

# Skeletal System: Crash Course

## Welsh's Notes - Honors Physiology!

**Bone** = connective tissue (review!) that is constantly being broken down, regenerating, and repairing itself throughout your lifetime! (206 bones in the human body)

*\*Think... what is the **function** of bone? It supports muscles acting as levers for movement, it protects internal organs, it creates blood cells (hematopoiesis), it **stores calcium** and other minerals.*

→ *What is **calcium** used for in the body?! - helps neurons fire, helps muscles contract...*

### Axial vs. Appendicular Skeleton

*\*Be sure to know the difference between the two, and which bones belong to which category!*

### Shape Classifications -

Long (longer than they are wide) - Example: humerus; femur

Short (cube shaped) - Example: carpals; tarsals

Flat (thin) - Example: plates in the skull; sternum; scapula

Irregular (abnormal shape) - Example: vertebrae, pelvis

### Basic Internal Anatomy

Compact Bone = dense, smooth-looking, external layer

Spongy Bone (Trabeculae) = help the bone resist stress; stores bone marrow

**Red** - makes blood cells

**Yellow** - stores energy for fat

### Long Bone Anatomy

→ Epiphyses: ends of long bones

→ Diaphysis: shaft of long bone

→ Medullary Cavity: cavity within diaphysis that stores **yellow** bone marrow

→ Osteons: structural unit of bone - provides rigidity and strength for the bone (tree rings that we see in a microscope!)

-Lamellae = a single ring (tube) of an osteon - filled with collagen fibers that run in the same direction

*\*\*each lamellar ring runs fibers in opposite directions! (offers structure/ support!)*

-Central (or Haversian) Canal = cavity of osteon that stores blood vessels and nerve endings

-Lacunae = house **osteocytes** (mature bone cells that monitor bone matrix)

**OsteoBlasts**: bone makers (bone building cells - construct our bones from a cartilage model) =

**OsteoClasts**: bone breakers (bone breaker downer) = **resorption**

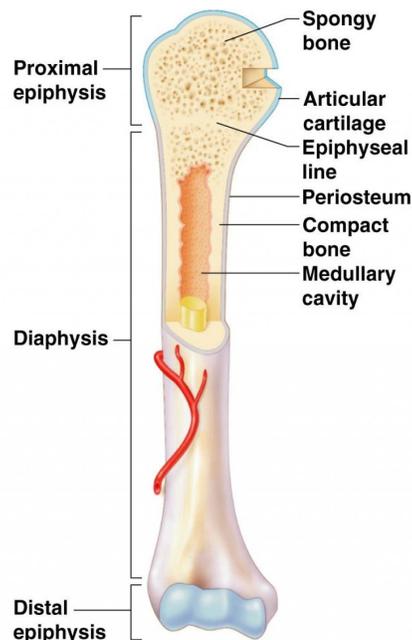
*Think - why would we ever want to **break down** bone? (What is our bone **STORING** for us?!) **CALCIUM!***

REMEMBER **\*\***These two cell types work together to create a perfect *balance* that allow our bones to regenerate... therefore maintaining **HOMEOSTASIS!!**

### Bone Remodeling:

Wolff's Law states that bone remodeling responds to stresses in the bone, leading to such things as differences in bone size between left and right hands, thicker bone where muscles attach in certain athletes, and the development of some bony protrusions as muscles gain strength in babies.

Exercising stimulates bone remodeling, and ultimately bone strength!



Not in the video, but super important (and we'll continue to talk about this!)

<p style="text-align: center;"><b>Bone Growth =</b></p> <p>New bone being formed to increase the <b>length</b> of the bone (think development during infancy, childhood and puberty - growth spurts! Triggered by <u>hormones</u> at different times in your life) New growth happens <b>internally</b>, at the <b>growth plate</b> (also known as the epiphyseal plate) through a process called...</p> <p style="text-align: center;">↓</p>	<p style="text-align: center;"><b>Bone Remodeling =</b></p> <p>New bone being formed to remodel or reshape the bone (think after trauma, stress on the area, an injury, with old age, etc.) New growth happens <b>on the surface</b> of the bone (like painting new coats of paint a house) through a process called...</p> <p style="text-align: center;">↓</p>
<p style="text-align: center;"><b>Interstitial Growth =</b></p> <p>Osteoblasts deposit new bone <b>internally</b> with the goal of increasing the <b>length</b> of the bone. Typically happens at the growth plate, and is triggered by hormones.</p>	<p style="text-align: center;"><b>Appositional Growth =</b></p> <p>Osteoblasts <u>and</u> osteoclasts working together to remodel the surface of bone (with the goal of increasing or reshaping the <b>width</b> of the bone) Triggered in response to mechanical stress, injury, old age, etc.</p>
<p><b>Homeostasis - Negative Feedback Example</b> <i>Why this all makes sense!!</i></p>	
<p style="text-align: center;"><b>If Blood calcium levels are LOW...</b></p> <p>→ Think about negative feedback. If <b>blood</b> calcium levels are <b>LOW</b>, we want to <u>increase</u> blood calcium to get it 'back to normal' - Where do we <b>get</b> this calcium from?! The <b>BONES!!</b></p> <p>→ What cells are in charge of bone resorption?! (or the breaking down of bone?!) = <b>OSTEOCLASTS!</b></p> <p>→ Osteoclast activity is triggered by a hormone called <b>PTH, or Parathyroid Hormone</b> (<i>you'll need to know this too!</i>)</p> <p>*In summary, when blood calcium is too low, Parathyroid Hormone is released and sent throughout the body to stimulate osteoclasts to start bone resorption, breaking down bone to increase calcium levels in the bloodstream.</p>	<p style="text-align: center;"><b>If Blood calcium levels are HIGH...</b></p> <p>→ Think about negative feedback. If <b>blood</b> calcium levels are now too <b>HIGH</b>, we want to <u>decrease</u> blood calcium to get it 'back to normal' - Where do we then need to <b>store</b> the calcium?! The <b>BONES!!</b></p> <p>→ What cells are in charge of bone building?! (or creating bone matrix?!) = <b>OSTEOBLASTS!</b></p> <p>→ Osteoblast activity is triggered by a hormone called <b>Calcitonin</b> (<i>you'll need to know this too!</i>)</p> <p>*In summary, when blood calcium is too high, Calcitonin is released and sent throughout the body to stimulate osteoblasts to start bone building, depositing new bone matrix to decrease calcium levels in the bloodstream.</p>

**\*\*Remember** that this is all stuff we will take notes on and review like CRAZY together throughout the unit - this is just your introduction!