

# Bone Marrow: Types, Functions and Clinical Importance

Catania Cassar\*

Department of Oncology, Virtual University, Sao Paulo, Brazil

## Commentary

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**\*For Correspondence:**

Catania Cassar, Department of Oncology, Virtual University, Sao Paulo, Brazil

**E-mail:** [cassarcatania@gmail.com](mailto:cassarcatania@gmail.com)

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## DESCRIPTION

Bone marrow, a soft and spongy tissue located within the cavities of specific bones, predominantly the femur and tibia, stands as a vital tissue of the body's blood cell maintenance. This tissue holds important role in the human skeletal system, driving the production of blood cells essential for various physiological functions. Comprising two distinctive types, red marrow and yellow marrow, bone marrow participates in hematopoiesis, generating red blood cells, white blood cells, and platelets to maintain the delicate balance required for overall health. The red bone marrow, found in the trabecular cavities of bones, is the primary site of blood cell formation, while yellow bone marrow, rich in fat cells, primarily serves as a reservoir for potential red bone marrow activation during increased demand. The intricate interplay of these two marrow types highlights the versatility and adaptability of this remarkable tissue, underscoring its pivotal role in sustaining human physiology.

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### Red bone marrow

**Hematopoiesis:** The primary function of red bone marrow is hematopoiesis, which is the formation and development of blood cells. It is responsible for producing red blood cells (erythrocytes), white blood cells (leukocytes), and platelets (thrombocytes).

**Stem cells:** Red bone marrow contains hematopoietic stem cells, which have the ability to differentiate into various types of blood cells. These stem cells are crucial for maintaining a constant supply of new blood cells throughout life.

**Location:** In adults, red bone marrow is mainly found in the flat bones, such as the sternum, pelvic bones, ribs, and vertebrae.

### Yellow bone marrow

**Fat storage:** Yellow bone marrow is composed mostly of fat cells and serves as a storage site for adipose tissue. Unlike red bone marrow, yellow bone marrow is not actively involved in blood cell production.

**Transition:** In some situations, such as severe blood loss or certain medical conditions, yellow bone marrow can transform back into red bone marrow to increase the production of blood cells.

**Location:** Yellow bone marrow is typically found in the central cavities of long bones.

### Bone marrow aspiration

**Diagnostic procedure:** Bone marrow aspiration is a medical procedure where a small sample of bone marrow is extracted for diagnostic purposes. It is often performed to investigate blood disorders, leukemia, and other hematological conditions.

**Procedure:** During a bone marrow aspiration, a needle is inserted into the bone, and a liquid marrow sample is withdrawn for analysis.

### Bone marrow transplantation

**Medical intervention:** Bone marrow transplantation, also known as hematopoietic stem cell transplantation, is a medical procedure used to treat certain cancers, blood disorders, and immune system disorders.

**Source of cells:** Healthy bone marrow cells (stem cells) are collected from a donor (either the patient or a compatible donor) and transplanted into the patient after high-dose chemotherapy or radiation to replace damaged or diseased cells.

### Clinical importance

**Blood cell regulation:** Bone marrow plays a crucial role in maintaining the balance of blood cells in the body, ensuring a healthy immune system, oxygen transport, and blood clotting.

**Research and therapeutics:** Ongoing research focuses on understanding the molecular mechanisms of hematopoiesis, which has implications for developing treatments for various blood disorders.

Bone marrow is a vital component of the human body, supporting the continuous production of blood cells essential for various physiological functions. Understanding its structure, functions, and clinical relevance is crucial for both medical professionals and individuals seeking to maintain overall health.