

Human Anatomy & Physiology General

Differences between anatomy and physiology:

anatomy = structure [greek: 'to cut up']

physiology = function

Anatomy

the study of parts and their interrelationships

how the body is organized

provides a standardized language

eg "stomach" means different things to
different people

Physiology

is the study of biological functions

cause/effect

interactions

More conceptual approach, interactions stressed

Relationship between anatomy and physiology

What are you?

A collection of carefully arranged atoms and
molecules

A conglomeration of trillions of cells (75 Trillion)

Dozens of tissues and organs

8-10 major organ systems

Life is very complex must simplify to understand but lose something in the translation

How can we organize and study such complex processes?

Use **models** to understand complex processes

Some examples of models in physiology:

1. Levels of structural organization:

[Hierarchy of complexity]

matter, energy and their interactions can be
applied at many levels in biological systems

moving up scale each level is more complex
than one below it

each level includes all those below it

new properties emerge from each level

in terms of energy, each unit is more unstable
than the one below it

atoms –smallest structural units of matter
(protons, neutrons, electrons)

molecules – interaction of atoms to form
compounds

organelles – specialized components of cells
performing specific cellular functions

cells – basic unit of life

tissues – groups of cells carrying out a specific
function

organs – groups of organs performing given
functions

organ systems – group of interacting organs

organism – total functioning unit

[population – association of same species living in
same habitat]

[community – popyulations osf several different
species livng in same place]

[ecosystem – highest level of biological
organization]

most complex

environment and community and all
interactions]

Learn different things by studying at different
levels:

eg	stomach tissues/cells	digests food, ulcers mucous cells, endocrine cells etc
	chemicals	enzymes, hormones,

Each level has emergent properties

2. Major Organ Systems

How does your body work?
chemical reactions

To maintain yourself you must continually replenish **nutrients**

→and this requires **energy**

Greater size → greater complexity

→greater efficiency

need “organs and organ systems” to coordinate and control all this activity

What Is Life?

What is life

a highly organized interaction of matter and energy

can't define in one sentence

must consider several **properties of life** or life functions:

each property taken individually is NOT unique to living things

many nonliving things do one or more of them
eg. viruses don't quite fit

Properties of Life

1. maintaining boundaries:
 - internal versus external environment
2. movement
3. responsiveness
 - functions are regulated within and between cells
4. assimilation & digestion
5. metabolism
 - anabolism & catabolism
6. excretion
7. reproduction
 - survival of genetic information
8. growth

Survival needs:

- 1. nutrients**
 - solids, liquids, gasses
- 2. gaseous oxygen, O₂**
 - (is actually a nutrient)

needed for energy reactions in cells

3. water

solvent

reactant

4. temperature range near 37° [$\sim 0^\circ - 100^\circ$]

need liquid water

proteins (enzymes) sensitive to temp

5. atmospheric pressure near 760mm Hg

gas exchange

pressure is equivalent to weight of air: a room 12x15x9 ft holds about 170 lbs of air

air pressure at sea level: about 14 lbs per square inch; winds produce lots of force

lowest atm humans can survive is about 1/5th of an atmosphere;

would become starved for oxygen if pressure were much lower; some bacteria can survive in "vacuum packed" foods

not enough oxygen gas at low pressures

high pressures cause implosion

6. gravity

space science – gravity is essential for normal

bone and muscle maintenance and cardiovascular fitness

Homeostasis

Homeostasis:

ability to maintain a constant internal environment regardless of fluctuations in the external environment
→ boundaries needed

Requires:

receptor → control center → effectors

Negative Feedback

Positive Feedback & Homeostatic imbalances