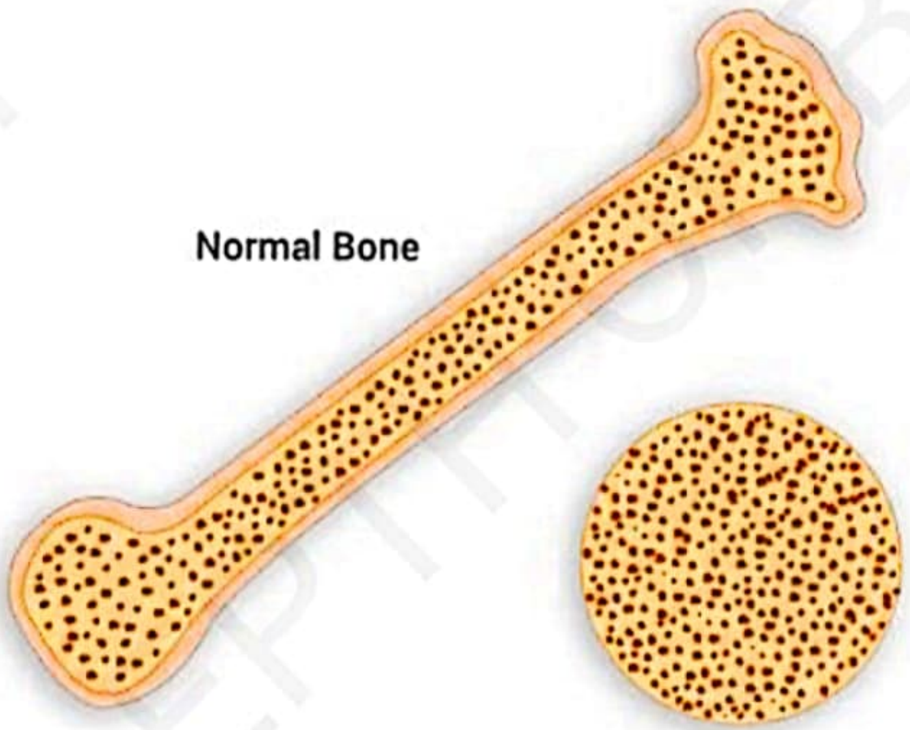
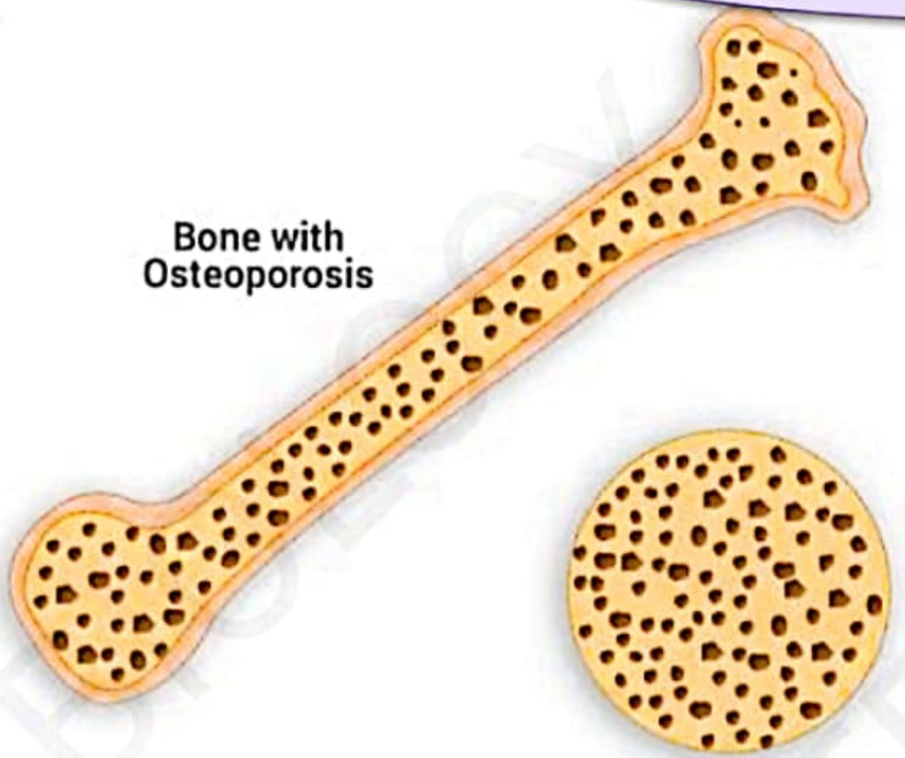
OSTEOPOROSIS

[DEPTH OF BIOLOGY]

A condition in which bones become weak and brittle.

Breakdown of bones > formation of bones results in porous bones i.e. decrease in bone density





[DEPTH OF BIOLOGY]

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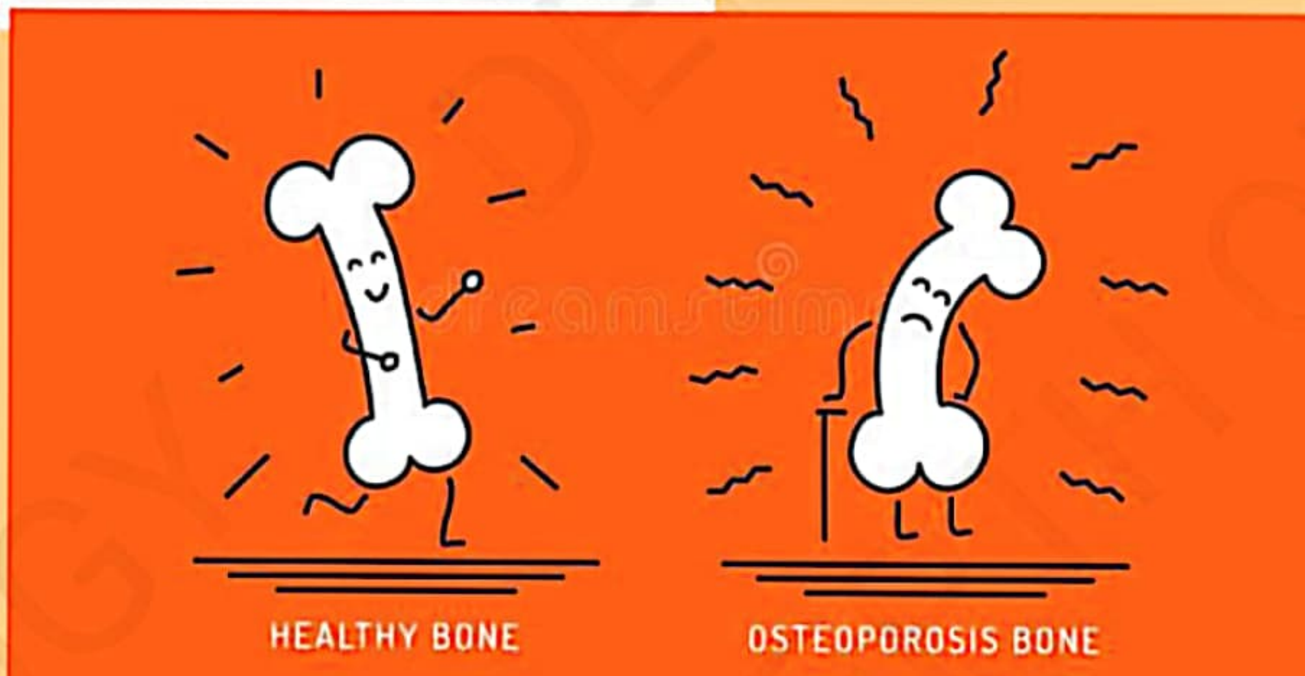

- Hard external layer known as CORTICAL BONE
- Soft internal layer known as SPONGY/ TRABECULAR bone *[composed of trabaeculae]*

[DEPTH OF BIOLOGY]

Are like a framework of beams that give structural support to spongy bones

- CORTICAL BONE- made up of many functional, pipe like units called **osteons** which runs through the length of bone.

[DEPTH OF BIOLOGY]

In the centre of osteons there are hollow space called **HAVERISIAN CANAL**, which contain the blood supply & innervation for the bone cell.

[DEPTH OF BIOLOGY]

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DEPTH OF BIOLOGY

- Around the haversian canal there are concentric lamellae which look a bit like tree ring.

- The lamellae have a organic part mostly **COLLAGEN** & an inorganic part called **HYDROXY APATITE** which is mostly **Ca, phosphate.**

- In between neighbouring lamellae space present called **LACUNAE** which contain bone cell called ***osteocytes.***

- SPONGY BONE- replaced in every 3-4 years & compact bone is replaced every 10 year in a process called BONE REMODELING which has 2 steps

BONE REABSORPTION	BONE FORMATION
Here specialised cell called osteoclasts is broken down. [DEPTH OF BIOLOGY]	**Osteoblast- form new bone**

#BONE REMODELING-

[DEPTH OF BIOLOGY]

Highly depends upon serum **Ca level-** *it is balanced by PTH, calcitonin & vitamin D.*

[DEPTH OF BIOLOGY]

PTH - produced by parathyroid gland;

-secreted when blood Ca level decreases

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Now it increases bone reabsorption to release Ca into the blood stream.

[DEPTH OF BIOLOGY]

DEPTH OF BIOLOGY

- **CALCITONIN-** produced by thyroid gland when Ca level in blood increase.

[DEPTH OF BIOLOGY]

So it oppose PTH & promote bone formation & decreasing bone reabsorption.

- **VITAMIN-D:** promotes Ca absorption in the gut so it increases serum Ca.

[DEPTH OF BIOLOGY]

Promote bone formation & decrease reabsorption.

[DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

- Oestrogen androgen inhibit bone reabsorption
- When osteoblast > osteoclast

- Lowering the bone mass = osteoporesis

- ***If we take cross section of osteoporetic bone-***

1. It will show normal cell with normal mineralistion
2. But in osteomalacia- lack of mineralisation

<u>so in osteoporesis abnormality is found is-</u>

a. Fewer trabaculae in the spongy bone

b. Thinning of cortical bone.

c. Widening of haversian canal.

[DEPTH OF BIOLOGY]

These changes increase the risk of fracture & they are known as FRAGILITY or pathogenic fracture

- Some bones like ribs, vertebrae , shoulder blade consists mainly of spongy bones.
- Hence they have great risk of fragility fracture.

- **Factors that increase bone mass loss/ increase risk of osteoporesis-**

➢ Low estrogen [after menopause].

➢ Low serum calcium.

➢ High alcohol consumption.

➢ Smoking.

➢ **Drugs-** glucocorticoids

Decrease Ca absorption from gut.

Drug like heparin & L-thyroxine are antagonist of Vitamin- D.

- Physical inactivity {astronauts}.
- Disease which cause osteoporesis-

- Turner syndrome
- Cushing syndrome
- Klienfelter syndrome hyperprolactinemia
- Diabetes mallietus

[DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

TYPES

[DEPTH OF BIOLOGY]

POST- MENOPAUSAL

•Here decrease in estrogen level lead to increase in bone Reabsorption.

[DEPTH OF BIOLOGY]

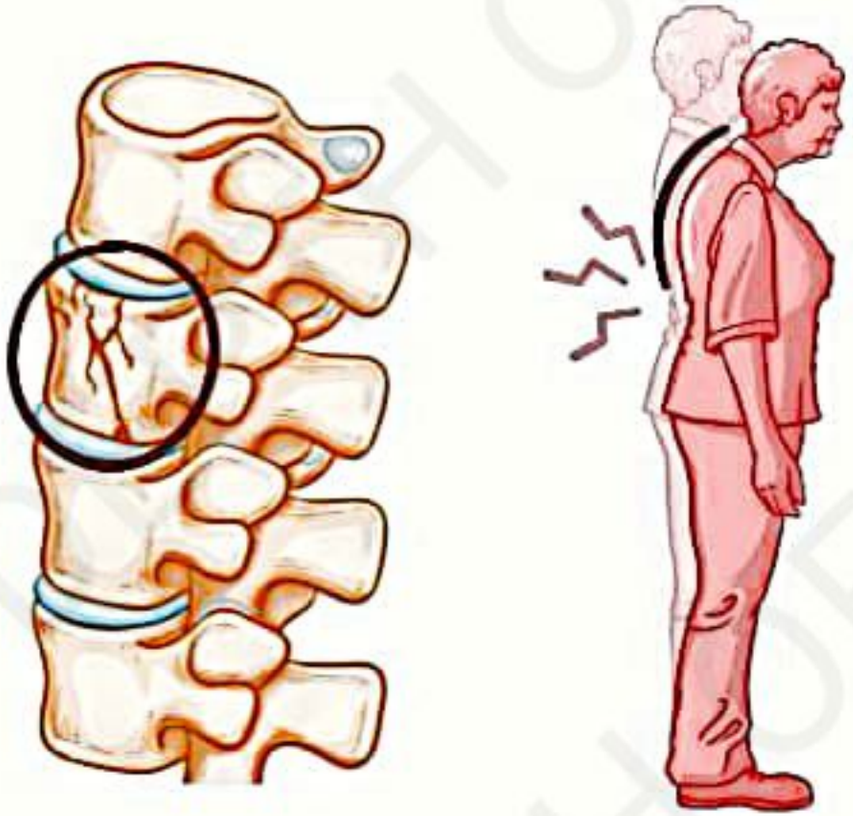
SENILE

•Here osteoblasts gradually loses its ability to form bones.
•Osteoclast work properly [DEPTH OF BIOLOGY]

SYMPTOMS

FRACTURES

* VERTEBRAL/COMPRESSION

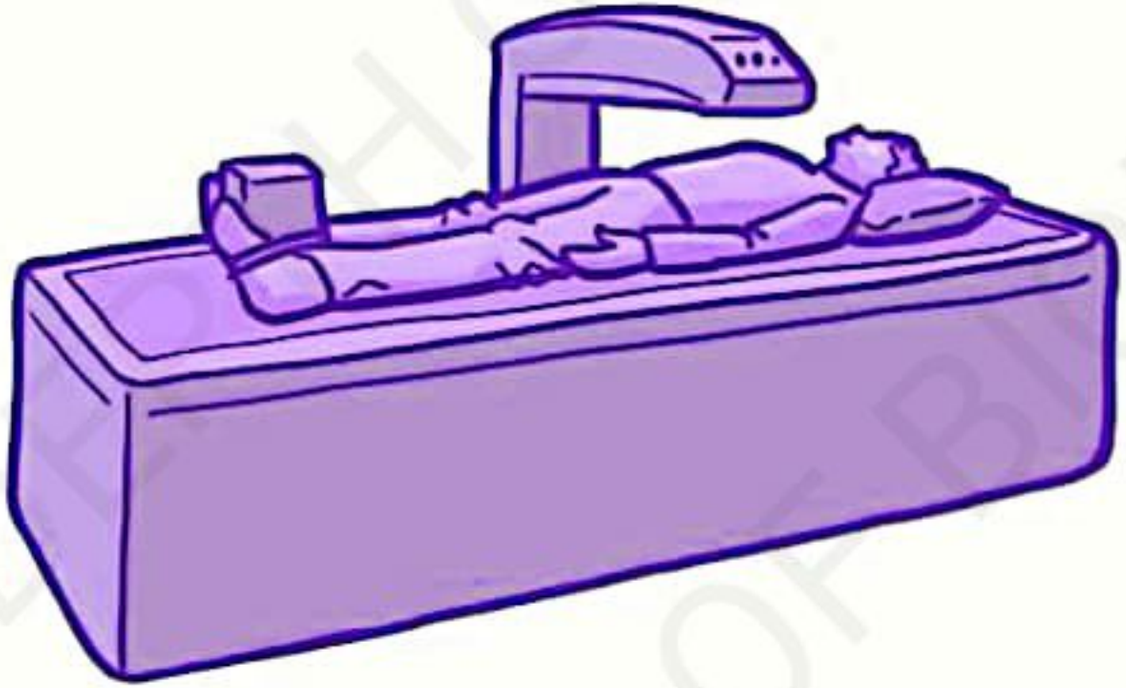


* FEMORAL NECK

* DISTAL RADIUS

DIAGNOSIS

DUAL-ENERGY X-RAY ABSORPTIOMETRY (DEXA) SCAN



* TESTS **BONE DENSITY**
  - INDIVIDUAL'S vs. NORMAL ADULT

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T SCORE
≤ -2.5

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OSTEOPOROSIS

TREATMENT

* **BISPHOSPHONATES**
  - ALENDRONATE, RISEDRONATE

* **ADVANCED: TERIPARATIDE**
  - RECOMBINANT PTH
  - ↑ BONE FORMATION

* **THIAZIDE DIURETIC: HYDROCHLOROTHIAZIDE**
  - ↓ MINERAL BONE LOSS

* **DENOSUMAB**
  - MONOCLONAL ANTIBODY

* **RALOXIFENE**
  - SELECTIVE ESTROGEN RECEPTOR MODULATOR

→ **POSTMENOPAUSAL OSTEOPOROSIS**