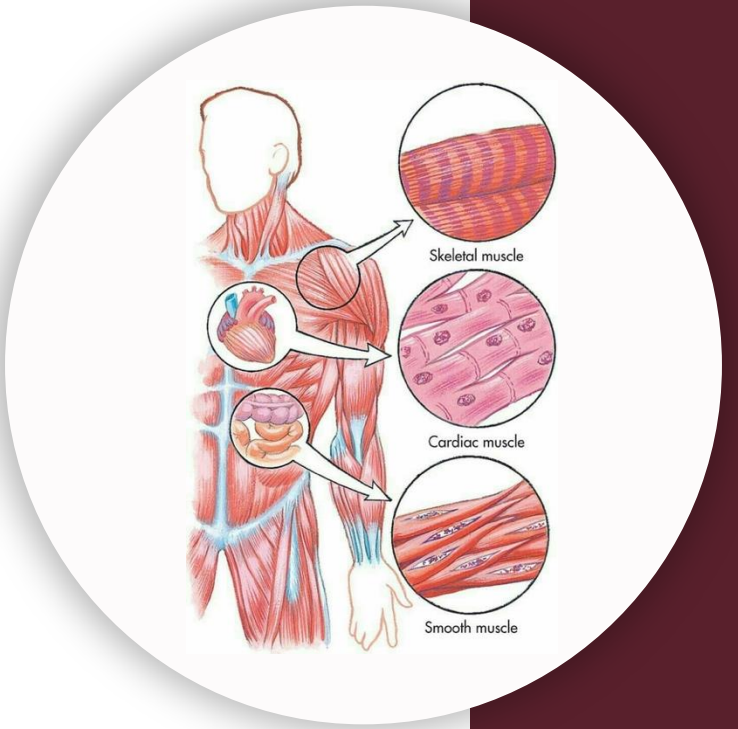
بسم الله الرحمن الرحيم

Histology – Final 4

Bone tissue Pt.2



Done by : Jannat Nasri

Osteoblasts

- **Originating from mesenchymal stem cells.**
- **Produce the organic components of bone matrix**
- **Located exclusively at the surfaces of bone matrix.**
- Active ones are located exclusively at the surfaces of bone matrix (integrins)

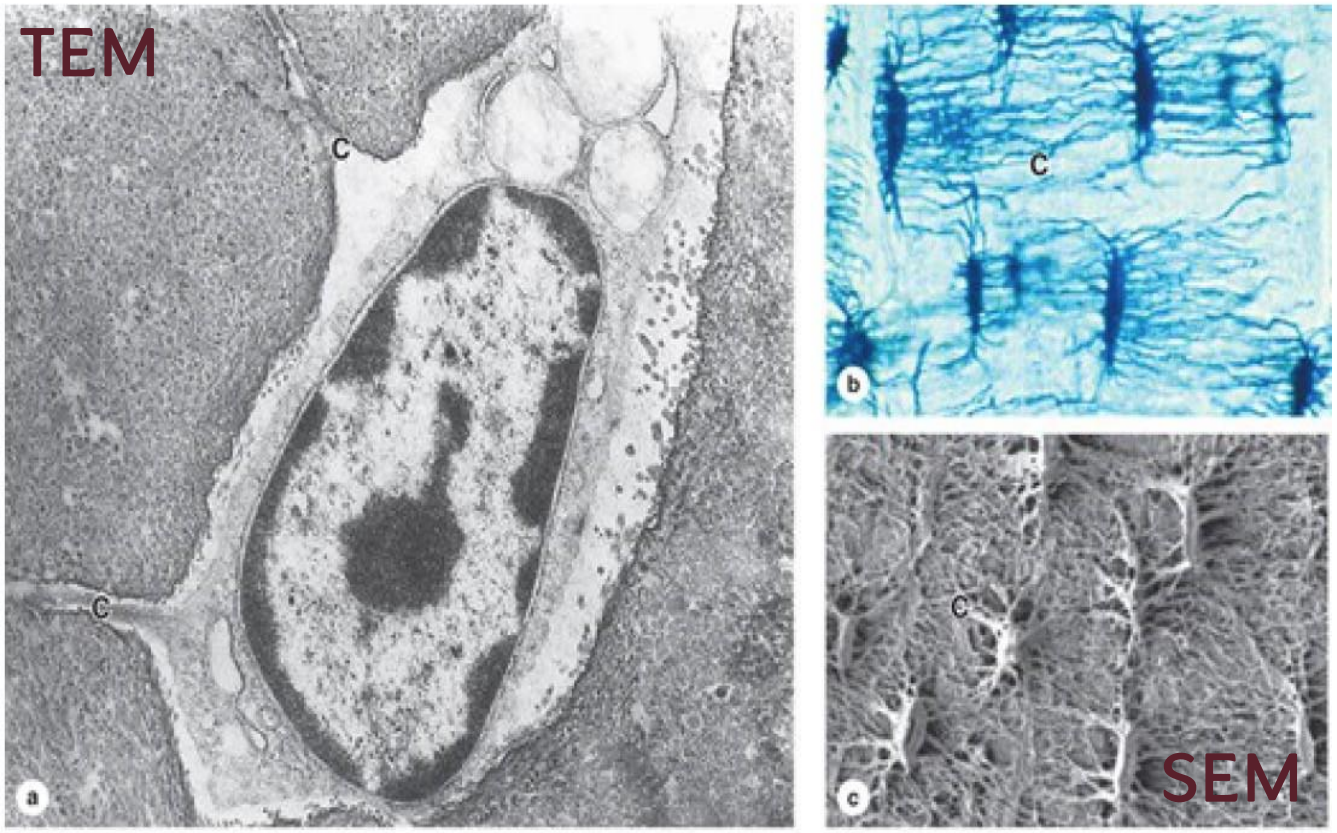
After osteoblasts produce and secrete the bone matrix, some of them become trapped within it. These trapped cells either differentiate into osteocytes or undergo programmed cell death (apoptosis) if they are no longer needed. Apoptosis helps maintain bone homeostasis by removing excess or non-functional osteoblasts.

Osteoblasts

When their synthetic activity is completed:

- Some osteoblasts differentiate as osteocytes entrapped in matrix-bound lacunae.
- Some flatten and cover the matrix surface as bone lining cells
- The majority undergo apoptosis.

Osteocytes

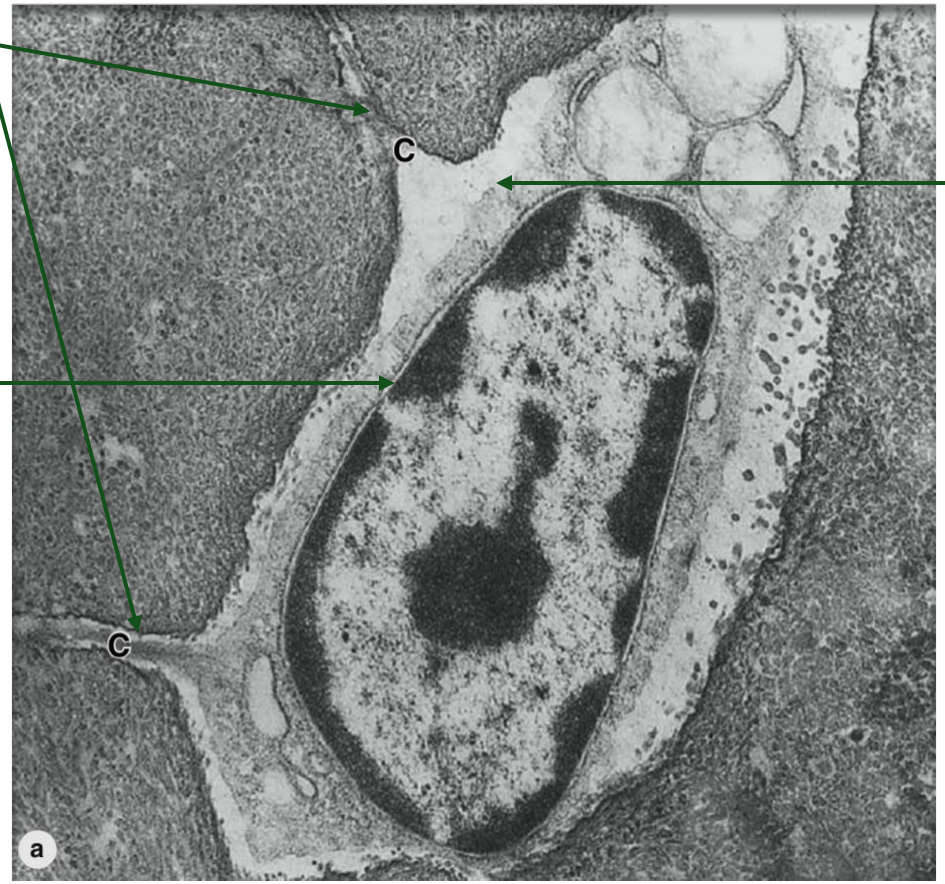


Acts as mechanostate

- Surrounded by the material they secrete and then differentiate as osteocytes.
- Processes in canaliculi 250-300 nm.
- Osteocytes communicate with one another and with nearby osteoblasts and bone lining cells via gap junctions at the ends of their processes
- The most abundant cells in bone,
- Exhibit significantly less RER, smaller Golgi complexes, and more condensed nuclear chromatin than osteoblasts Heterochromatic
- Maintain the calcified matrix, and their death is followed by rapid matrix resorption

TEM Image of an Osteocyte

canaliculi



lacuna

The large central cell is the osteocyte, a mature bone cell.

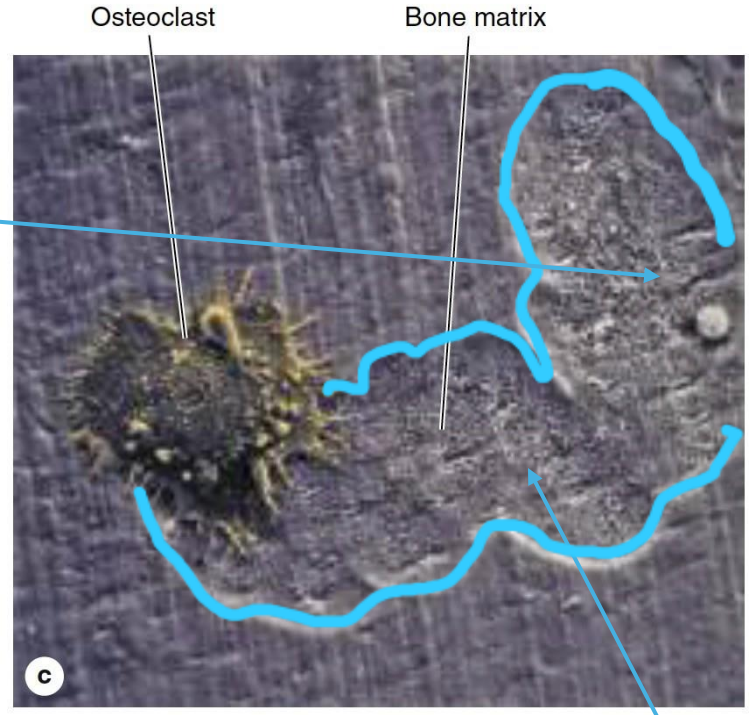
The osteocyte extends processes through canaliculi and senses mechanical load, acting as a mechanostat. This role is vital in maintaining bone homeostasis.

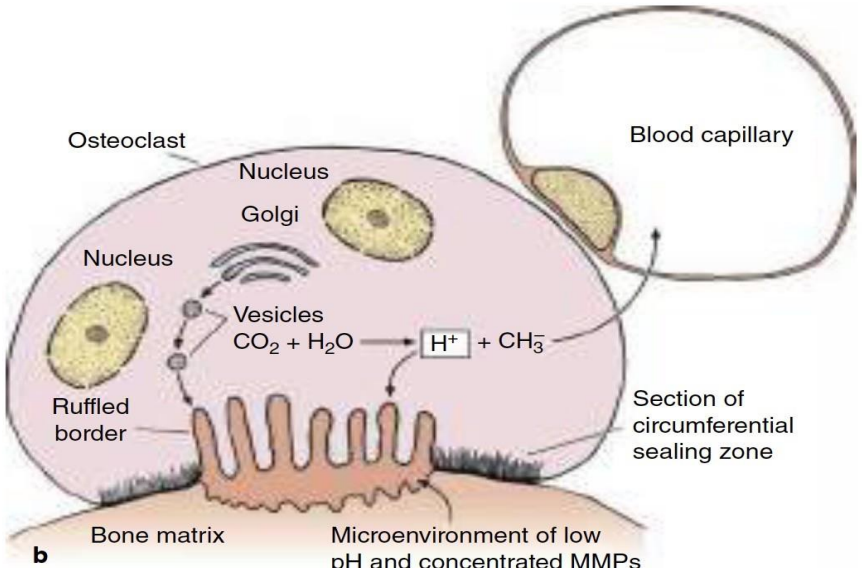
Osteoclast

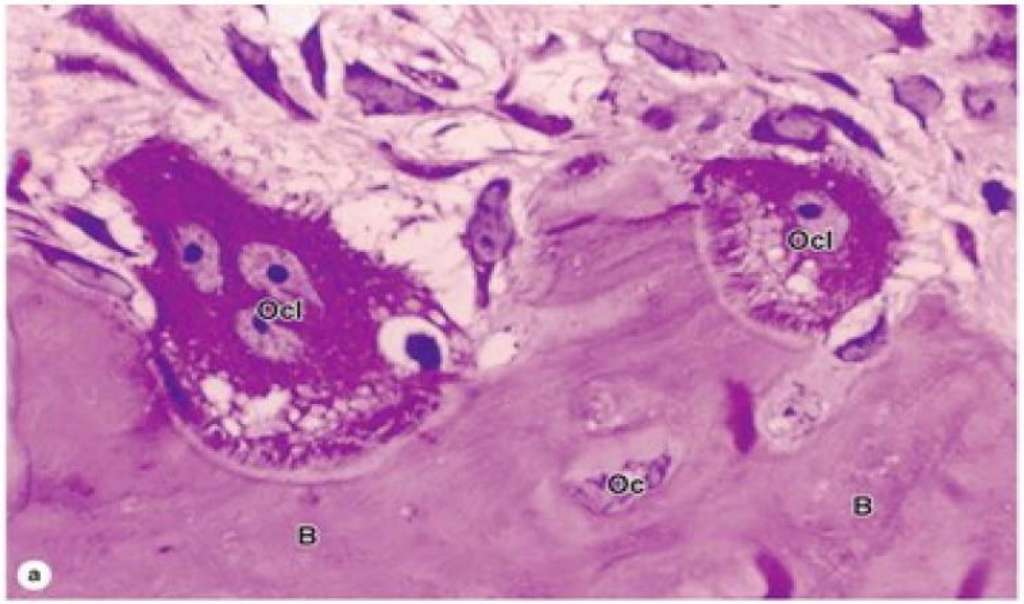
- Very large, motile cells with multiple nuclei.
- Resorption cavities (Howship lacunae)
- Osteoclast's circumferential **sealing zone** where integrins tightly bind the cell to the bone matrix.
- The sealing zone surrounds a **ruffled border** of microvilli and other cytoplasmic projections close to this matrix.

SEM

It was here







The trace of osteoclast

Osteon

Osteon (Haversian system):

- **Complex of concentric lamellae**
- **100-250 μm in diameter**
- **Surrounding a central canal that**
- **Contains small blood vessels, nerves, and endosteum**

Periosteum & Endosteum

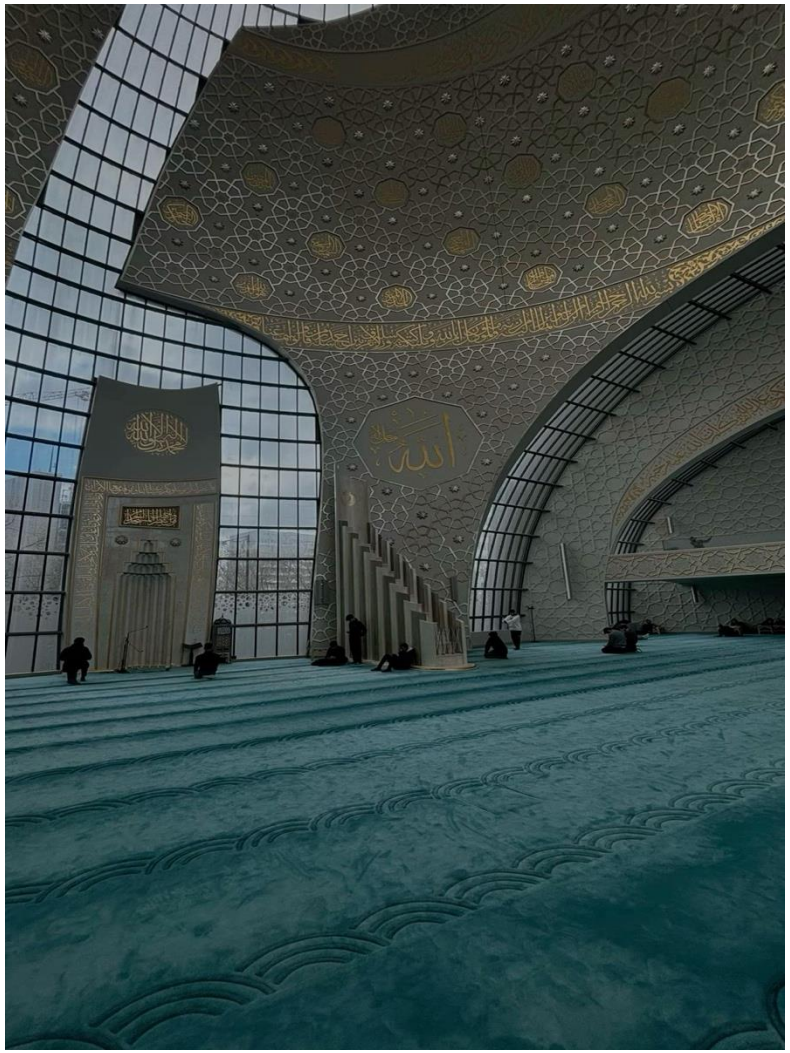
- **External and internal surfaces of all bones**
- **Periosteum is a dense connective tissue, containing mostly bundled type I collagen, but also fibroblasts and blood vessels**
- **Type I collagen (Fibrillar collagens types I, II, and III).**
- Bone is vascularized by small vessels that penetrate the matrix from the periosteum.
- Endosteum covers all trabeculae around the marrow cavities.

For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			

رسالة من الفريق العلمي:



دعاء سيدنا سليمان عليه السلام

"رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ وَأَنْ أَعْمَلَ صَالِحًا تَرْضَاهُ وَأَدْخِلْنِي بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ"