



Human Body Systems

Virtual Learning

9-12th PLTW[®] HBS

PLTW[®] 5.2.3 Bone Remodeling and Repair
Part 2: Calcium Balance Feedback Loop

May 14, 2020



Human Body Systems

9-12th PLTW[®] HBS
Lesson: May 14, 2020

Objective/Learning Target:

Students will be able to create a feedback loop that shows how the body maintains a calcium balance. (*Reference: PLTW[®] 5.2.3 Bone Remodeling and Repair*)



Let's Get Started/Warm Up Activities:

Before we start our lesson today, watch the videos below:

- [Anatomy of a Fracture as a Result of Systemic Bone Loss](#)
- [Bone Remodeling and Modeling](#)

Lesson/Activity:

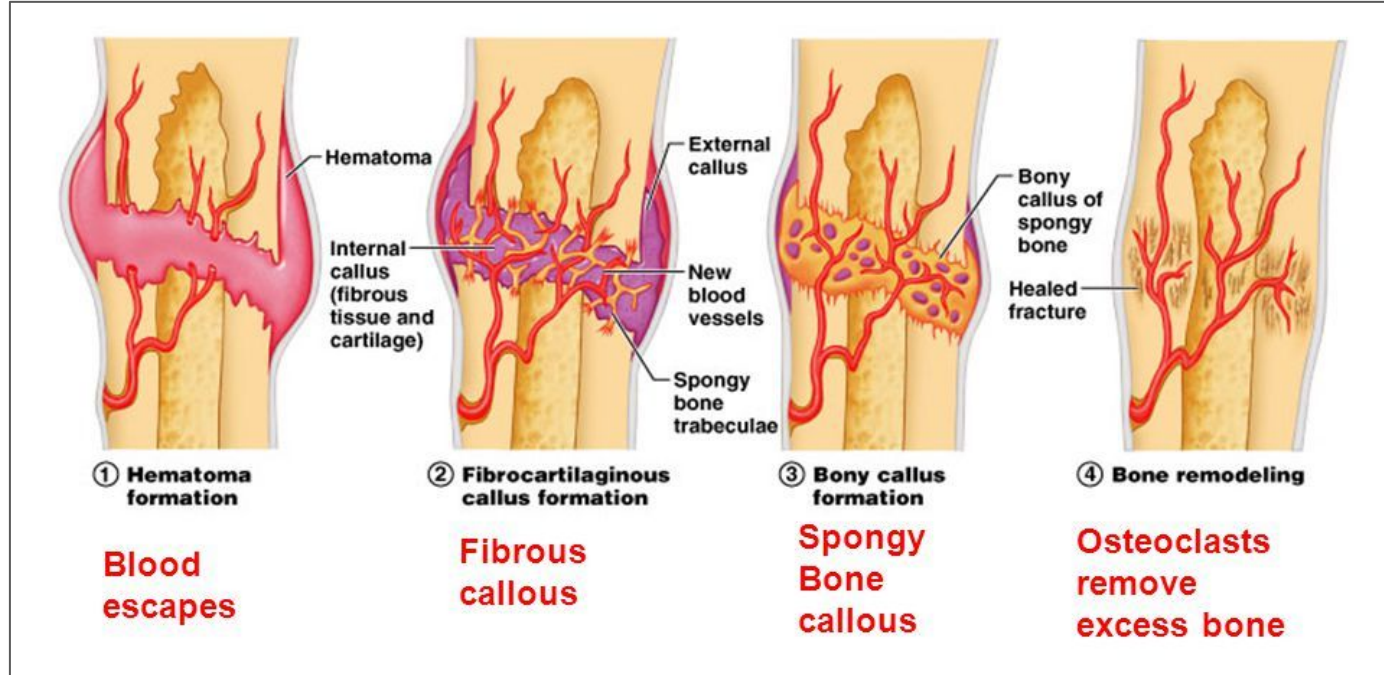
Activity #1: On a piece of paper or in your notebook, write the following notes:

Four Stages of Bone Healing: Click [HERE](#) to see a video on bone fracture healing.

- Step 1 – Hematoma Formation Blood vessels that are ruptured during the break swell to form a mass called a hematoma. This mass forms between the broken bones.
- Step 2 – Fibrocartilage Callus Formation New capillaries begin to form into the clotted blood in the damaged area. Connective tissues cells form a mass of repair tissue called a fibrocartilage callus. This callus contains some cartilage, some bone and collagen fibers and the combined mass closes the gap between the broken bones.
- Step 3 – Bony Callus Formation The fibrocartilage callus is gradually replaced by one made of spongy bone. This new mass is referred to as the bony callus. Osteoclasts and osteoblasts move to the area and multiply.
- Step 4 – Bone Remodeling Over the weeks and months to come, the callus is remodeled with the help of osteoclasts and osteoblasts. The shape of the bones will gradually return to normal and there will eventually be little evidence of the fracture.

Lesson/Activity:

Activity #2: On a piece of paper or in your notebook, draw the diagram illustrating the four stages of bone repair. Feel free to use colored pencils, crayons or markers if available.





Lesson/Activity continued:

Watch the video: [What Are Parathyroid Glands? How Calcium is Controlled](#)

Read this article: [The Parathyroid Glands: Example Feedback Loop](#)

Activity #3: Watch the video about how calcium is controlled by your parathyroid glands.

Create a feedback loop and include the following:

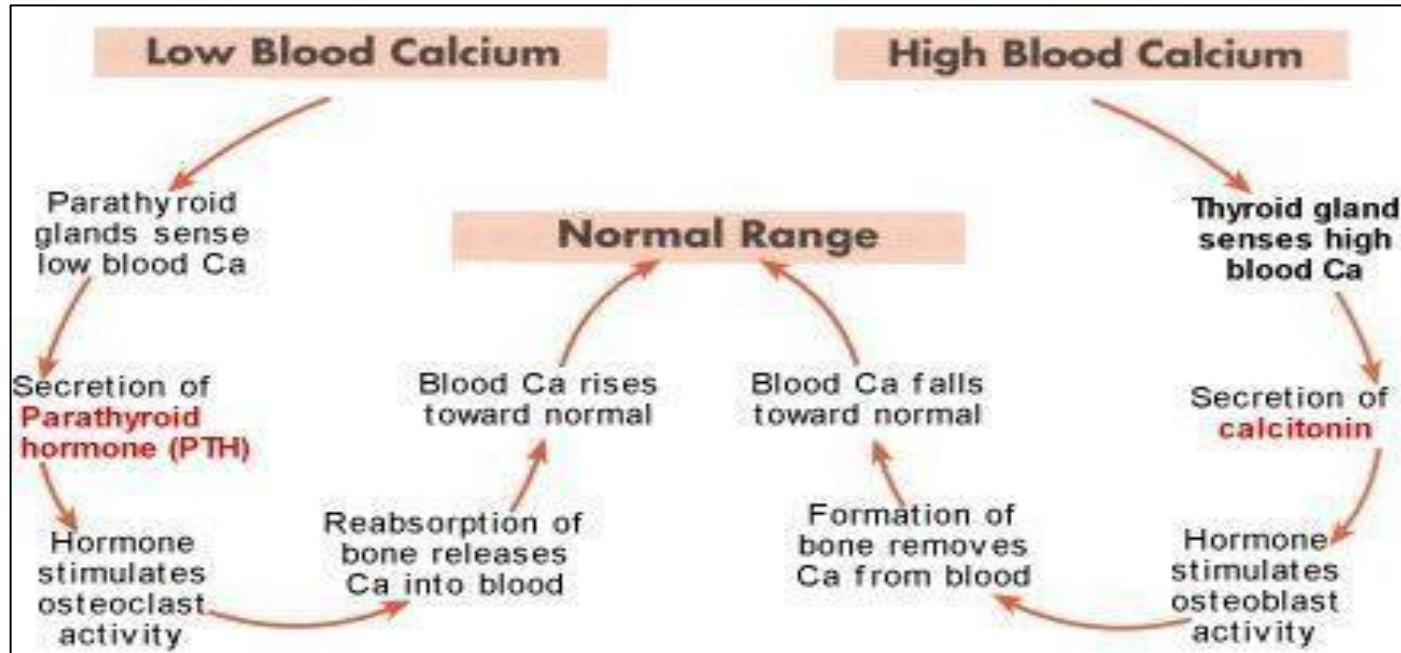
- Depict how the body detects high or low levels of calcium in the blood.
- Include descriptions that contain the following words: bone, calcitonin, parathyroid hormone, osteoclasts, osteoblasts, thyroid gland, parathyroid gland.
- Show the involvement of the endocrine system and the skeletal system in restoring a calcium balance. Make sure to reference specific glands and their target organs as well as pinpoint how bone is affected.

Lesson/Activity Answer(s):

Activity #1 Answer(s):
 Click [HERE](#) to view answers.

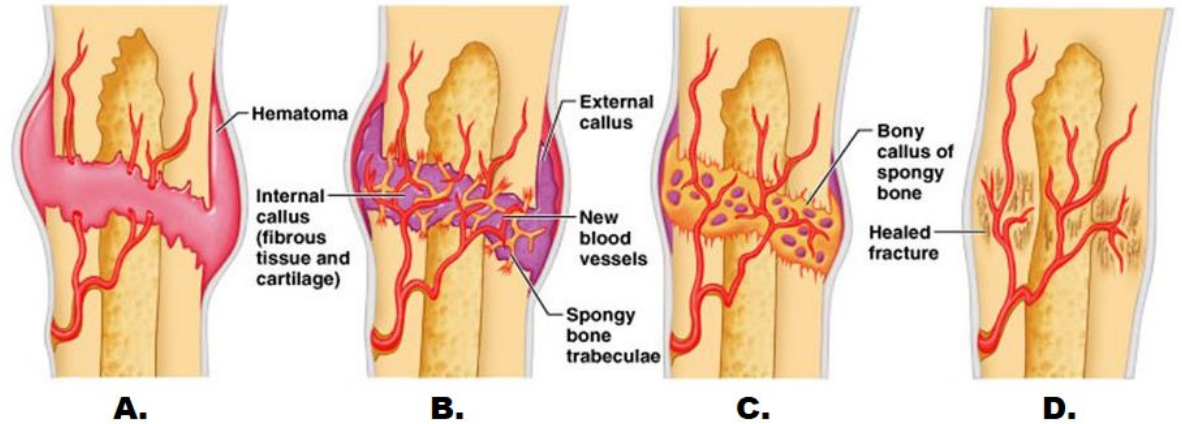
Activity #2 Answer(s):
 Click [HERE](#) to view answers.

Activity #3 Answer(s):
 See feedback loop (right).



Practice:

Practice #1: On a separate sheet of paper, and **WITHOUT** using your diagram from Activity #1, practice by writing down each of the four stages of bone healing.





Practice Answer(s):

Practice #1 Answer(s):

Click [HERE](#) to view the answer(s).



Additional Practice and/or Resources:

Learn More:

[HBS Lesson 5.2.3 Flashcards](#)

Test your knowledge by clicking on the link above.

[Fracture Healing Animation](#)

This video describes the basics of bone fracture healing and a brief description of stages of primary and secondary fracture healing (callus formation & bone remodeling).

[Bone Remodeling and Repair](#)

Check out this video on bone remodeling and repair.