

Bones

~Physiology~

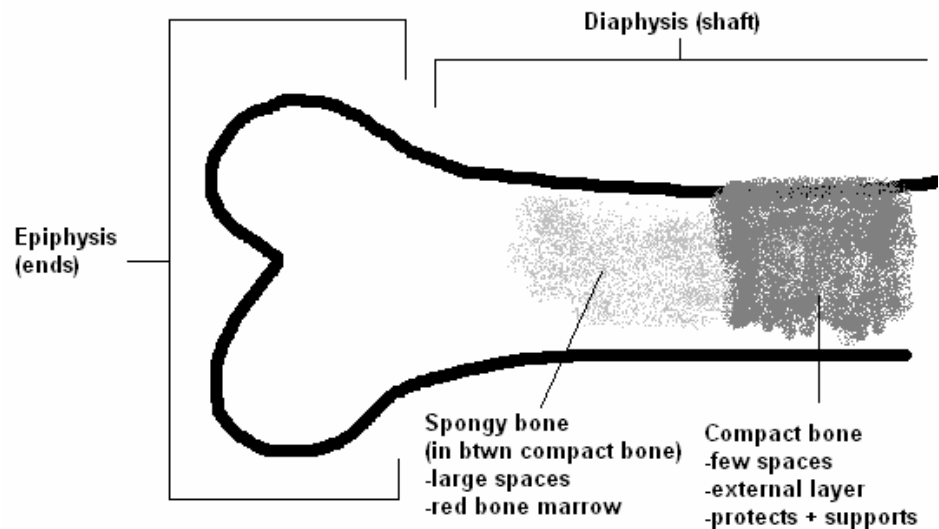
A Meridian® Study Guide by Vivian Le

BONES

- Support soft tissue + provide attachment for skeletal muscles
- Protect internal organs
- Provide movement
- Store and release minerals (Ca + P)
- Produce blood cells (red marrow)
- Store energy in fats (yellow marrow)

Types of Bones	Example
Long bones	Femur
Short bones	Wrist/ankle bones
Flat bones	Sternum
Irregular bones	Vertebrae

Parts of Bone



Ossification

- Process by which bone forms
- Begins in the womb (-6 months) until adulthood (age 25)
- Minerals deposited turn cartilage -> bone
- Growth stops when ossification stops

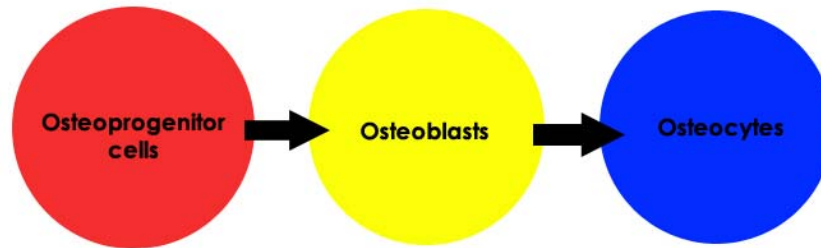
Bone Components

- Cells
- Blood vessels (feed cells)
- Matrix (in between cells)
 - Intercellular substance
 - Contains minerals (Ca + P) that makes bones hard
 - Contains collagen (protein) that makes bones strong

Cellular Components of Bone

Osteoprogenitor cells	Osteoblasts (want more of this)	Osteocytes	Osteoclasts
-dividing cells -similar to stem cells (genesis) -develops into osteoblasts	-found on surface of bone -makes new bone tissue -secrete collagen -develops into osteocytes	-mature bone cells -carry out daily activities of bone tissue	-HUGE cells -found on surface of bone -eats old bone by secreting enzymes that function in RESORPTION*

*Resorption: breaking down of bone tissue, necessary for growth, development, maintenance, and repair of bone



Bone Density

- measure of how many grams of calcium (and other bone minerals) are packed into a segment of bone (matrix)
- LESS space is better = denser, stronger bone
- bone density test: measures risk of osteoporosis
- affected by cigarettes, aging

Bone = Storage (ATM bank) for

-excess calcium from blood production

-phosphates for nucleic acid and ATP

Calcium in the Body

Necessary for

- Heart function -> otherwise convulsions + heart attack
- Muscle contraction
- Nerve function
- Blood clotting
- Building and repairing teeth and bones

Blood calcium level must be maintained between **9.0 - 10.5 mg/dl**. Otherwise, you're dead. If not enough, calcium will be "pulled" from bones

Bone Remodeling (always happening)

-replacement of old bone by new bone

-old bone destroyed by osteoclasts through resorption, new bone created by osteoplasts

- allows injured bone to be replaced

-maintains homeostasis of blood calcium levels

Hormonal Control

Parathyroid Hormone (PTH)	Calcitonin
(less bone eating) -secreted when Ca^{2+} levels in blood drop -Osteoclasts become more active - Ca^{2+} and phosphates released from bone into blood - Ca^{2+} saved from urine	(more bone eating) -secreted when Ca^{2+} level in blood increase -inhibits osteoclasts - Ca^{2+} absorbed into bones from blood - Ca^{2+} deposited into bone

Ligaments hold bone to bone.

It keeps bones from moving in weird positions that may cause pain and more damage.

Keeping Bones Healthy

- Engage in weight-bearing exercise
- Eat a well balanced diet rich in calcium and vitamin D
- Avoid caffeine

Osteoporosis (bye-bye bone... hello old crone...)

- Spaces inside the bone grow larger
- Outer shell of bone weakens
- Bone is weaker and thinner, able to break easier
- ½ women are affected because of menopause (over age 50)
- Only 1/8 men over age 50. Starts with more bone, bone loss starts later
- Caffeine affects the elderly and women, increase rate of bone loss
- Too much animal protein (meat) steals away protein to neutralize protein and acid
- Soda is bad for young girls and women. Keeps calcium from being absorbed
- Cigarettes increase risk of osteoporosis, longer to recover

Directional Terms Vocabulary

Inferior	Lower part of body
Superior	Upper part of body
Anterior	Front part of body
Posterior	Back part of body
Deep	Toward the inside of the body
Superficial	Near the surface of the body
Intermediate	In the middle between two joints
Lateral	Farther from the middle line

Medial	Closer to the middle line of the body
Proximal	Closer to the point of attachment
Distal	Farther from the point of attachment
Dorsal	Back part of the body if 4 legged -top of body (back)
Ventral	Front part of the body if 4 legged -bottom of body (belly)

SOME ADDITIONAL BONE NOTES

- Osteoporosis - weakening of the bone, greater spaces in them
- Osteoarthritis - weakening of the cartilage that cushions the bone
- Chondrocytes - cells that generate new bits of cartilage

JOINTS

- A joint is a point of contact between bones, between cartilage and bones, or between teeth and bones.
 - Flexors and Extensors (muscles)
 - flexors decrease the joint angle
 - extensors increase the joint angle
 - flexors and extensors work together in antagonistic pairs, with one flexing or contracting, while the other extends or relaxes.
 - **Arthritis**
 - form of rheumatism that is a painful disorder of supporting structures of the body, not caused by infection or injury
 - deterioration of cartilage
 - "wear and tear"
 - joints become swollen, stiff, and painful