LOS COBOS MEDICAL CENTER

compensar

UNIVERSIDAD EL BOSQUE

Miocinas y hueso

Jorge Castillo

Especialista en Endocrinología
Los Cobos Medical Center
Bogotá, Colombia

www.eldoctorcastillo.com

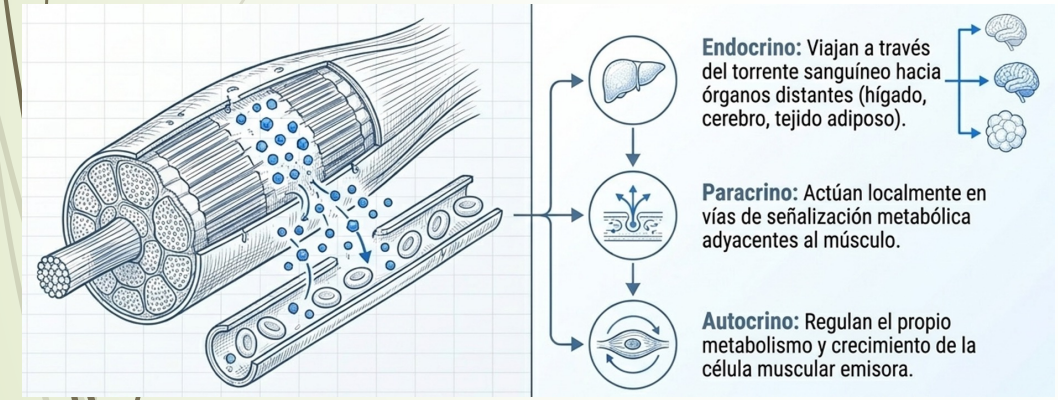
Conferencia disponible en…

www.eldoctorcastillo.com

Conflicto de interés : NO

MIOCINAS : DEFINICION

Citoquinas u otros péptidos producidos, expresados y liberados por las fibras musculares esqueléticas que ejercen efectos endocrinos, paracrinos o autocrinos.



Exerkinas: Moléculas derivadas en respuesta al ejercicio

VG: Cardiocinas, hepatocinas, baptocinas, neurocinas, miocinas

MIOCINA EN EL METABOLISMO

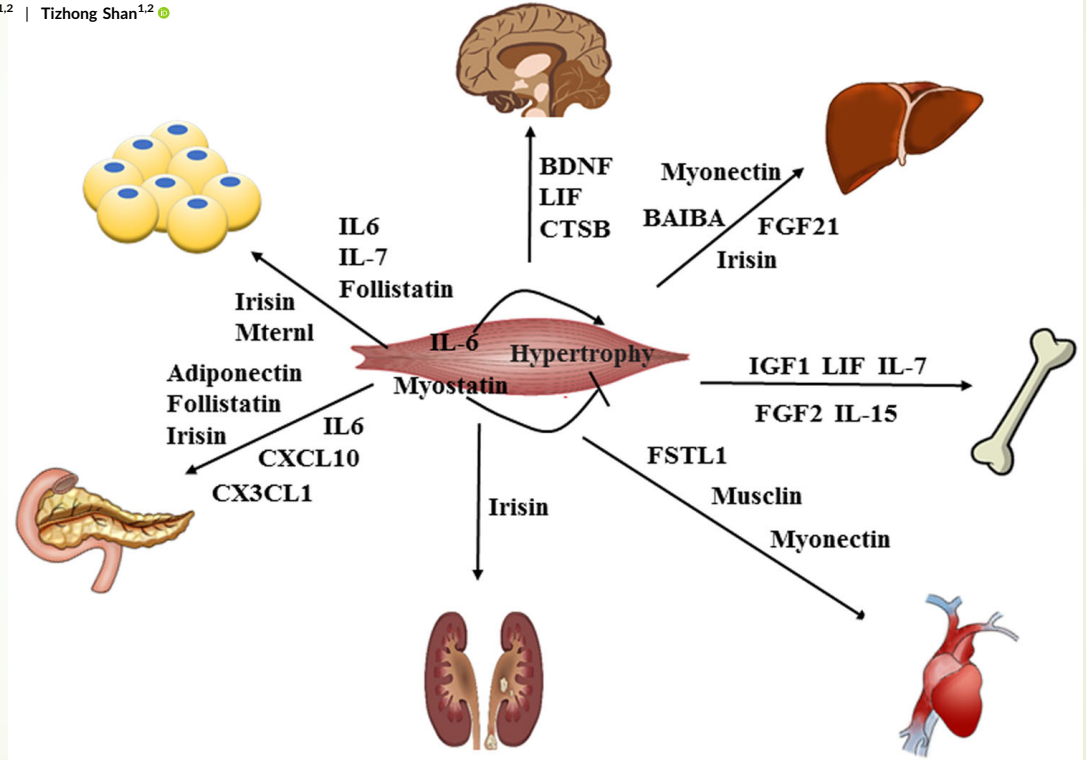
Miocina	Gatillo Principal	Tejido Objetivo	Efecto Metabólico Principal
IL-6	Contracción pura / Depleción de glucógeno	Sistémico (Músculo, Hígado, Sangre)	Lipólisis aguda, captación de glucosa (AMPK), supresión de TNF-α (terra-cotta accent on TNF-α).
IL-15	Entrenamiento de fuerza / Resistencia	Tejido Adiposo Visceral (terra-cotta accent on Visceral)	Reducción de adiposidad visceral específica.
IL-8	Ejercicio excéntrico exhaustivo	Endotelio Vascular Local	Promueve angiogénesis (creación de capilares).
BDNF	Contracción muscular intensa	Cerebro y Músculo Local	Neuroplasticidad, volumen hipocampal, oxidación de grasas local.
FGF21	Hiperinsulinemia (Respuesta a insulina)	Hígado y Músculo	Regulación transcripcional del metabolismo energético (PGC-1α).

REVIEW ARTICLE

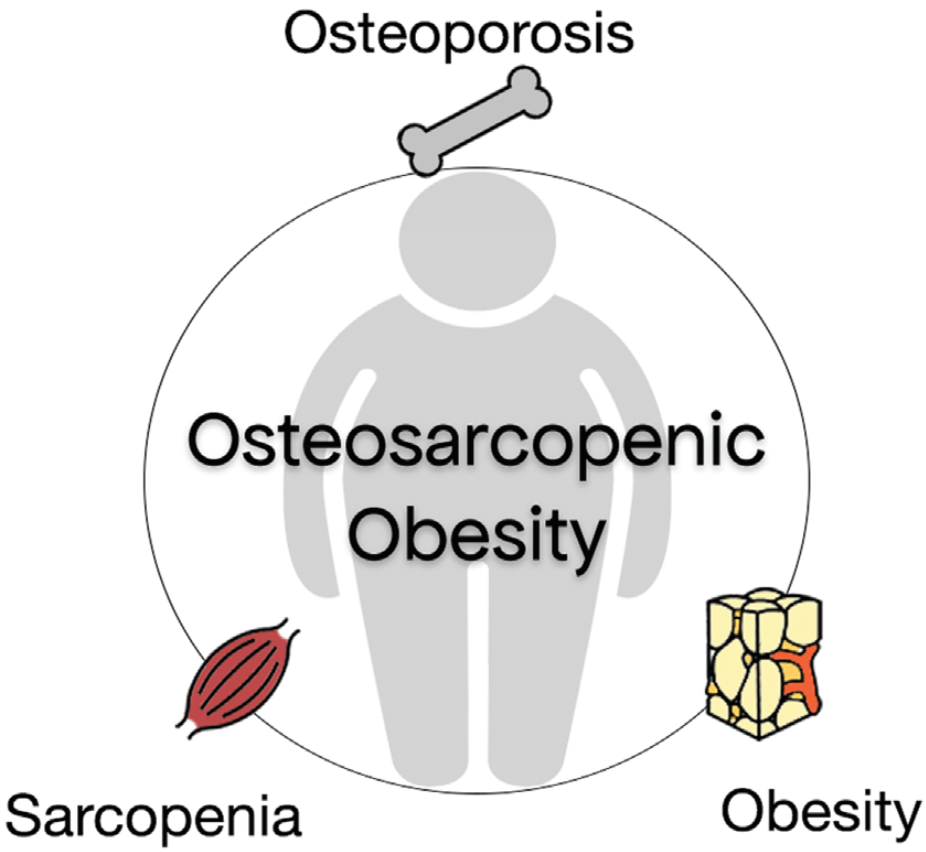
Journal of Cellular Physiology WILEY

Myokines mediate the cross talk between skeletal muscle and other organs

Wentao Chen[1,2] | Liyi Wang[1,2] | Wenjing You[1,2] | Tizhong Shan[1,2]

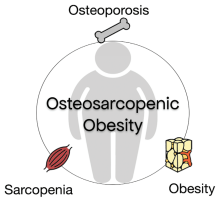


J Cell Physiol. 2020;1–20.


Osteoporosis
Osteosarcopenic Obesity
Sarcopenia
Obesity

Interacción musculo/hueso

❑ Varias similaridades entre los dos tejido



FACTORES EXTRINSECOS

INACTIVIDAD

- Masa Osea
- Microarquitectura
- Propiedades Bioquímicas

Factores Nutricionales

Tratamiento Medico

Estilo de vida

- Acidosis Metabólica
- Bajo grado de Inflamación
- Estrés Oxidativo
- Cambios Hormonales
- Lipotoxicidad

INFLAMACION

Deficiencia de Vitamina D

- Masa Muscular
- Fuerza Muscular
- Desempeño Físico

Disregulación Metabólica

- Factores Genéticos
- Deficiencia Hormonal (GH, Tiroides,)
- Insulino Resistencia
- Comorbilidades (Obesidad, diabetes, Cushing, caquexia

Osteoporosis

Sarcopenia

Ageing Research Reviews 21 (2015) 55-70

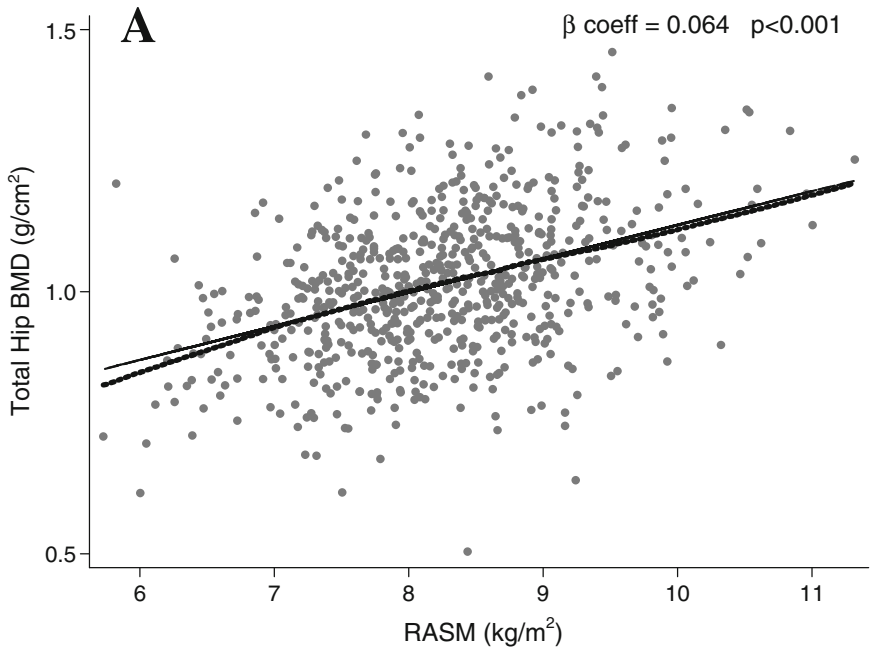
Osteoporos Int (2013) 24:87–98
DOI 10.1007/s00198-012-2057-z

ORIGINAL ARTICLE

Sarcopenia and its relationship with bone mineral density in middle-aged and elderly European men

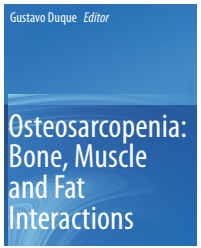
S. Verschueren · E. Gielen · T. W. O'Neill · S. R. Pye · J. E. Adams · K. A. Ward · F. C. Wu · P. Szulc · M. Laurent · F. Claessens · D. Vanderschueren · S. Boonen

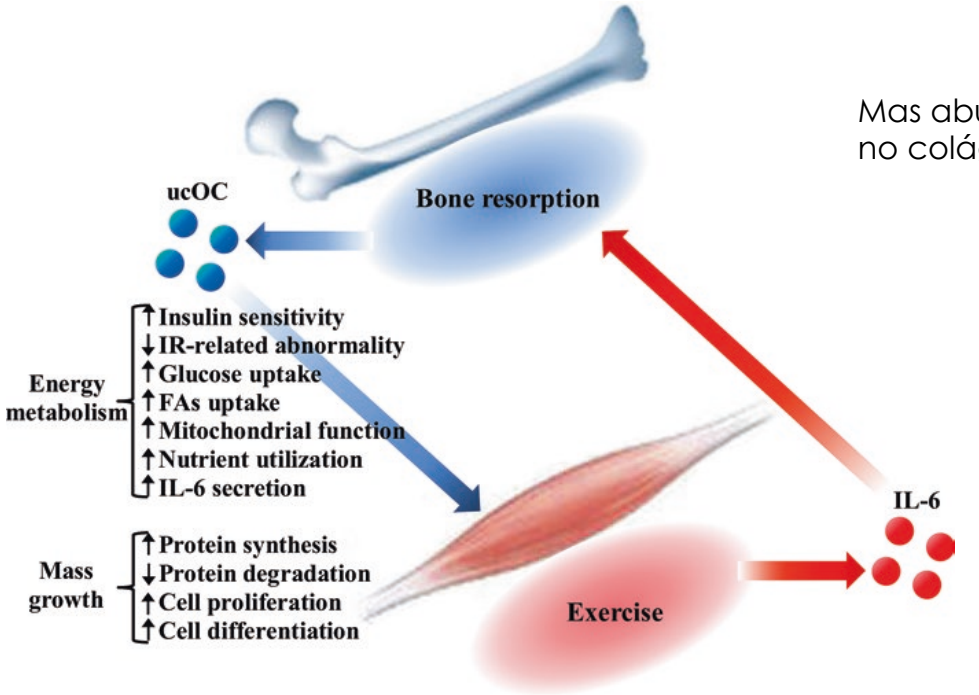
Relative appendicular skeletal muscle mass (RASM) Vs Total Hip BMD



Osteoporos Int (2013) 24: 87-98

Chapter 7
The Endocrine Actions of Undercarboxylated Osteocalcin in Skeletal Muscle: Effects and Mechanisms





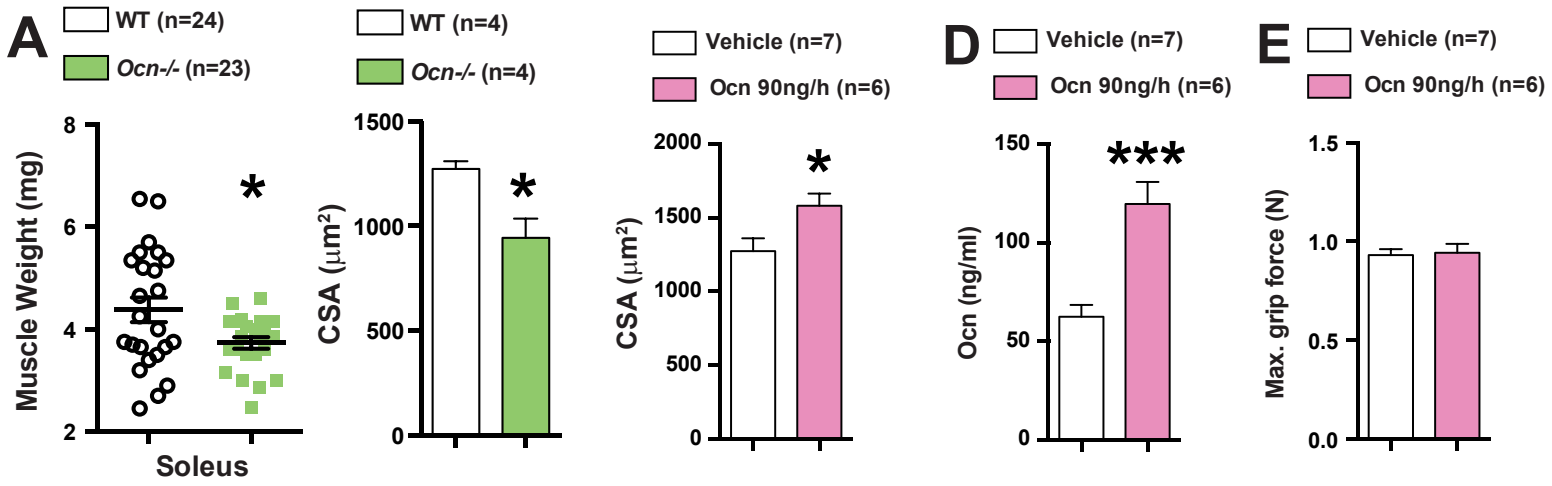
Mas abundante proteina no colágeno en el hueso

- Osteosarcopenia, Dr Duque

Brief communication

MOLECULAR METABOLISM

Osteocalcin is necessary and sufficient to maintain muscle mass in older mice

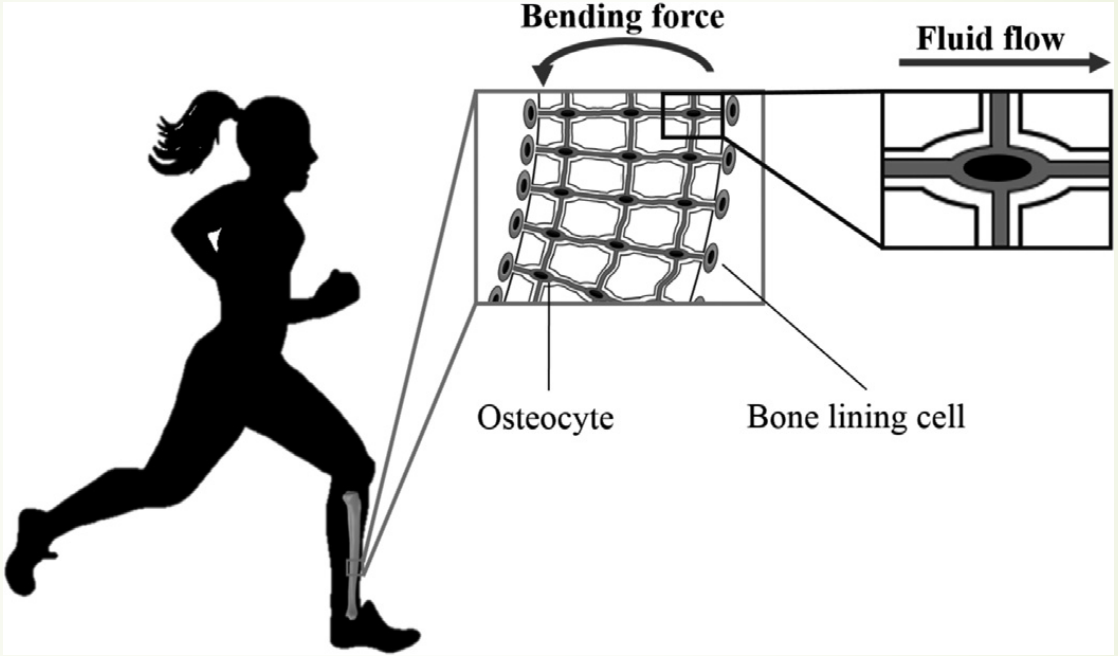


dx.doi.org/10.1016/j.molmet.2016.07.002

Hueso que soportan peso (cadera y columna) pierden 1 – 1.5% de DMO / mes

6 meses en el espacio = 10 años en la tierra

La pérdida de masa ósea de un paciente con espasticidad se parece mucho a la de un astronauta

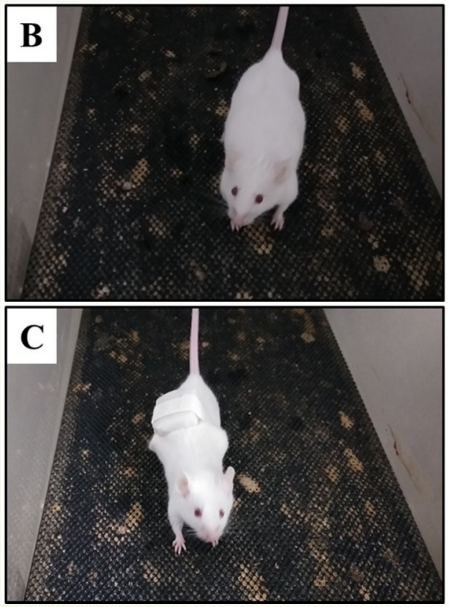


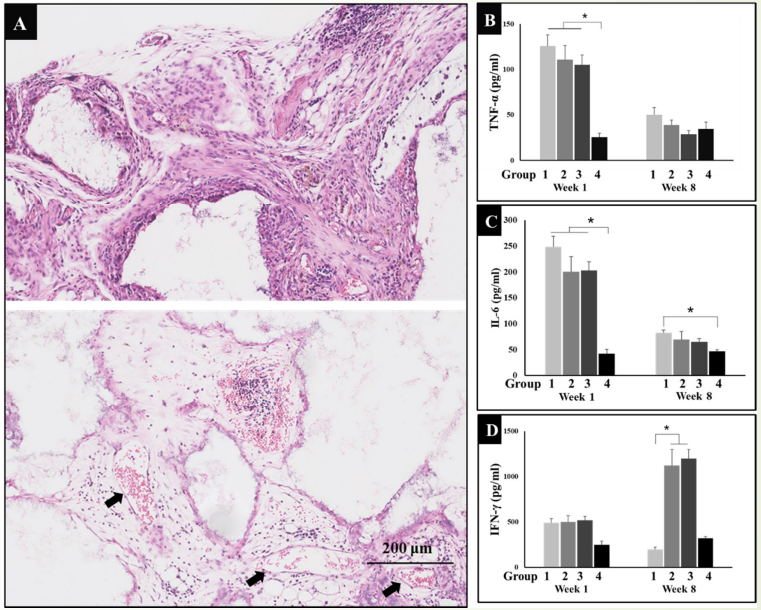
Medical Engineering and Physics000 (2015) 1–10

Article

Exercise Promotes the Osteoinduction of HA/β-TCP Biomaterials via the Wnt Signaling Pathway

Lijia Cheng *,†, Ahmad Taha Khalaf †, Tianchang Lin, Ling Ran, Zheng Shi, Jun Wan, Xin Zhou and Liang Zou *



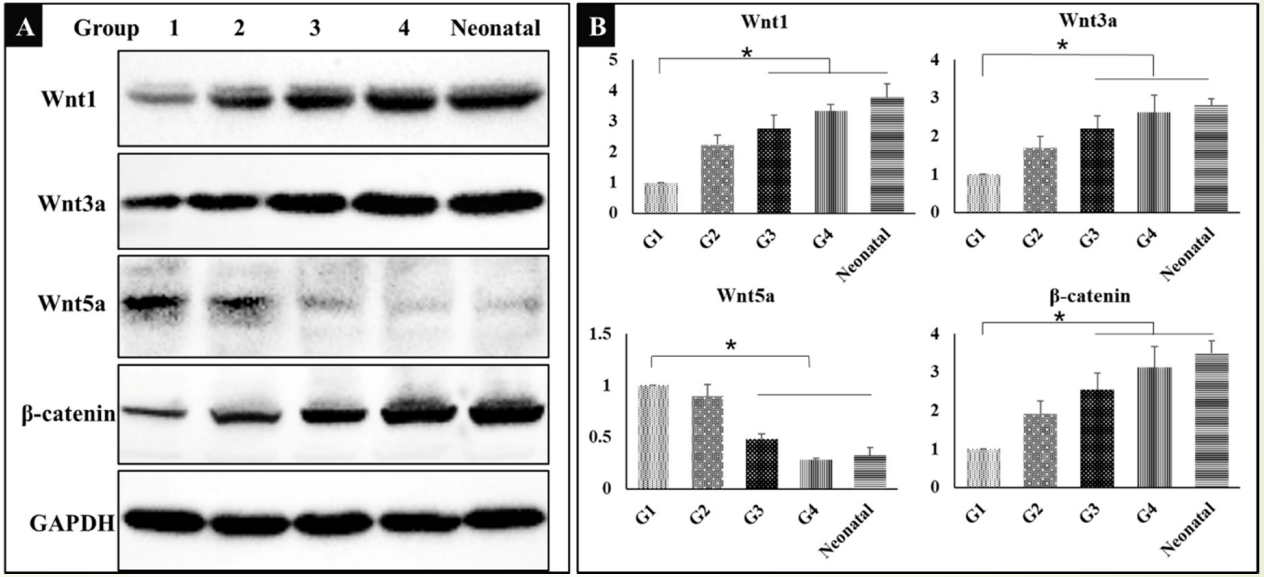


Metabolites **2020**, *10*, 90

Article

Exercise Promotes the Osteoinduction of HA/β-TCP Biomaterials via the Wnt Signaling Pathway

Lijia Cheng *,†, Ahmad Taha Khalaf †, Tianchang Lin, Ling Ran, Zheng Shi, Jun Wan, Xin Zhou and Liang Zou *



Metabolites **2020**, *10*, 90

MIOCINAS

Factor	Impacto sobre hueso
Carga mecánica	Principal
Hormonas sistémicas	Muy alto
Miocinas	Modulador relevante
Adipocinas/inflamación	Modulador

Modulan:

- diferenciación osteoblástica
- actividad osteoclástica
- supervivencia osteocitaria
- señalización Wnt/β-catenina
- RANKL/OPG
- inflamación medular

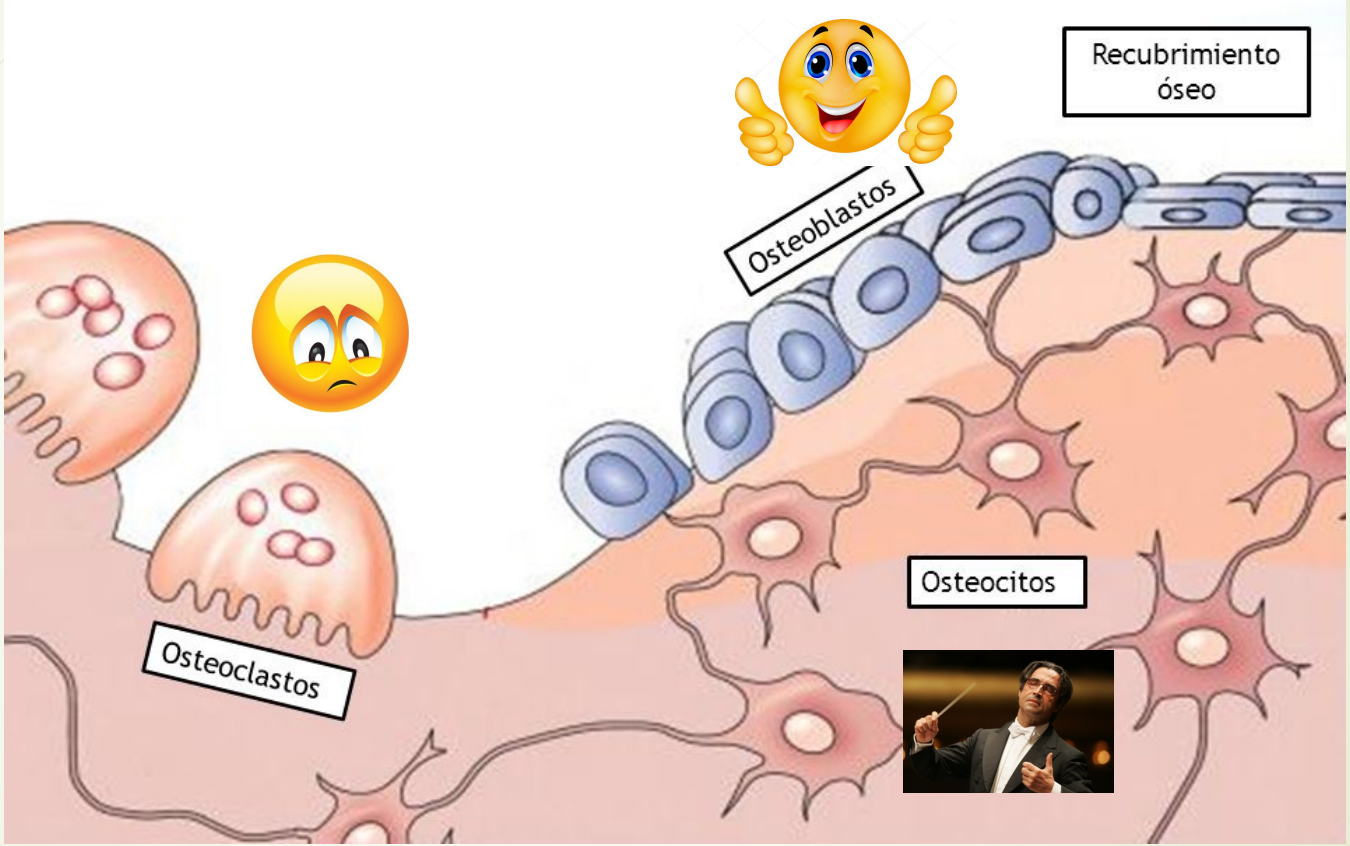
Pero:

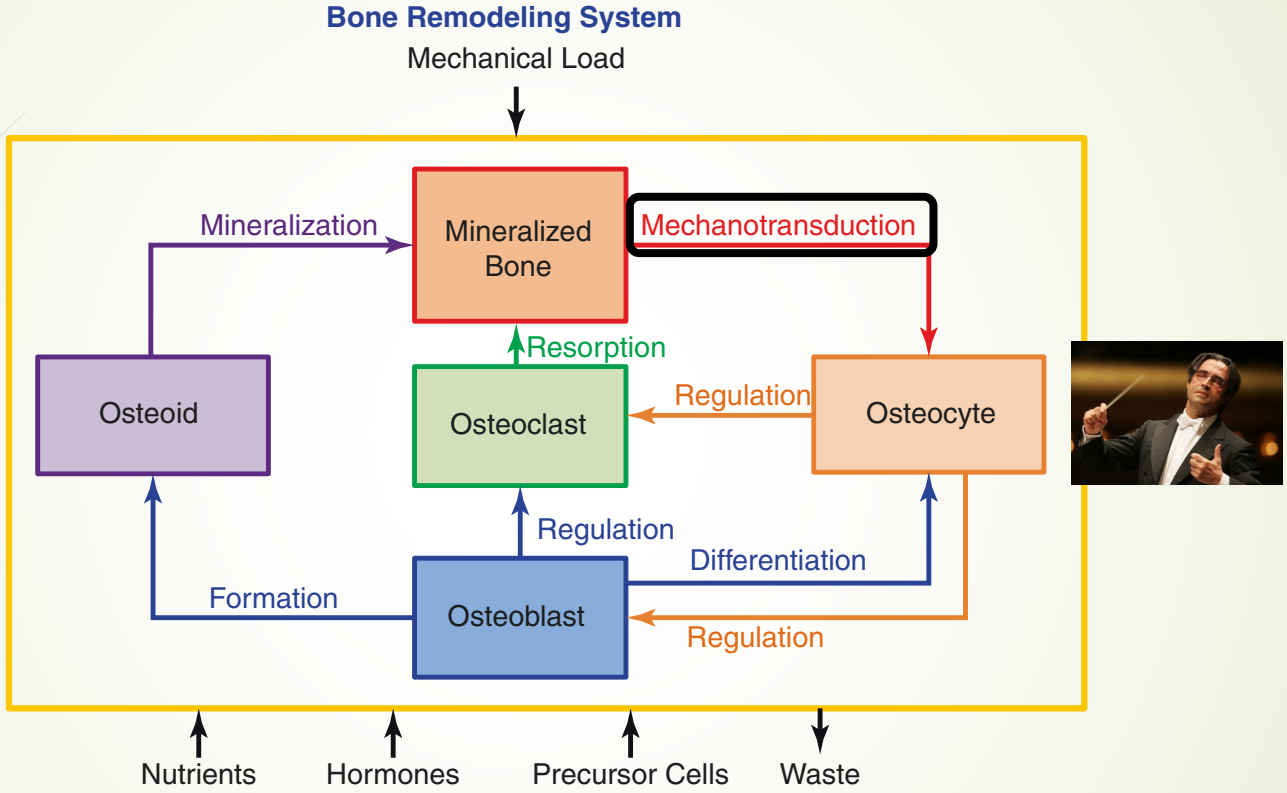
Su efecto aislado probablemente es:

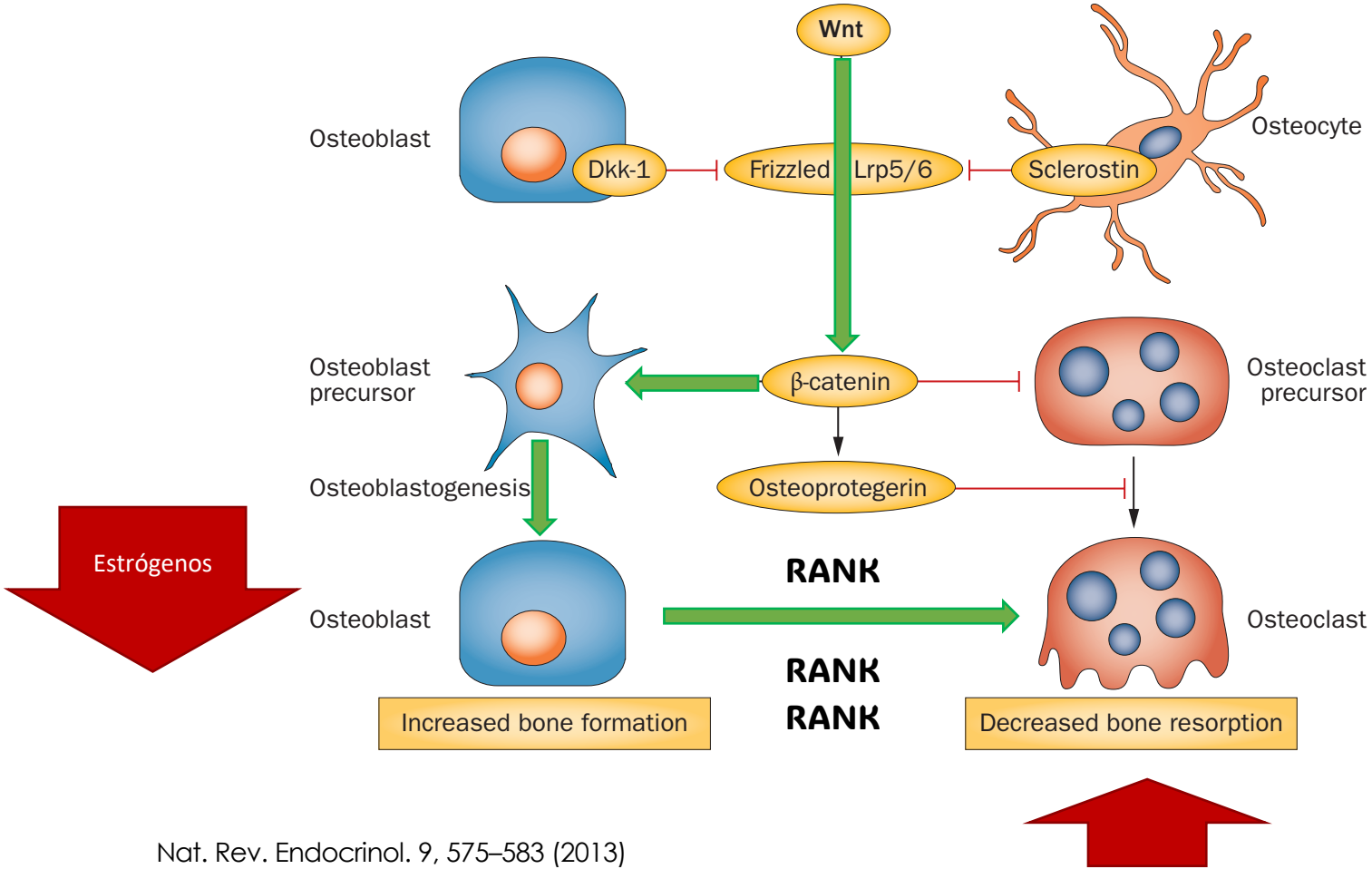
- **modulador**
- no el principal determinante absoluto de masa ósea

La carga mecánica sigue siendo dominante.

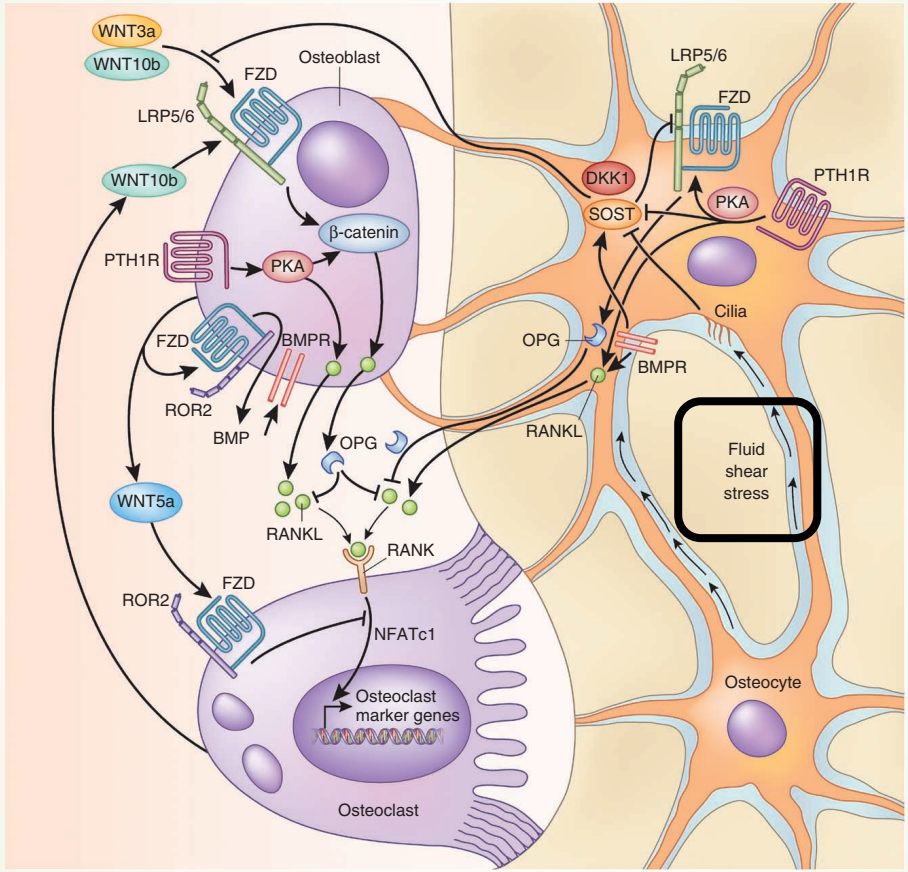
Células del hueso



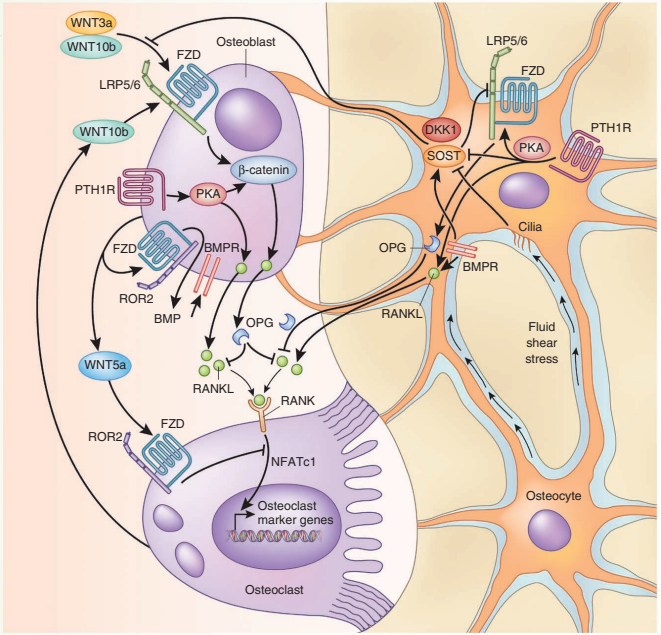

Bone Remodeling System
Mechanical Load
Mineralization
Mineralized Bone
Mechanotransduction
Resorption
Osteoid
Osteoclast
Regulation
Osteocyte
Regulation
Differentiation
Formation
Osteoblast
Regulation
Nutrients
Hormones
Precursor Cells
Waste

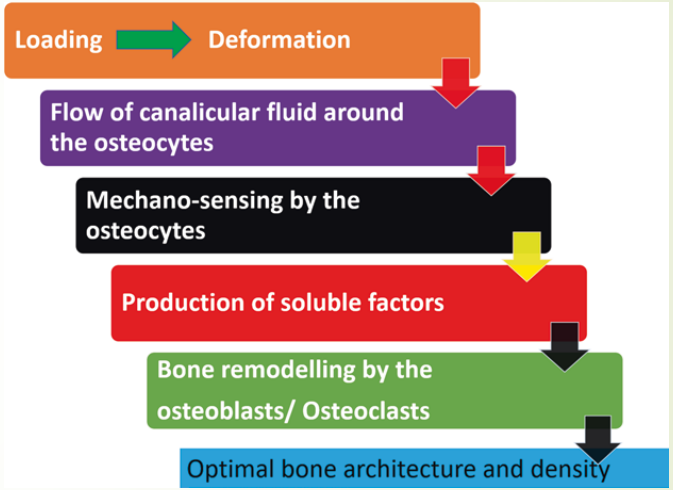


Nat. Rev. Endocrinol. 9, 575–583 (2013)



New Horizons in Osteoporosis Management Yasser El Miedany


WNT3a
WNT10b
FZD
Osteoblast
LRP5/6
WNT10b
β-catenin
PTH1R
PKA
FZD
BMPR
ROR2
BMP
OPG
RANKL
RANK
WNT5a
FZD
ROR2
NFATc1
Osteoclast marker genes
Osteoclast
LRP5/6
FZD
DKK1
SOST
PKA
PTH1R
Cilia
OPG
BMPR
RANKL
Fluid shear stress
Osteocyte


Loading
Deformation
Flow of canalicular fluid around the osteocytes
Mechano-sensing by the osteocytes
Production of soluble factors
Bone remodelling by the osteoblasts/ Osteoclasts
Optimal bone architecture and density

Contents lists available at ScienceDirect

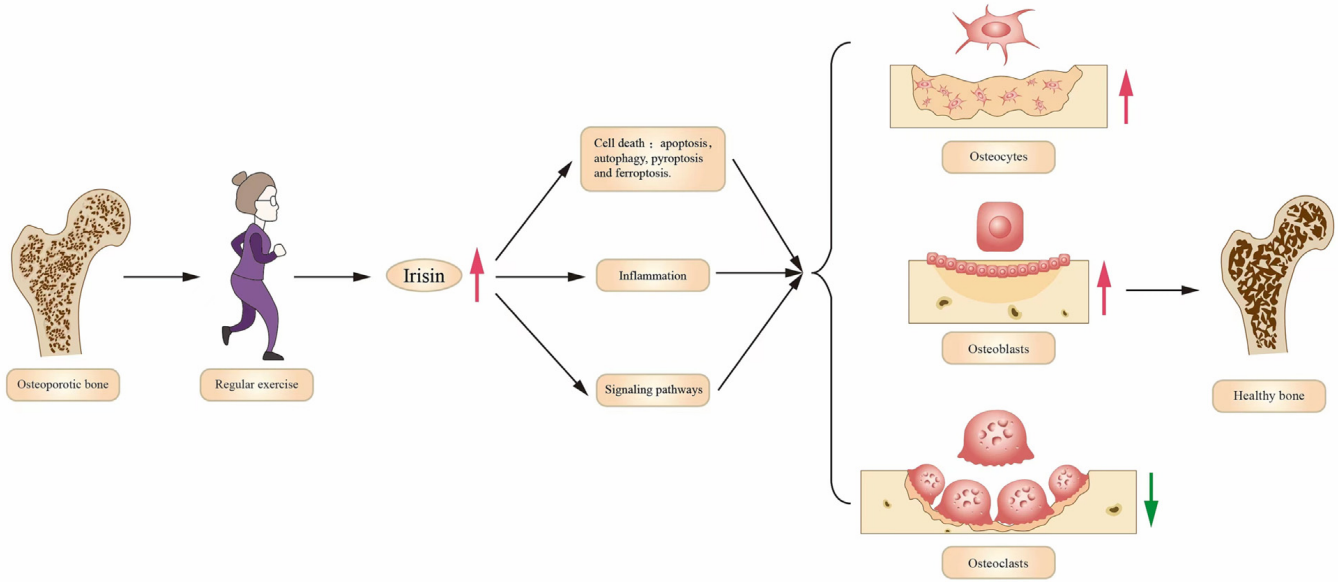
Journal of Advanced Research

journal homepage: www.elsevier.com/locate/jare

Review

Irisin as an agent for protecting against osteoporosis: A review of the current mechanisms and pathways

Xinli Hu [1], Zheng Wang [1], Wei Wang [1], Peng Cui, Chao Kong *, Xiaolong Chen *, Shibao Lu *



Contents lists available at ScienceDirect

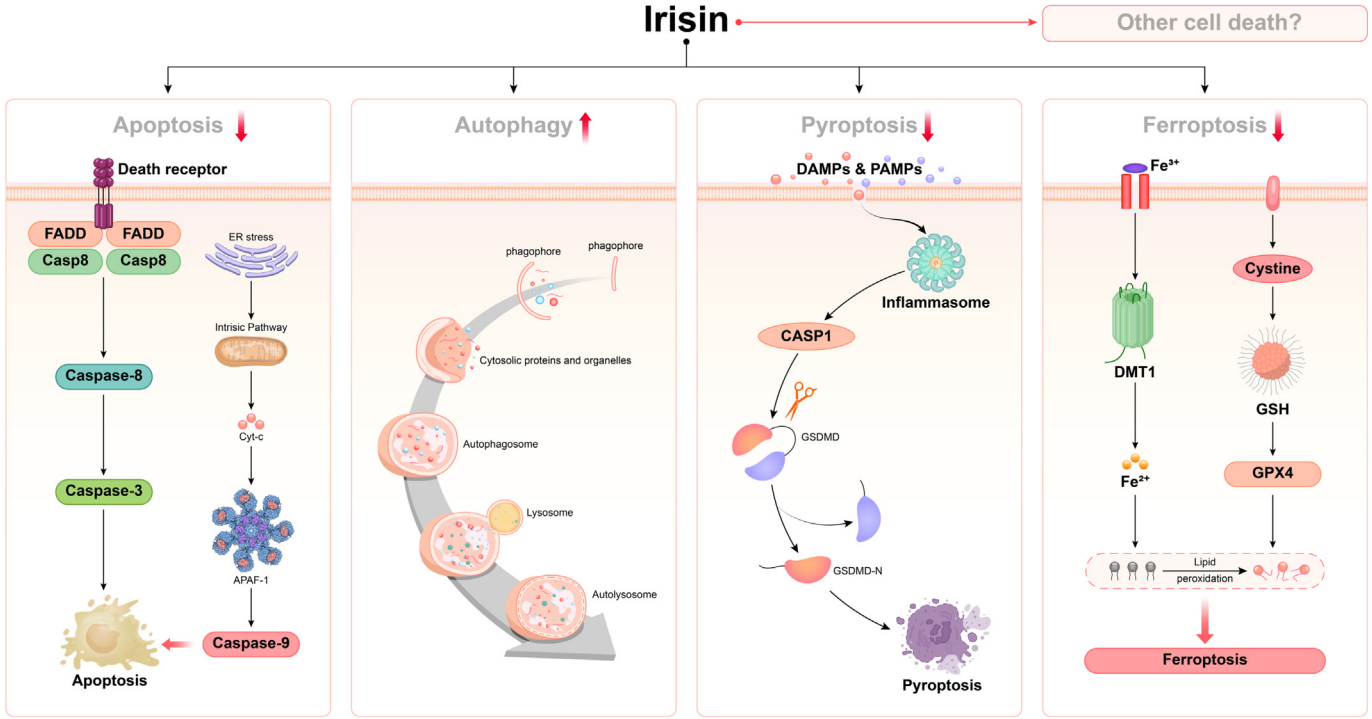
Journal of Advanced Research

journal homepage: www.elsevier.com/locate/jare

Review

Irisin as an agent for protecting against osteoporosis: A review of the current mechanisms and pathways

Xinli Hu [1], Zheng Wang [1], Wei Wang [1], Pe



Contents lists available at ScienceDirect

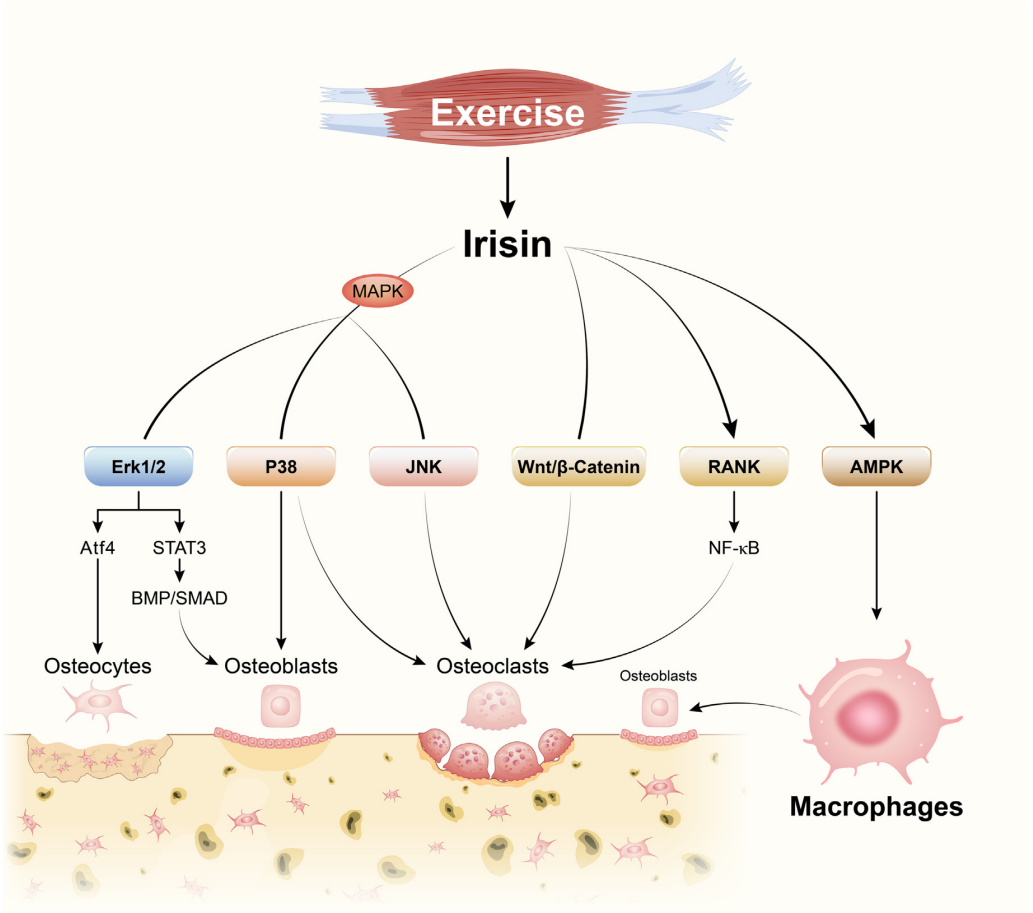
Journal of Advanced Research

journal homepage: www.elsevier.com/locate/jare

Review

Irisin as an agent for protecting against osteoporosis: A review of the current mechanisms and pathways

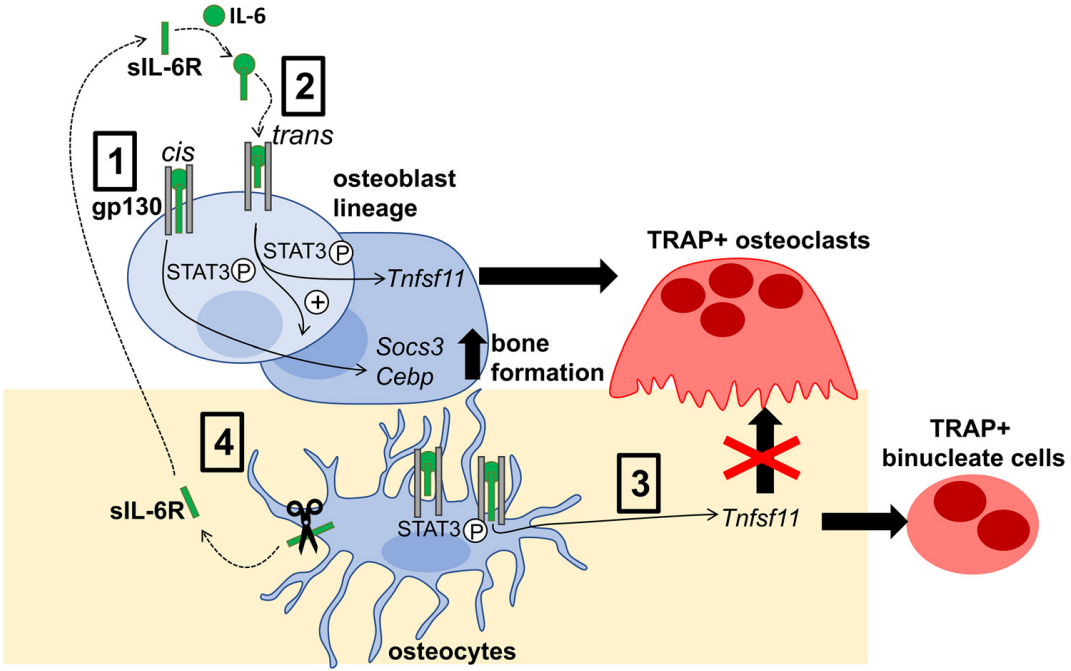
Xinli Hu [1], Zheng Wang [1], Wei Wang [1], Peng Cui, Chao Kong *, Xiaolong Chen *, Shibao Lu *

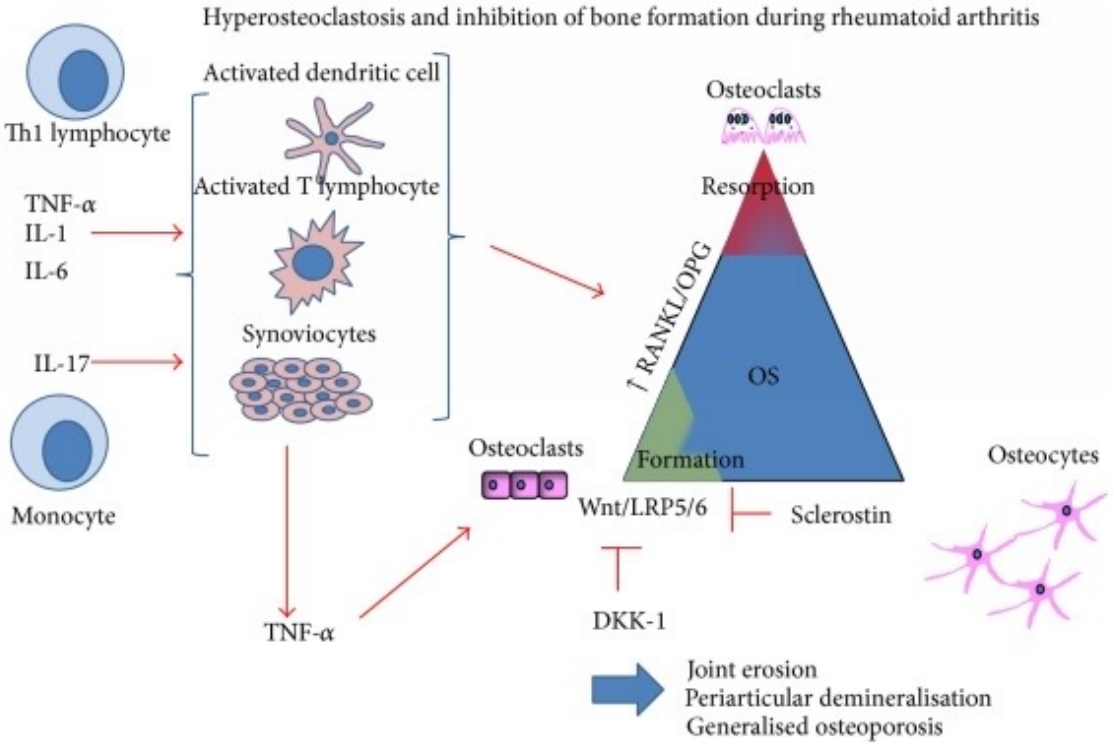


JBC ARTICLE

IL-6 exhibits both *cis*- and *trans*-signaling in osteocytes and osteoblasts, but only *trans*-signaling promotes bone formation and osteoclastogenesis

Received for publication, February 21, 2019, and in revised form, March 25, 2019 Published, Papers in Press, March 28, 2019, DOI 10.1074/jbc.RA119.008074





Bone Remodelling Markers in Rheumatoid Arthritis. Mediators Inflamm. 22 de octubre de 2013.

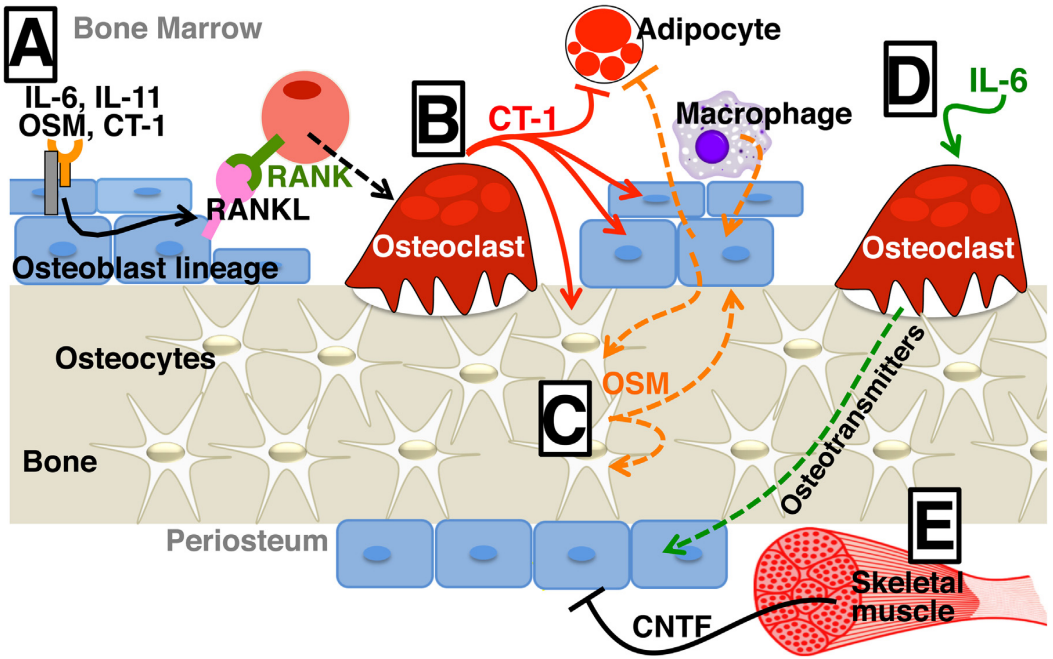
Contents lists available at ScienceDirect

The International Journal of Biochemistry & Cell Biology

journal homepage: www.elsevier.com/locate/biocel

Review article

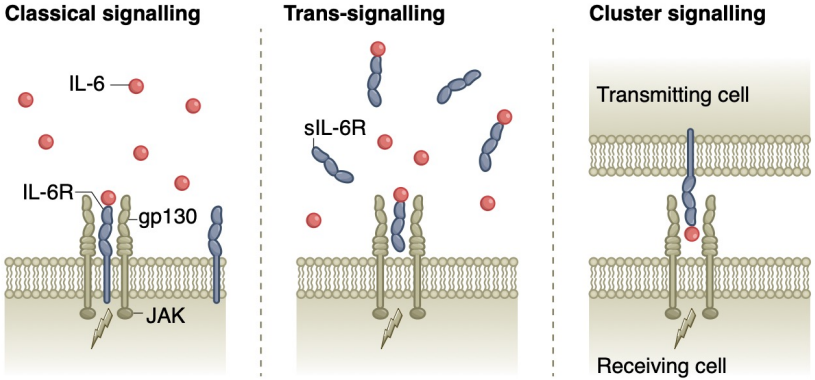
Cell-specific paracrine actions of IL-6 family cytokines from bone, marrow and muscle that control bone formation and resorption



PERSPECTIVE
https://doi.org/10.1038/s42255-022-00538-4
nature metabolism
Check for updates

Interleukin 6 as an energy allocator in muscle tissue

Timothy M. Kistner[1], Bente K. Pedersen[2] and Daniel E. Lieberman[1]

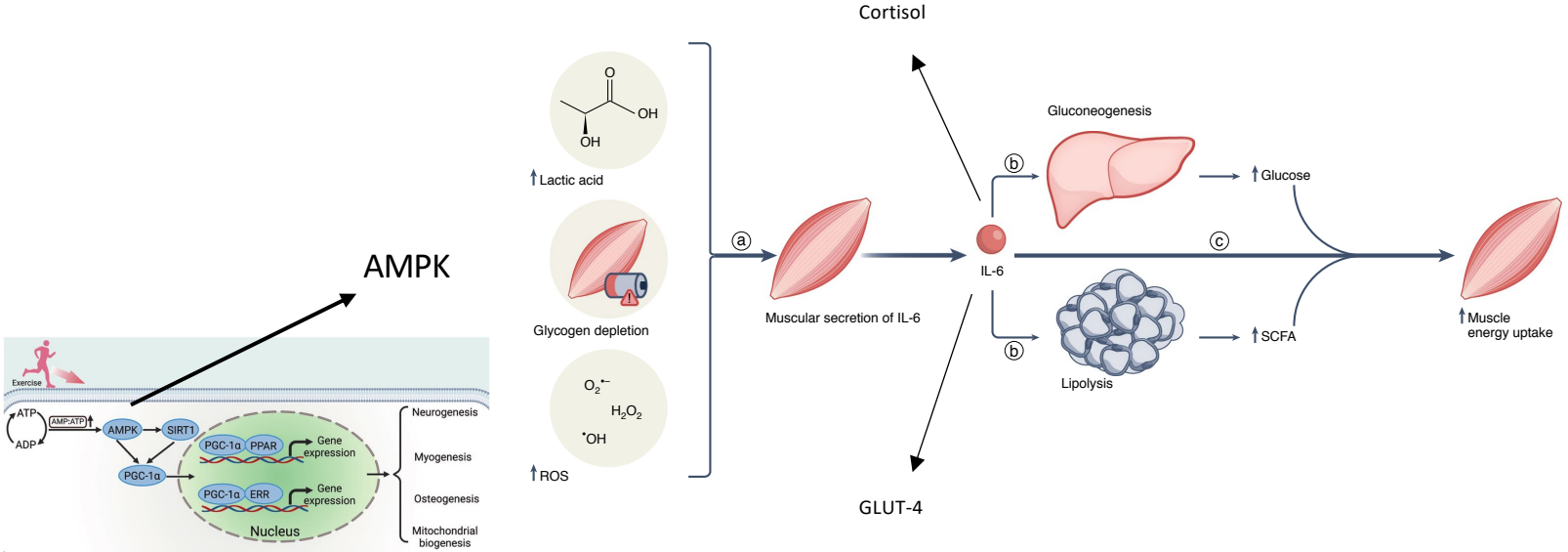


Adipocitos
Hepatocitos
Miocitos
Leucocitos

PERSPECTIVE
https://doi.org/10.1038/s42255-022-00538-4
nature metabolism
Check for updates

Interleukin 6 as an energy allocator in muscle tissue

Timothy M. Kistner[1], Bente K. Pedersen[2] and Daniel E. Lieberman[1]



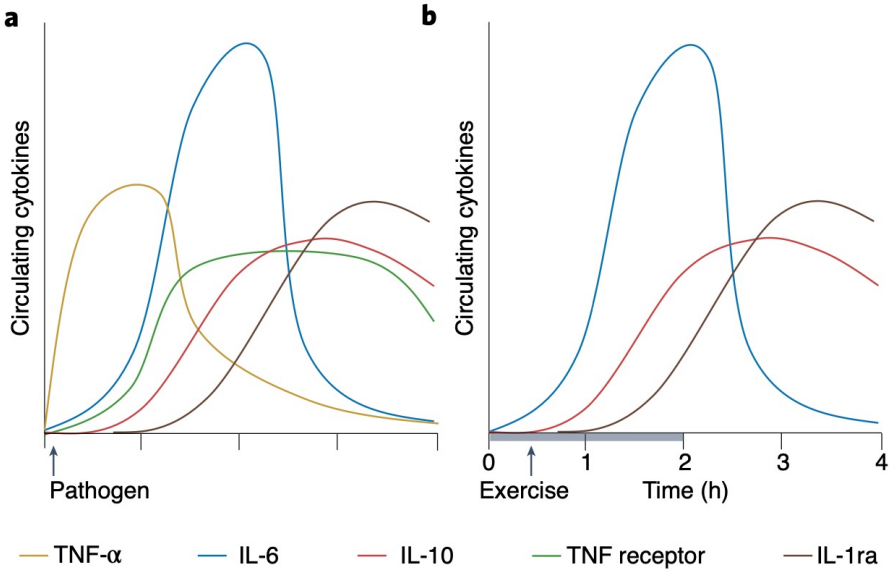
PERSPECTIVE
https://doi.org/10.1038/s42255-022-00538-4
nature metabolism
Check for updates

Interleukin 6 as an energy allocator in muscle tissue

Timothy M. Kistner[1]✉, Bente K. Pedersen[2]✉ and Daniel E. Lieberman[1]✉

Duración
Intensidad
Masa Muscular

Respuesta inmune
vs ejercicio



5000

Contents lists available at ScienceDirect

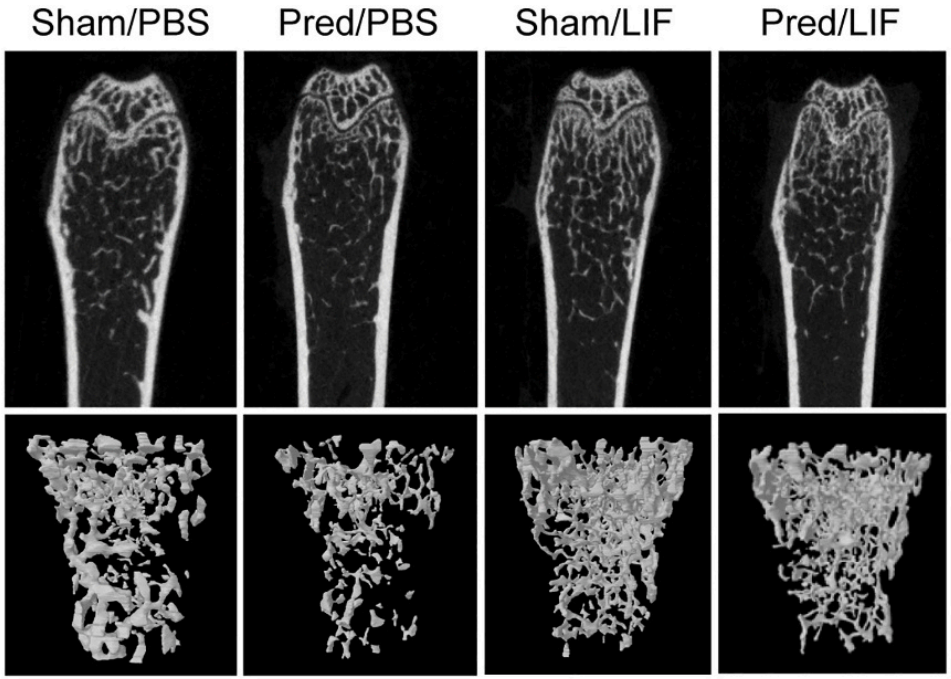
Bone

journal homepage: www.elsevier.com/locate/bone

Full Length Article

Leukemia inhibitory factor treatment attenuates the detrimental effects of glucocorticoids on bone in mice

LIF: Leukemoa Inhibitory Factor



Bone 145 (2021) 115843

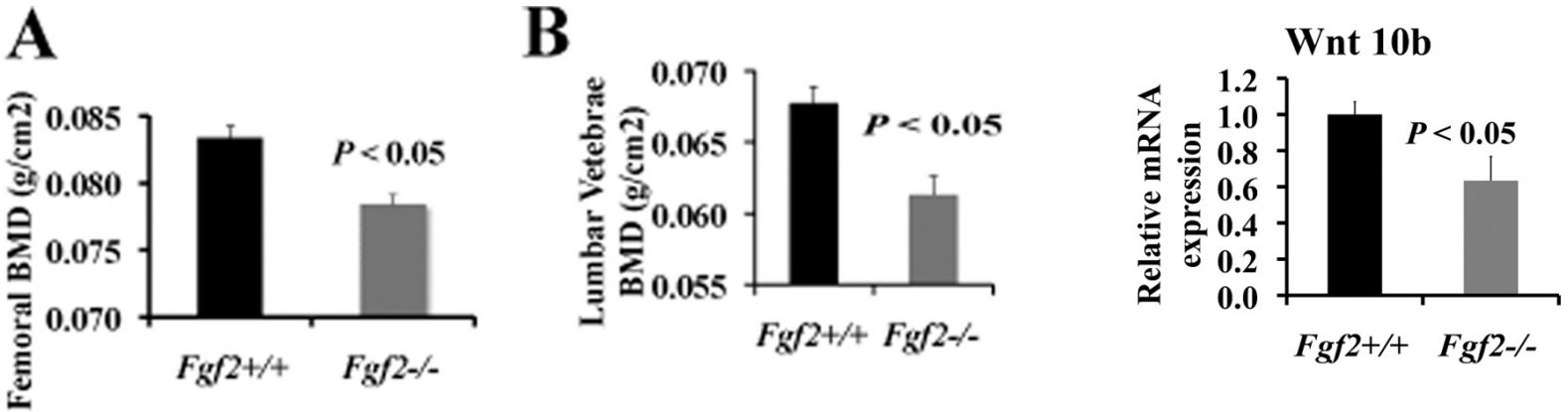
5001

Fibroblast Growth Factor 2 Stimulation of Osteoblast Differentiation and Bone Formation Is Mediated by Modulation of the Wnt Signaling Pathway*[S]

Received for publication, June 22, 2011, and in revised form, October 6, 2011 Published, JBC Papers in Press, October 10, 2011, DOI 10.1074/jbc.M111.274910

Yurong Fei[‡], **Liping Xiao**[‡], **Thomas Doetschman**[§], **Douglas J. Coffin**[¶], **and Marja M. Hurley**[‡1]

From the [‡]*University of Connecticut Health Center, Farmington, Connecticut 06030, the* [§]*University of Arizona, Tucson, Arizona 85724, and the* [¶]*University of Montana, Missoula, Montana 59812*



THE JOURNAL OF BIOLOGICAL CHEMISTRY VOL.286,NO.47,pp.40575–40583,November25,2011

5002

Review Article

Effect of myokines on bone tissue metabolism: a systematic review

Łukasz Jaśkiewicz [a,*], Anna Romaszko-Wojtowicz [b], Grzegorz Chmielewski [c], Jakub Kuna [c], Magdalena Krajewska-Włodarczyk [c]

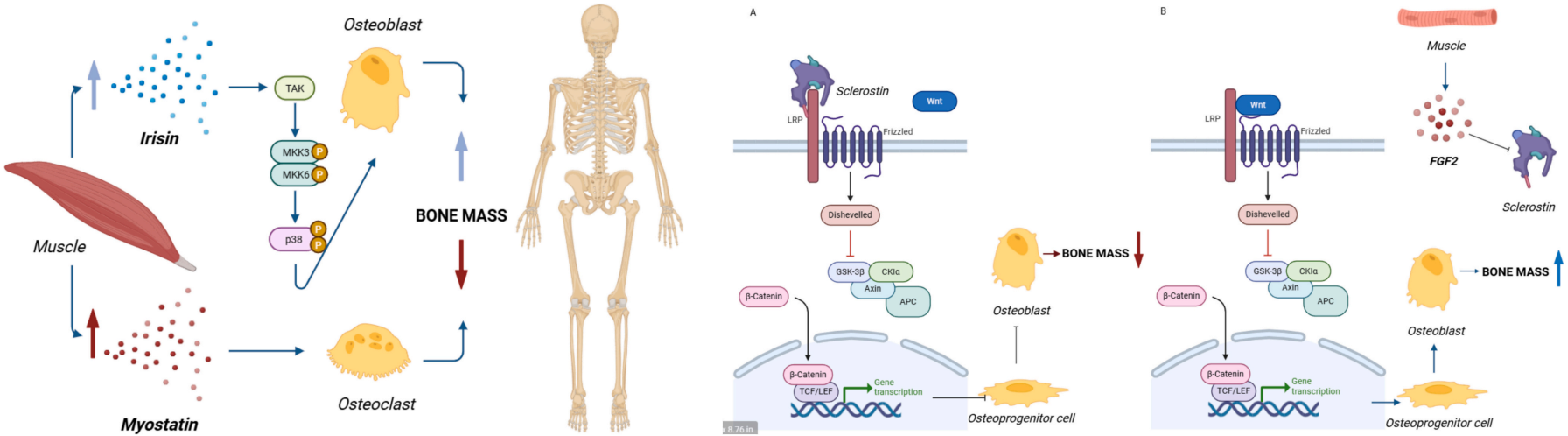
Actualmente **no existen ensayos clínicos que utilicen miocinas como intervención terapéutica directa** para mejorar el metabolismo óseo. La investigación se encuentra principalmente en **fase preclínica** (estudios in vitro y en modelos animales) y en **estudios observacionales en humanos** que evalúan asociaciones entre niveles circulantes de miocinas y salud ósea. Bone

Bone 201 (2025) 117654

Review Article

Effect of myokines on bone tissue metabolism: a systematic review

Łukasz Jaśkiewicz [a,*], Anna Romaszko-Wojtowicz [b], Grzegorz Chmielewski [c], Jakub Kuna [c], Magdalena Krajewska-Włodarczyk [c]



Bone 201 (2025) 117654

CONCLUSIONES : RESPUESTA DEL HUESO

Impacto

Tensión

Fuerza Muscular

CONCLUSIONES : RESPUESTA DEL HUESO MENOS APROPIADA

Ciclismo

Natación

Buenas para el perfil Metabólico

Gracias

@ eldoctorcastillo

www.eldoctorcastillo.com

jorgecastillomd@hotmail.com