacterial and viral physiology
Human Structure

- Hierarchy of complexity
  - organism is composed of organ systems
  - organ systems composed of organs
  - organs composed of tissues
  - tissues composed of cells
  - cells are composed of organelles
  - organelles composed of molecules
  - molecules composed of atoms
  - Atoms composed of subatomic particles (protons, neutrons, etc)

A little history: Homeostasis

- Hippocrates (460–410 BC) noted that body normally returns to a state of equilibrium by itself
  - needs to detect the change and oppose it
- Walter Cannon (1871–1945) coined the term homeostasis indicating stable internal environment
- Internal environment described as dynamic equilibrium, e.g. it fluctuates within a range around a certain set point
- Loss of homeostatic control causes illness or death

Negative Feedback Loops

- Mechanism to keep a variable close to its set point
- Thermostat senses a change and activates mechanisms to reverse it
Negative Feedback, Set Point

- Room temperature does not stay at set point of 68 degrees -- it only averages 68 degrees

Human Thermoregulation

- Blood temperature sensing nerve cells in base of brain control shivering, sweating and vasomotor activity, e.g. vasodilation with heat and vasoconstriction with cold
- Evaporation of water and heat radiation occur

Control of Blood Pressure

- Rise in blood pressure detected
  - stretch receptors are located in walls of heart and major arteries
- Nerve signals travel to cardiac center in brainstem
- Nerve signals slow heart and lower blood pressure
Structures Needed for Feedback Loop

- **Receptor** = structure that senses change
  - stretch receptors in heart & large blood vessels send information of an elevated BP to integrator
- **Integrator** = control center
  - cardiac center in brainstem that signals heart to slow
- **Effector** = structures that carry out commands of the control center
  - heart slows and BP decreases
  - sweating begins and evaporation cools the body

Positive Feedback Loops

- Physiological change that leads to an even greater change in the same direction (self-amplifying)
- Normal way of producing rapid changes
  - birth, blood clotting, protein digestion, generation of nerve signals

Life-Threatening Fever

- If temperature rises above 108 degrees due to bacterial infection
  - metabolic rate increases causing body to produce heat even faster
- Temperature increases and cycle repeats
- Fatal at 113 degrees
Homeostasis - maintaining a state of constancy within the body

- Most of the body's systems are involved in the process of maintaining relatively constant and ideal conditions within the body.
- Constancy in temperature, water content, salt content, amount of oxygen and carbon dioxide in tissues, level of circulating waste products in the blood are examples.
- Remember that **Negative** feedback control keeps conditions relatively constant (within a narrow range).
- Remember that homeostatic regulation requires:
  - Receptor
  - Integrator or Control Center
  - Effector