

➤ **INTRODUCTION TO PHYSIOLOGY**

- **ORGANIZATION OF LIFE**

(HOW TO BUILD A HUMAN)

- ATOMS
- MOLECULES
- MACROMOLECULES
- CELLS
- TISSUES
- ORGANS
- ORGAN SYSTEMS
- ORGANISM (HUMAN)
- POPULATION
- COMMUNITY
- ECOSYSTEM
- BIOSPHERE

- **PRIMARY TISSUE TYPES**

- *HISTOLOGY* = THE study of tissues
- MUSCLE TISSUE
- NERVOUS TISSUE
- EPITHELIAL TISSUE
- CONNECTIVE TISSUE

- **PHYSIOLOGY**

- The study of the integrated functions of the vital systems of living organisms.
- This study could be of bacteria, plants, animals or humans

- **HOMEOSTASIS** = maintenance of a relatively stable internal environment

- Homeostasis is essential for the survival of each cell, and each cell, through its specialized activities, contributes as part of a body system to the maintenance of the internal environment shared by all cells

•PARAMETERS THAT ARE HOMEOSTATICALLY REGULATED

- BLOOD OXYGEN CONCENTRATION
 - (~200 ml/L in arteries)
 - PULSE-OXYMETER (~ 99-100%)
- TOTAL BODY WATER (TBW) = 0.6 x Body Weight
- BLOOD GLUCOSE CONCENTRATION (~ 70-100 mg/dl)
- BLOOD/BODY NUTRIENT LEVEL (Carbohydrates, Amino Acids, Fatty Acids, Vitamins, Minerals, etc.)
- BODY TEMPERATURE (~ 37 ° C OR ~ 98-99 ° F)

PARAMETERS THAT ARE HOMEOSTATICALLY REGULATED

- BLOOD CARBON DIOXIDE LEVEL (~ 480 - 520 ml/L)
- BLOOD pH = ACIDITY/ALKALINITY (~ 7.4)
- SALT AND OTHER ELECTROLYTE CONCENTRATION
 - (Na⁺, K⁺, Ca⁺, Cl⁻, Mg⁺, H⁺, HCO₃⁻, PO₄, etc.)
- BLOOD VOLUME (related to total body water)
 - plasma volume, salt and water balance
- BLOOD PRESSURE
 - related to blood volume, cardiac output, & total peripheral resistance
- METABOLIC WASTE CONCENTRATION IN BLOOD
 - urea, hormone metabolites, drug metabolites, etc.

•ORGAN SYSTEMS

- *NERVOUS SYSTEM*
- *SKELETAL SYSTEM*
- *MUSCULAR SYSTEM*
- *CARDIOVASCULAR (CIRCULATORY) SYSTEM*
- *RESPIRATORY SYSTEM*
- *LYMPHATIC SYSTEM*
- *IMMUNE SYSTEM*
- *URINARY (EXCRETORY) SYSTEM*
- *DIGESTIVE SYSTEM*
- *ENDOCRINE SYSTEM*
- *REPRODUCTIVE SYSTEM*

•ORGAN SYSTEMS

•CONTROL SYSTEMS

- **INTRINSIC OR LOCAL CONTROLS** = built in or inherent control system for particular organs. Usually regulated by localized chemical changes acting in a discrete area or tissue. These controls only act on one tissue or organ and do not allow for a coordinated, whole-body response.
- **EXTRINSIC CONTROLS** = Most physiological factors are controlled in this manner. The nervous and endocrine systems monitor and coordinate the extrinsic control of all organ systems. This “outside” control allows for the coordinated regulation of several organs toward a common goal to maintain homeostasis for the entire body.

- **NEGATIVE FEEDBACK**

- Most homeostatically controlled parameters in the body are regulated by negative feedback.
- **Negative feedback** occurs when a change in a controlled variable triggers a response that opposes the change, driving the variable in the opposite direction of the initial change.

- **POSITIVE FEEDBACK**

- This type of control mechanism is relatively *rare* in the body because it moves the controlled variable even farther from a steady state.
- *Positive feedback* continually enhances the output so that the controlled variable continues to be moved in the direction of the initial change
- Positive feedback reinforces the change in the same direction. Such action would be comparable to the heat generated by a furnace triggering the thermostat to call for even more heat output from the furnace so that the room temperature would continually rise.
- Examples = Mechanisms of Ovulation and Parturition (Birth)

- **PATHOPHYSIOLOGY**

- As we proceed through the course, we will discuss a number of different pathophysiological conditions (diseases and abnormal states) which illustrate physiological mechanisms
- *Pathophysiology* refers to the study of the abnormal functioning of the body (altered physiology) associated with disease.

- **TYPES OF ORGANIC MOLECULES**

CARBOHYDRATES
STRUCTURE OF GLYCOGEN
LIPIDS - TRIGLYCERIDES (FATS)
AMINO ACIDS
PROTEINS/PEPTIDES
NUCLEOTIDE
DNA (DEOXYRIBONUCLEIC ACID)

SURFACE TO VOLUME
RELATIONSHIP LIMITS CELL SIZE

- **HORMONES**

- Hormone = a chemical (molecule) released from one cell or tissue that regulates the function of another cell or tissue. Hormones are always transported in the blood.

TYPES OF HORMONES BASED ON THEIR CHEMICAL STRUCTURE

- STEROIDS = have a structure similar to cholesterol
- PROTEINS = chains of amino acids
- FATTY ACIDS = look somewhat like fat
- AMINES = contain a special nitrogen group

EXAMPLES OF HORMONES

- STEROIDS
 - Testosterone, Estrogen, Progesterone
- PROTEINS
 - LH, FSH, GnRH (these regulate the gonads)
- FATTY ACIDS
 - Prostaglandins (these cause cramps)
- AMINES
 - Adrenaline, Serotonin