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Commentary

The Endocrine Role of Bones in Energy Metabolism Control

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COMMENTARY

Bone is the fundamental regulator of calcium homeostasis and hematopoiesis, as well as a structural support for the entire body. In a rising number of studies, bone has been identified as an endocrine organ, meaning that bone-derived hormones regulate local bone metabolism and metabolic processes. Furthermore, these characteristics can influence global energy homeostasis by influencing insulin sensitivity, eating behaviour, and adipocyte commitment. These findings could lead to a new pathogenic mechanism for metabolic diseases such as osteoporosis, obesity, and diabetes mellitus, or they could be used to diagnose, treat, and prevent metabolic diseases such as osteoporosis, obesity, and diabetes mellitus. In this review, we outline the regulatory role of bone and bone-derived components in energy metabolism and discuss future research opportunities. The skeleton is made up mostly of bone matrix, osteoblasts, osteoclasts, osteocytes, and chondrocytes, and accounts for up to 15% of total body weight. Both organic and inorganic particles make up the bone matrix, which serves as the skeletal system's foundation. Type I collagen released by osteoblasts, as well as a variety of noncollagenous proteins, make up organic matter. Inorganic matter, also known as bone mineral, is made up of calcium, phosphorus, magnesium, and other minerals. In the body, it serves as a calcium and phosphorus storage store.

Osteoblasts produce osteoids and matrix vesicles, which aid in the stimulation of mineralization and bone formation. Osteoclasts can emit organic acids and proteases to dissolve and absorb bone matrix. The most common cells in bone tissue, osteoocytes, are essential for bone matrix renewal and maintenance. The majority of cartilage is made up of chondrocytes, and endochondral ossification is an important phase in bone growth. Hematopoietic cells in the bone marrow perform the majority of the hematopoietic activity of bone. An endocrine organ's production of a peptide or steroid hormone is employed to control distant functions. Several breakthroughs in bone science in recent years have shown the skeleton's endocrine function. FGF23 and osteocalcin are two novel hormones produced by bone cells that act like traditional endocrine hormones to regulate energy balance and mineral homeostasis.

Body homeostasis necessitates a dynamic balance of energy metabolism. Metabolic problems can occur when the balance is disrupted. The liver, islets, fat, muscle, and bone are among the metabolic organs and tissues involved in energy metabolism. Metabolomic studies have identified the alteration of metabolic pathways during the pathological course of osteoporosis, providing convincing evidence for the metabolic involvement of bone in endocrinology. Other circulating hormones that affect bone tissue include adiponectin, leptin, and insulin. In turn, bone-derived hormones influence energy metabolism throughout the body. Recent studies have discovered that bone cells such as osteoblasts, osteoclasts, BMSCs, and adipocytes have endocrine functions. They can produce and secrete proteins, polypeptides, cytokines, inflammatory agents, adipokines, and exosomes, among other bioactive chemicals..

Among the specialised bone cells (osteocytes, osteoblasts, osteoclasts, and chondrocytes) that can secrete factors that regulate energy metabolism throughout the body are osteocalcin, osteoprotegerin, osteopontin, bone morphogenetic protein, fibroblast growth factors, sclerostin, Lcn2, neuropeptide Y, and parathyroid hormone-related protein. Some of these factors, like Lcn2 and sclerostin, are produced solely by one type of cell, while others, like Osteopontin (OPN), can be secreted by a wide range of cells.

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