TOPIC: MICROSCOPIC ANATOMY OF BONES: BONE CELLS

Introduction to Bone Cells

- **Bone Tissue (_____ Tissue):** is comprised of cells and ECM.
  - Cells of Bone tissue:

Osteoprogenitors
(Osteogenic cells)

*Make **Progeny***

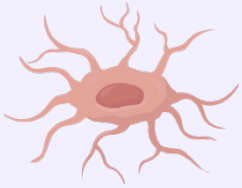
_____ cells (osteogenic cells) of the periosteum and endosteum.

Osteoblasts

***B**lasts **B**uild*

Secrete bone _____.

Osteocytes



***C**ytes: mature **C**ells*

_____ the matrix.

Osteoclasts

***C**lasts **C**ut*

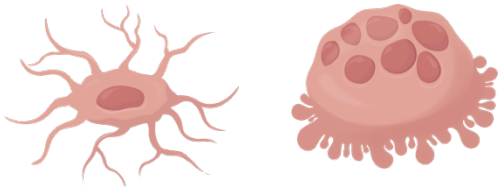
Break down _____ for remodeling.

Arise from _____ blood cells.

EXAMPLE: Calcium homeostasis is important for muscle contraction and nerve functioning. Bone cells help maintain blood calcium levels between 8.6 and 10.3 mg/dL. If the blood calcium level drops to 8 mg/dL, which type of bone cell will become more active? Which would become less active?

a) More active: _____

b) Less active: _____



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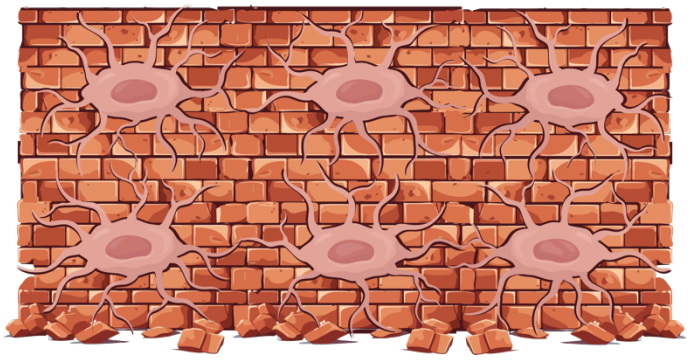
Osteoblasts

- Bone cells that are responsible for producing new bone _____.
  - Secrete _____ fibers and _____ binding enzymes.
  - Arise from osteoprogenitor cells of the periosteum and endosteum.
  - _____ osteoblasts become osteocytes.
  - Active in bone _____.

Osteocytes

- Mature bone cells that maintain matrix.
  - Trapped osteo_____ → osteo_____.
  - **Lacunae**: "rooms" that osteocytes are _____ in.
  - Monitor bone _____ and contribute to Ca+ homeostasis.
  - _____ allows communication & diffusion via gap junctions.



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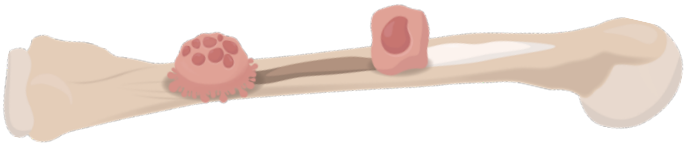
Osteoclasts

- Specialized for *osteolysis* (dissolving bone) & bone _____.
- Structural features of osteocytes:
  - Multinucleate: _____ cells – derived from white blood cells.
  - Ruffle Border: _____ surface area.
    - Secretes acid: dissolves _____ matrix.
    - Secretes enzymes: digest _____ matrix.

- **Bone Remodeling:** osteoclasts & osteo_____ work together to maintain the skeleton.
  - For maintenance, response to _____, Ca+ homeostasis



EXAMPLE: Osteoporosis is a common condition in older adults, especially women. Bones become weak due to an imbalance between osteoblast and osteoclast activity.

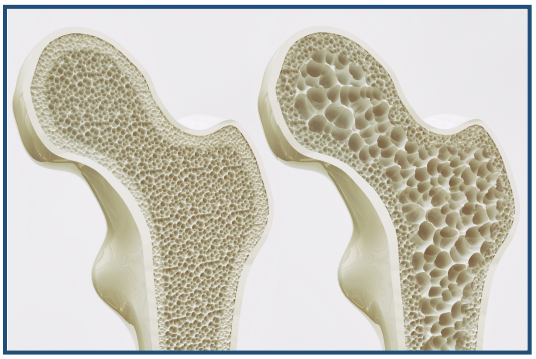
Which type of cell would be more active and which type of cell less active in an individual with osteoporosis? Explain your reasoning:

a) More active: _____

Reasoning: _____

b) Less active: _____

Reasoning: _____



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PRACTICE: How does the structure of an osteocyte allow communication with adjacent cells?

a) Osteocytes have cellular projections that meet and form gap junctions with adjacent osteocytes.

b) Osteocytes have ruffled borders to release signaling molecules that communicate with adjacent osteocytes.

c) Osteocytes have significant surface area to allow for rapid diffusion across the cell membrane.

d) Osteocytes are multinucleated allowing them to make more protein rapidly and pass information quickly.

PRACTICE: A central theme in anatomy is the relationship between structure and function. What structural feature of osteoclasts aids in their function of osteolysis?

a) Their multiple nuclei allow for more rapid production and deposition of collagen.

b) Their cellular projections allow cell to cell communication.

c) Their flattened shape allows them to move through the bone more easily.

d) Their ruffles border increases surface area between the osteoclasts and the matrix.

PRACTICE: Which pathway correctly identifies the relationship between bone cells?

a) Osteoprogenitor → osteoblast → osteoclast

b) Osteoprogenitor → osteoblast → osteocyte

c) Osteoclast → osteocyte → osteoblast

d) Osteoclast → osteoprogenitor → osteoblast

PRACTICE: What is the major function of bone cells found in lacunae?

a) Bone reabsorption.

b) Bone deposition.

c) Monitoring bone stress.

d) Laying down new organic matrix.