

# UNITS

Among other things; they studied chick embryos

**Kg**

**L**

g

mL

mg

mL

mg

nL

ng

pL

pg

fL

fg

Others:

moles (ex., pMoles)

length (ex., mm)

1 cc = 1 mL

1 kg = 2.2 lb

1 m = 39.37 inches

1 m<sup>2</sup> = 10.76 feet<sup>2</sup>

Unit conversion web page:

<http://webphysics.ph.msstate.edu/units/Default.htm>

# **Major Branches of Physiology & Medicine**

- Cardiovascular
- Renal
- Respiratory
- Gastrointestinal
- Neuroscience
- Endocrinology
- Reproductive
- Bone & Muscle (Orthopedic)

## **Major Branches of Physiology**

- Comparative Physiology
- Environmental Physiology
- Evolutionary Physiology
- Developmental Physiology
- Cell Physiology/Biology

## Physiology is an Integrating Science

*Examples:*

- How did a system evolve?
- What were the survival advantages for this feature?
- How does ontogeny reflect evolution?

“Ontogeny recapitulates phylogeny”

## Terminology

**anatomy**- the science which deals with the form and structure of all organisms.

**physiology**- the study of the integrated functions of the body, and the functions of all of its parts (systems, organs, tissues, cells and cell components), including the biophysical and biochemical processes involved.

## Planes of reference

**median plane** - an imaginary plane passing through the body craniocaudally, which divides the body into equal right and left halves. Sometimes called the **midsagittal plane**. Example: a beef carcass is split into two halves on the median plane.

**sagittal plane**- any plane parallel to the median plane.

**transverse plane** (cross section)- at right angles to the median plane and divides the body into cranial and caudal segments. Example: a cross section of the body would be made on a transverse plane.

**frontal plane**- at right angles to both the median plane and transverse planes. The frontal plane divides the body into dorsal (upper) and ventral (lower) segments. Example: if a cow walks into a lake until the water comes above the chest, the surface of the water represents a frontal plane in relation to the cow.

## **Descriptive terms**

**cranial (or anterior)**- directional term meaning toward the head. Example: the shoulder is cranial to the hip.

**caudal (or posterior)**- directional term meaning toward the tail. Example: the rump is caudal to the loin

**rostral**- directional term used within the head to mean toward the nose

**medial**- an adjective meaning close to or toward the median plane. Example: the heart is medial to the lungs: (it is closer to the median plane than are the lungs)

**lateral (antonym of medial)**- an adjective meaning away from the

median plane. Example: the ribs are lateral to the lungs (they are farther from the median plane)

**dorsal-** a directional term meaning toward or beyond the backbone or vertebral column. Example: the kidneys are dorsal to the intestines.

**ventral-** away from the vertebral column or toward the mid-abdominal wall. Example: the udder is the most ventral part of the body of a cow.

**proximal-** relatively close to a given part, usually the vertebral column, body, or center of gravity. Proximal is generally used in reference to portions of an extremity or limb. Example: the knee is proximal to the foot.

**distal-** means relatively farther from the vertebral column. Example: the hoof is distal to the knee

**abduct-** to draw away from a position near or parallel to the median axis of the body (Hint: remember if you are abducted from

your home... you will be taken away)

**adduct-** to draw toward or past the median axis of the body

## **Microscopic Anatomy**

**cells-** small units which are used in construction of all living things (both plants and animals)

**tissues-** specialized cells grouped together. Examples: epithelial, connective, muscle, nervous

**organs-** various tissues associated in functional groups.  
Examples: the stomach is an organ that functions in digestion of food.

**system-** a group of organs that are involved in a common enterprise.



## A Brief History of Physiology

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Socrates (470-399 B.C.)

- Aristotle (384-322 B.C.)
- Galileo (1564-1642)
- Marcello Malpighi (1628-1694)
  - Microscopic biology/physiology
- Antoine Lavoiser (1743-1794)
  - Chemistry & metabolism; O<sub>2</sub> consumption
- William Harvey (1578-1657)
- The rapid expansion of our modern knowledge in physiology began in the late 1800s
- 1920s-1950 Phase of classic physiology research
- 1950-1980 Phase of biochemical discoveries; DNA, Enzymes, Receptors, Hormones, etc.
- 1980-present Phase of cell and molecular biology
- 1990-present Transgenics, cloning, knock-outs, xenotransplantation and more.

- Adaptation
  - Short term
  - From an evolutionary perspective
  
- Acclimatization
  - A physiological, biochemical or anatomical change within an animal based on chronic exposure to a different environment
  
- Acclimation
  - A physiological, biochemical or anatomical change within an animal based on acute or short-term exposure to a different environment

Examples:

- High altitude
- Cold temperatures or hot temperatures
- Zebu cattle
- Many others

# Homeostasis

The tendency of organisms to regulate and maintain relative internal stability

Claude Bernard (1872) & the *milieu interieur*

*“Constancy of the internal environment is the condition of life”*

## Feedback & Control

- Negative feedback systems and loops
- Positive feedback systems & loops
- Conformers and Regulators