The osteocyte: A multifunctional cell within the bone

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The knowledge of bone biology has largely changed in the last few decades. Osteocytes are multifunctional bone cells that are surrounded by mineralized bone matrix and for decades it was considered that they might be relatively inactive cells. However, nowadays it is known that osteocytes are highly active cells which are indispensable for the normal function of the skeleton, playing main roles in several physiological processes, both within and beyond the bone microenvironment. This review highlights and updates the current state of knowledge of the osteocyte and focuses on its roles in bone remodeling and mineral homeostasis, and also reviews its recently discovered endocrine function. Osteocytes secrete sclerostin (a protein that works as a negative regulator of bone mass), and FGF-23, the most important osteocyte-secreted endocrine factor, since it is able to regulate the phosphate metabolism. Moreover, osteocytes can act as mechanosensory cells, transforming the mechanical strain into chemical signaling towards the effector cells (osteoblasts and osteoclasts). Therefore, the osteocyte plays an important role in bone biology, specifically in the remodeling process, since it regulates both the osteoblast and osteoclast activity. Finally, the paper discusses the clinical application of the bone biology, updating the new therapies against bone-loss disorders.

Bone remodeling

FGF-23

Osteocyte

Sclerostin

beta catenin

bisphosphonic acid derivative

blosozumab

calcium

cell marker

connexin 43

denosumab

dickkopf 1 protein

fibroblast growth factor 23

glycogen synthase kinase 3

Hermes antigen

immunoglobulin enhancer binding protein

low density lipoprotein receptor related protein 5

low density lipoprotein receptor related protein 6

matrix metalloproteinase 14

osteocalcin

osteoclast differentiation factor

osteoprotegerin

parathyroid hormone

parathyroid hormone receptor 1

parathyroid hormone related protein

parathyroid hormone[1-34]

phosphate

prostaglandin E2

protein E11

receptor activator of nuclear factor kappa B

romosozumab

sclerostin

unclassified drug

unindexed drug

Wnt protein

calcium

aging

apoptosis

atypical femur fracture

atypical subtrochanteric femur fracture

autocrine effect

autophagy

bone age

bone density

bone disease

bone fragility

bone linning cell

bone loss disorder

bone marrow cell

bone mass

bone matrix

bone mineralization

bone multicellular unit

bone necrosis

bone remodeling

bone structure

bone tissue

bone tumor

bone turnover

calcium blood level

calcium transport

cancer prevention

cell activity

cell body

cell communication

cell damage

cell death

cell differentiation

cell function

cell maturation

cell stimulation

cell surface

cell transformation

cell viability

cells by body anatomy

cellular distribution

cellular secretion

chronic kidney disease mineral bone disorder

chronic kidney failure

cortical bone

drug activity

effector cell

endocrine cell

enzyme inhibition

extracellular matrix

femur fracture

femur subtrochanteric fracture

fracture nonunion

gap junction

gene

gene expression

genetic transcription

human

incidence

ischemia

jaw osteonecrosis

lacunocanalicular system

mechanosensory cell

mechanotransduction

mesenchymal stem cell

microenvironment

mineral metabolism

nonhuman

ossification

osteoblast

osteoclast

osteoclastogenesis

osteocyte

osteoid

osteolysis

osteoporosis

paracrine signaling

pathologic fracture

pathophysiology

phosphate metabolism

porosity

postmenopause osteoporosis

prophylaxis

protein degradation

protein expression

protein function

protein localization

protein phosphorylation

protein protein interaction

protein secretion

protein synthesis

protein transport

regulatory mechanism

Review

SOST gene

trabecular bone

trabecular microcrack

treatment duration

blood

bone

bone development

cytology

mechanoreceptor

osteocyte

physiology

Apoptosis

Bone and Bones

Bone Remodeling

Bone Resorption

Calcium

Endocrine Cells

Humans

Mechanoreceptors

Mechanotransduction, Cellular

Osteocytes

Osteogenesis