Intro to Animal Structure and Function

[Note: This is the text version of this lecture file. To make the lecture notes downloadable over a slow connection (e.g. modem) the figures have been replaced with figure numbers as found in the textbook. See the full version with complete graphics if you have a faster connection.]

Hierarchy of Life

Atoms ⇒ Molecules ⇒ Supramolecular structures ⇒ cells (including organelles)

[See Fig. 7.1]

Hierarchy of Life

Cells ⇒ Tissues ⇒ Organs ⇒ Organ Systems ⇒ Multicellular Organisms

[See Fig. 40.1]

FOUR TISSUE TYPES

Epithelial

[See Fig. 40.1]

Connective

[See Fig. 40.3]

Muscle

[See Fig. 40.5]

Nervous

[See Fig. 48.2]

- **<u>Epithelial cells</u> are generally tightly packed, attached to basement membrane (extracellular matrix)**

Roles: protective, secretory

Types: simple, stratified, pseudostratified

Shapes: cuboidal, columnar, squamous

Combine type and shape to get description

[See Fig. 40.1]

- **<u>Connective tissue</u> is generally loosely packed, surrounded by extracellular matrix**

Roles: bind and support

[See Fig. 40.3]

Fibers: collagenous, elastic, reticular

Types: loose, adipose, fibrous, cartilage, bone, blood

Muscle Tissue

[See Fig. 40.5]

Nervous Tissue

[See Fig. 40.1]

Nervous Tissue

[See Fig. 48.14]

- **<u>Organ systems</u> are collections of organs and are interdependent**

Types: digestive, circulatory, respiratory, immune/lymphatic, excretory, endocrine, reproductive, nervous, integumentary (skin *et al*), skeletal, muscular

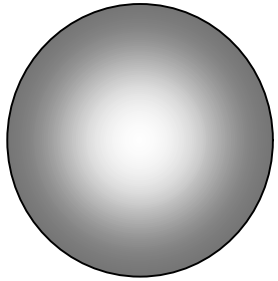
[See Fig. 40.10]

Body Plans: Exchanges with the environment

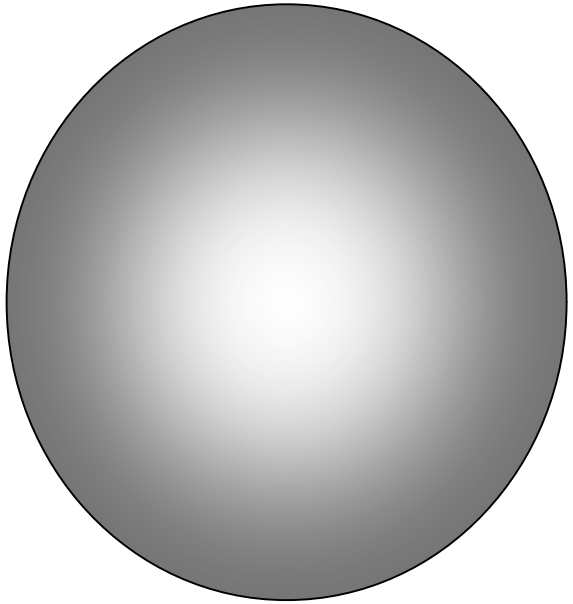
[See Fig. 40.9]

Surface area increases slower than volume

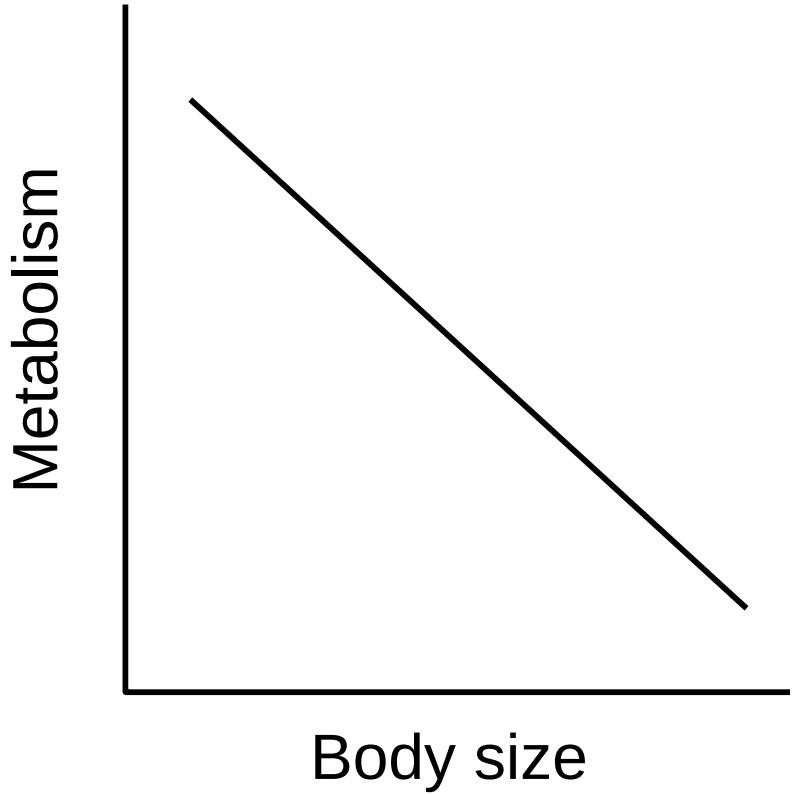
radius = 1
surface area = $4\pi r^2$
volume = $4/3\ \pi r^3$
surface/volume = 3/r or <u>3</u>



radius = 2
surface/volume = 3/r
= 3/2 or <u>1.5</u>



Metabolism is inversely related to body size



- **The internal environment of vertebrates is called <u>interstitial fluid</u>**
- **regulation of the internal environment is called <u>homeostasis</u>**

[See Fig. 40.10]

- **Animals are heterotrophs (contrast with autotrophs) and require energy from other organisms**

- **Endotherms are animals that generate their own heat-- resting metabolic rate is called basal = BMR**

- **Ectotherms are animals that get most of their heat from their environment --metabolic rate depends on enviro. temp. and is called standard = SMR**

metabolic rate = rate of energy consumption. Units are usually kcal/time (e.g. kcal/day)

BMR for humans is 1300-1500 kcal/day for women, 1600-1800 for men.

[See Fig. 40.7]

Homeostasis depends on negative feedback

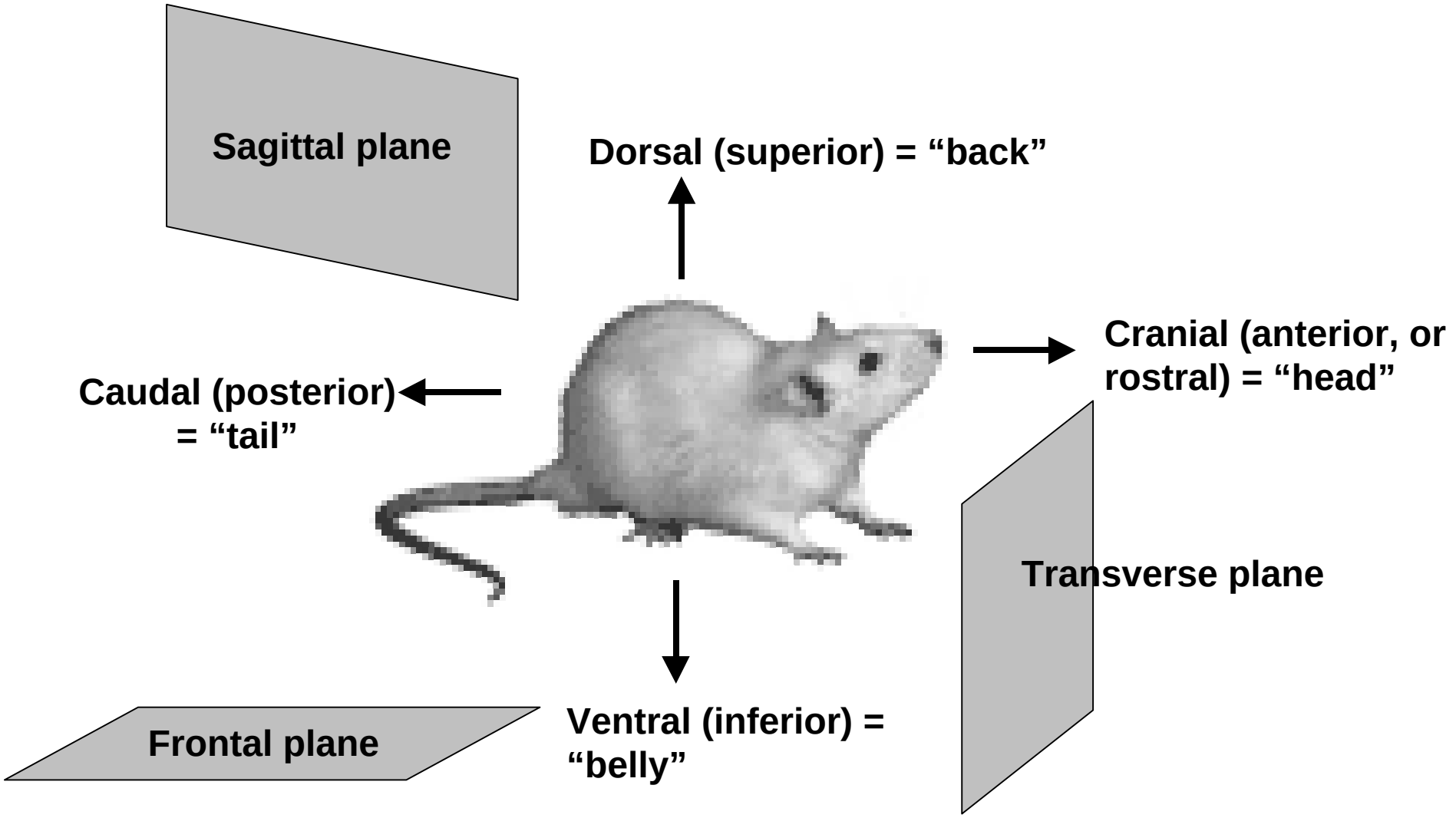
[See Fig. 40.12]

(contrast with positive feedback: used to accelerate events (e.g. childbirth)

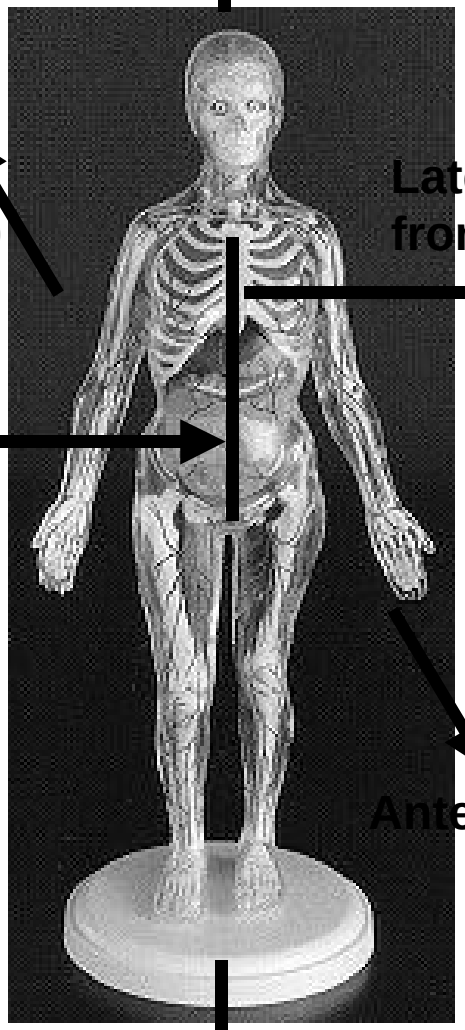
Example: Regulation of glucose levels in blood

[See Fig. 41.1]

Orientation of Body Planes: quadriped



Orientation of Body Planes: biped



Superior (cranial) = “head”

Sagittal plane

Posterior (dorsal) = “back”

Lateral (away from midline)

Frontal plane

Medial (towards or at midline)

Proximal = near
Distal = farther
Superficial = surface
Deep = internal

Anterior (ventral) = “belly”

Transverse plane

Inferior (caudal)= “tail”