17° Congresso Nazionale AME

Joint Meeting with AACE Italian Chapter

Andrea Palermo, MD PhD
Endocrinology and Diabetes
Campus Bio-Medico University
a.palermo@unicampus.it

AACE Italian Chapter
Course 2

Official language: English

Mineral metabolism disorders and osteoporosis: diagnosis and treatment

SESSION 1
Mineral metabolism disorders

1. Hypercalcemia of malignancy: pathogenesis and management
2. Disorders of phosphate homeostasis
3. Paget's disease of bone
4. Metabolism of kidney stone disease
5. The bone-muscle-fat cross-talk

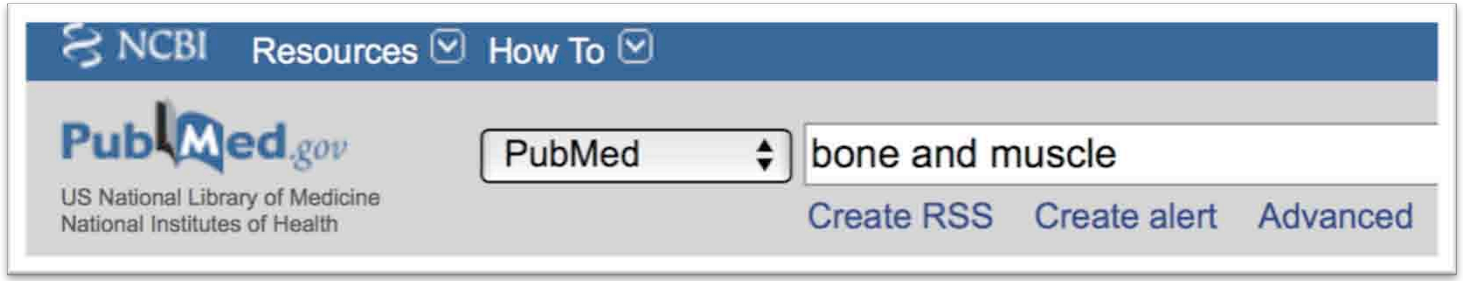
DISCLOSURE

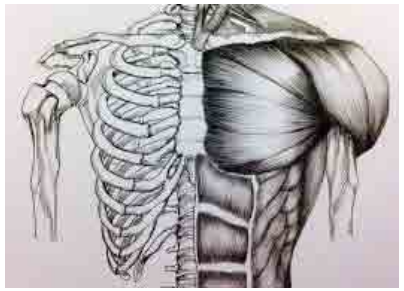
I have no actual or potential conflict of interest in relation to this presentation.

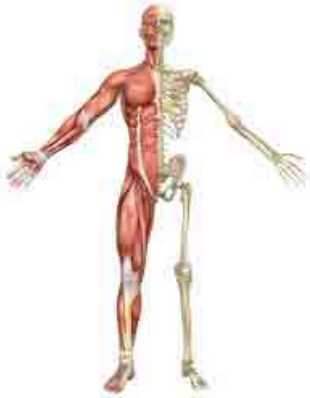
- ACKNOWLEDGEMENTS
- *FAT, BONE AND MUSCLE CORRELATION*: **EVIDENCE BASED OBSERVATIONS**
- *FAT, BONE AND MUSCLE CORRELATION*: **FROM BASIC OBSERVATIONS TO POTENTIAL MECHANISMS OF INTERACTION**
- TAKE HOME **MESSAGES**

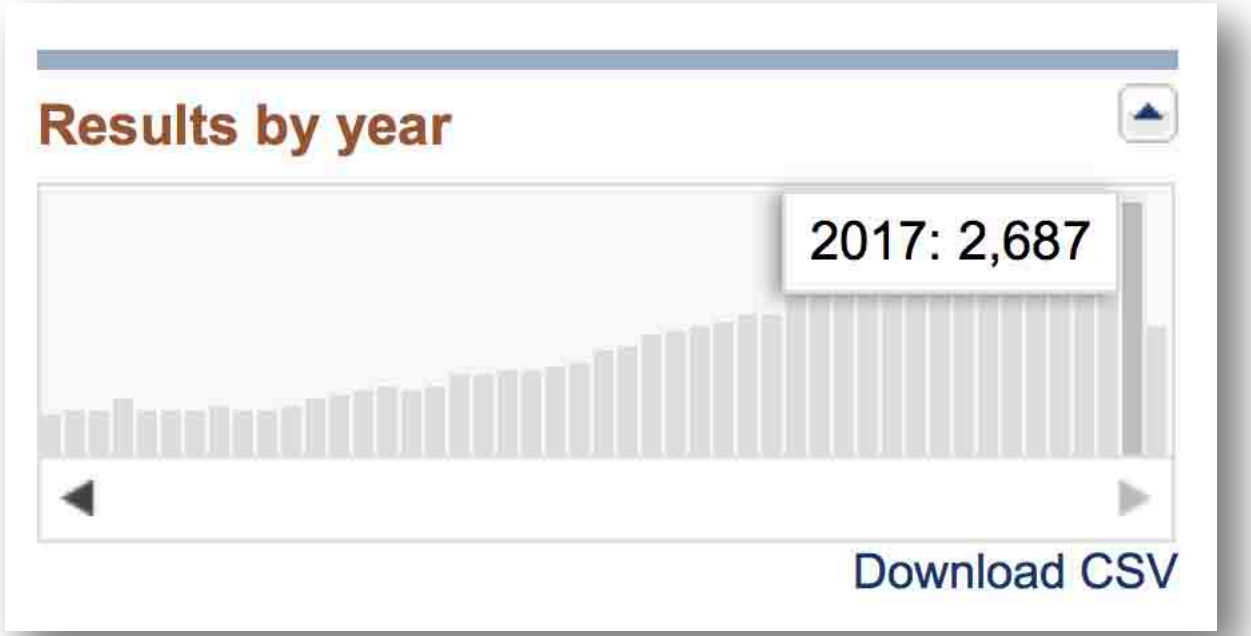
- ACKNOWLEDGEMENTS
- *FAT, BONE AND MUSCLE CORRELATION*: **EVIDENCE BASED OBSERVATIONS**
- *FAT, MUSCLE AND BONE CORRELATION*: **FROM BASIC OBSERVATIONS TO POTENTIAL MECHANISMS OF INTERACTION**
- TAKE HOME **MESSAGES**

THANKS









THANKS

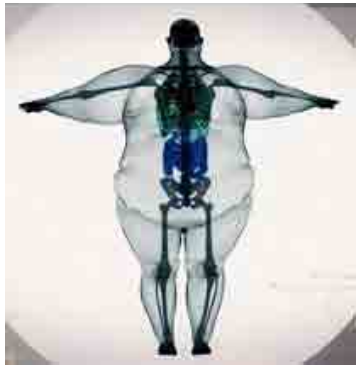
THANKS

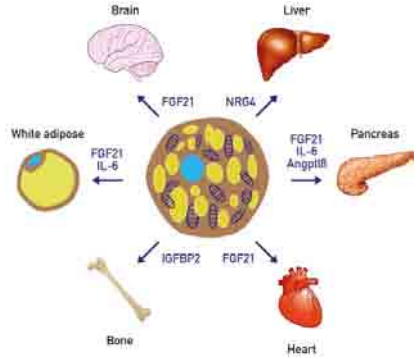
NCBI Resources How To

PubMed.gov
US National Library of Medicine
National Institutes of Health

PubMed | bone and fat

Create RSS Create alert Advanced





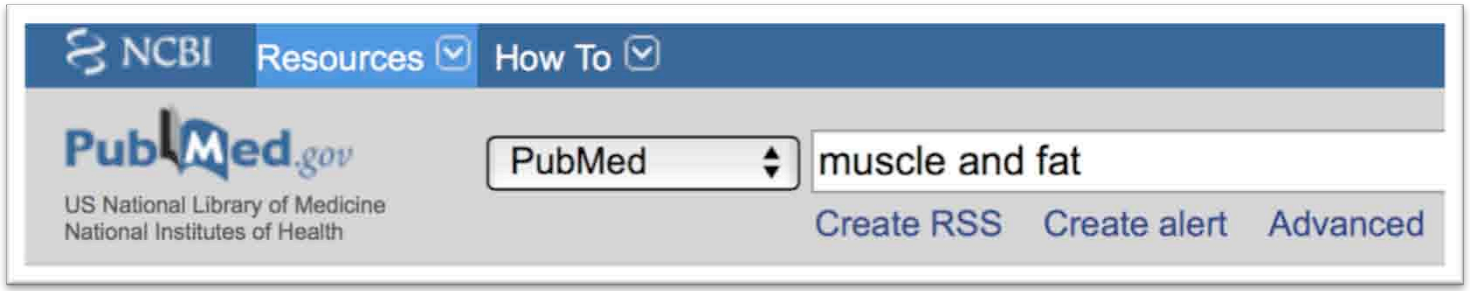
Results by year

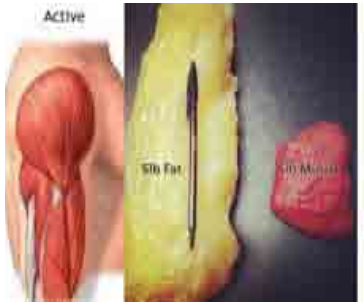
2017: 1,019

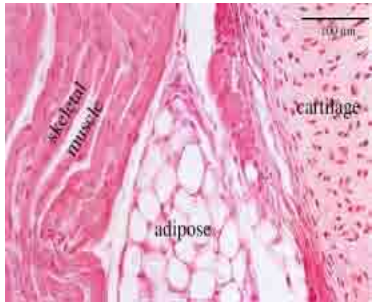
Download CSV

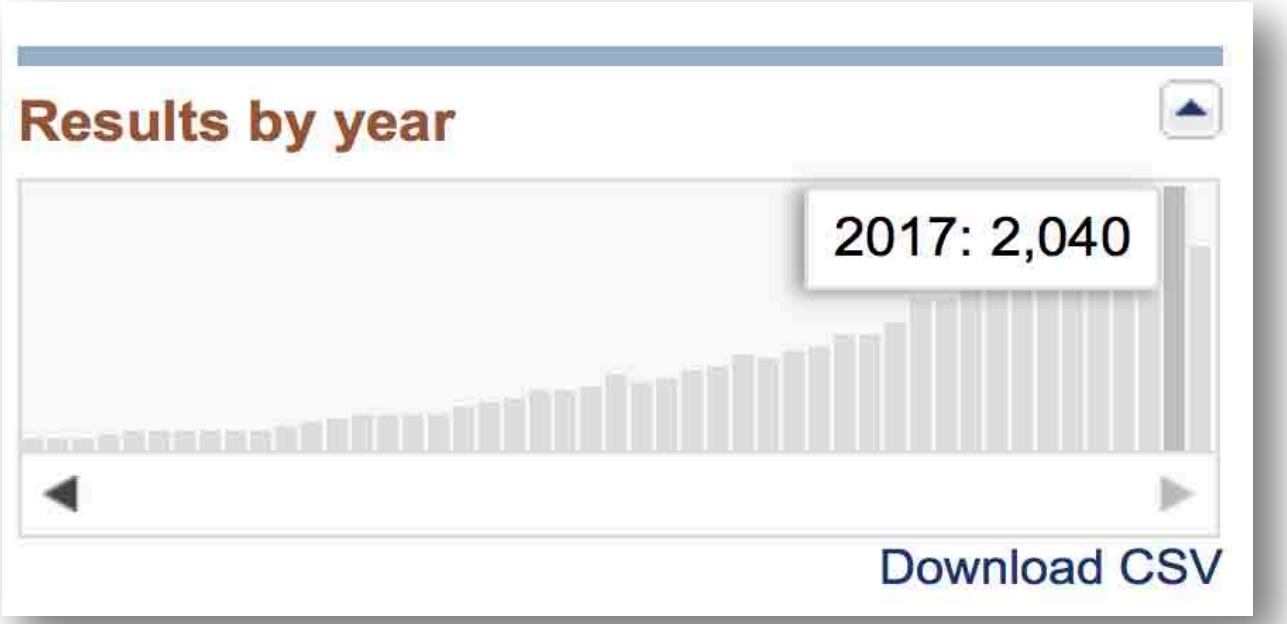
THANKS

THANKS





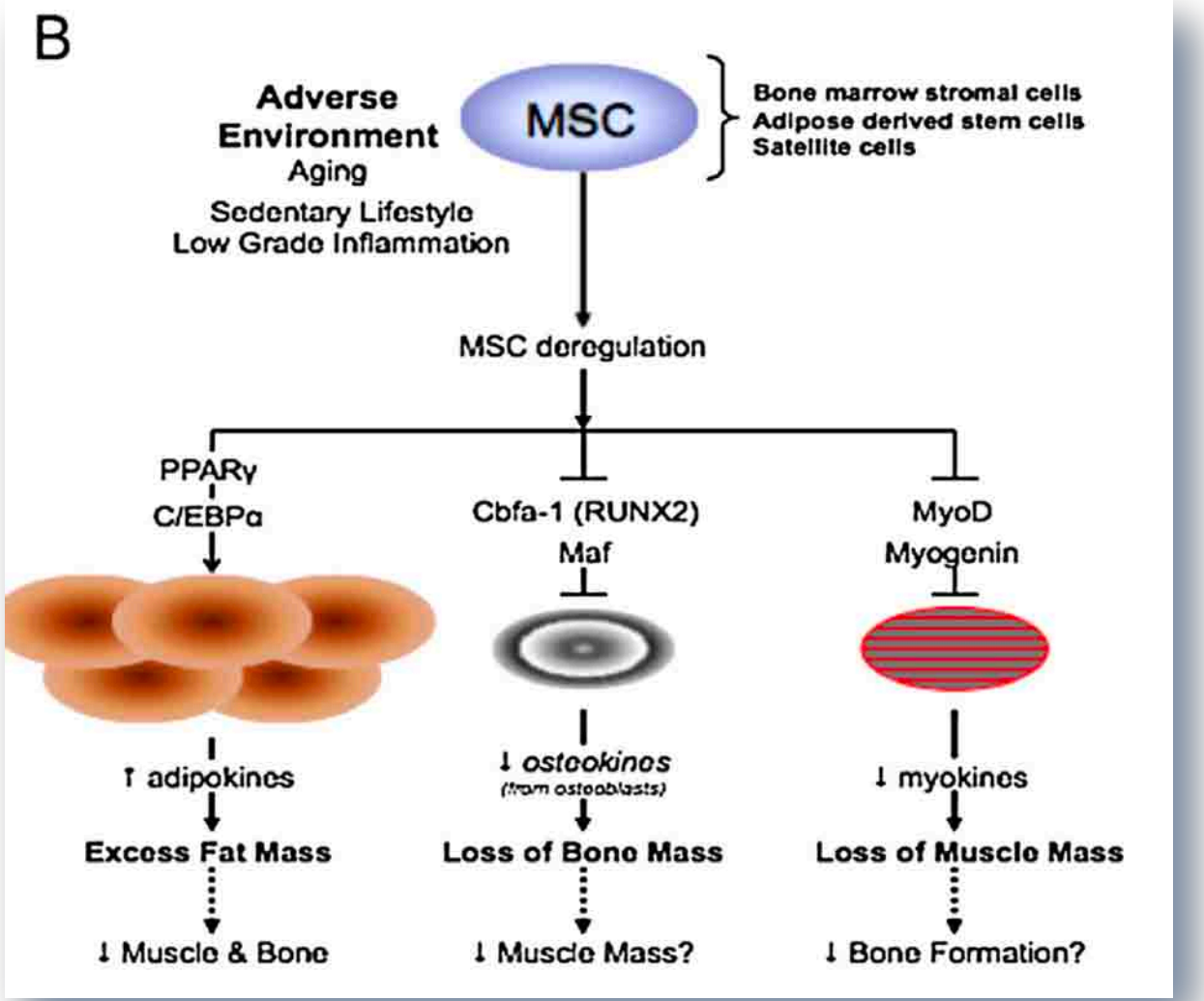




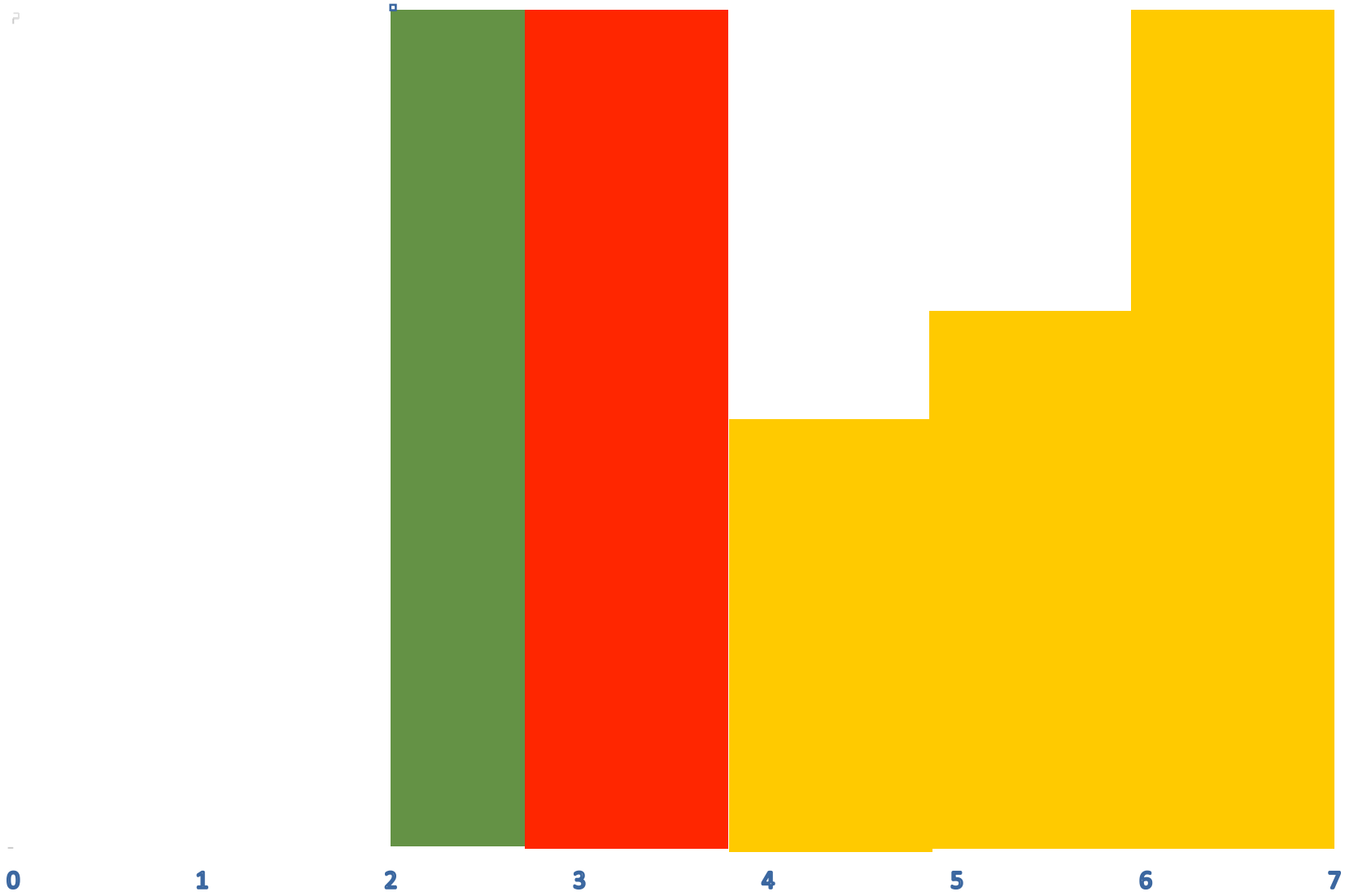
THANKS

- Is the **Bone – Muscle – Fat Cross-talk** real ?

TRANS-DIFFERENTIATION OF MSC TO DIFFERENT LINEAGES



GROWTH PEAKS OF DIFFERENT TISSUES



BONE: peaks by 30 yrs, plateaus through young adulthood, and declines slowly with age. After menopause, 1-2% loss of bone mass/year.

MUSCLE: peaks at 30-40 yrs and gradually declines with age. At 70-80 yrs, subjects lose up 40% of mass.

FAT: fat tissue accumulation increases with aging and then it might plateau or decline in very old

- ACKNOWLEDGEMENTS
- *FAT, BONE AND MUSCLE CORRELATION*: **EVIDENCE BASED OBSERVATIONS**
- *FAT, MUSCLE AND BONE CORRELATION*: **FROM BASIC OBSERVATIONS TO POTENTIAL MECHANISMS OF INTERACTION**
- TAKE HOME **MESSAGES**

BONE AND MUSCLE

SHORT REPORT

JBMR®

NIH Public Access

Author Manuscript

Ann. N.Y. Acad. Sci. ISSN 0077-8923

European Journal of Clinical Nutrition (2012) 66, 69–74

Contents lists available at ScienceDirect

Bone

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

Reduction in proximal femoral strength due to long-duration spaceflight

I.H. Keyak [a,b,c,*], A.K. Koyama [d], A. LeBlanc [e,f], Y. Lu [d], T.F. Lang [d]

Table 3. Prevalenc

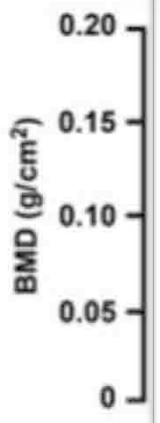
Model 1

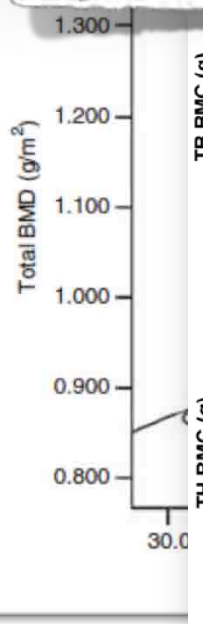
and alco

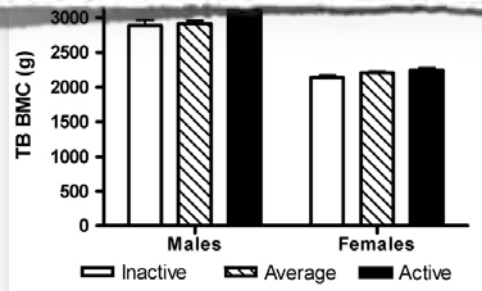
*P for tre

β-crosslaps (ng

Total protein (







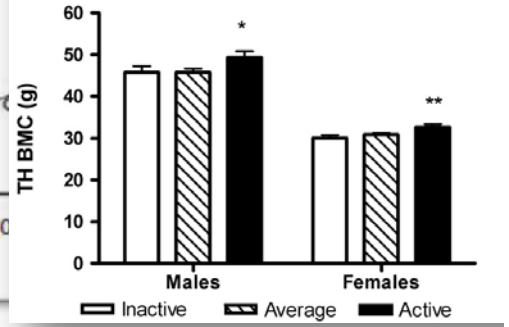
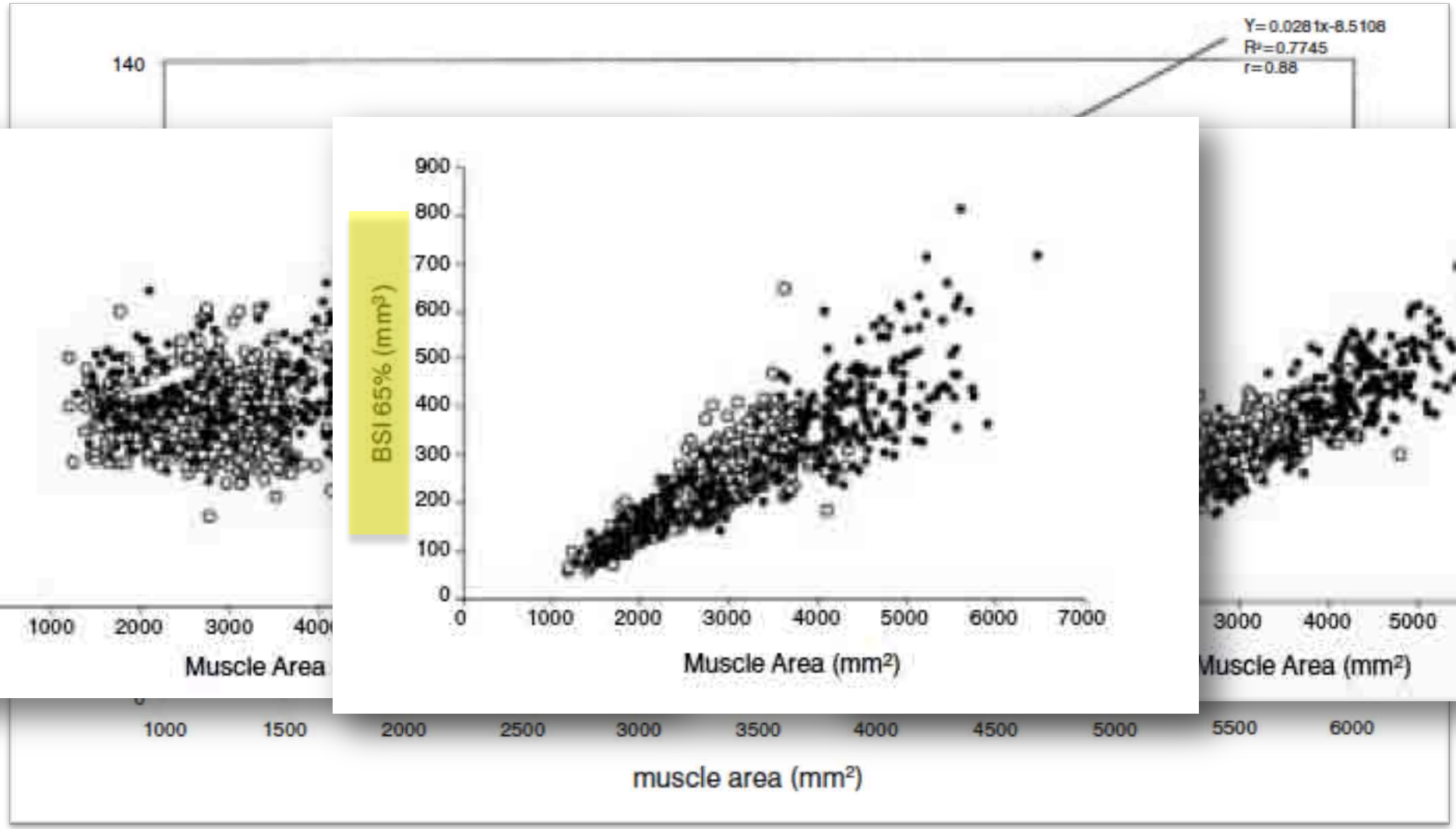


Table 2
Rate of change in proximal femoral strength and DXA aBMD

Subject number	Change in F_{FE} per month, stance loading	Change in F_{FE} per month, fall loading	Change in DXA total femur aBMD per month [2]
1	−0.6%	0.6%	−0.7%
2	−2.1%	−3.3%	−0.9%
3	−1.4%	−2.7%	−1.0%
4	−5.0%	−0.7%	−1.6%
5	−2.2%	−2.3%	−1.1%
6	−4.0%	−1.8%	−1.0%
7	−1.4%	0.2%	−1.0%
8	−1.4%	−2.6%	−0.4%
9	−3.1%	−3.9%	−1.7%
10	−4.6%	−3.1%	−1.8%
11	−2.4%	−1.8%	−1.2%
12	−1.4%	−2.1%	−1.8%
13	−3.6%	−2.4%	−0.8%
Mean	−2.6%	−2.0%	−1.2%
Standard deviation	1.4%	1.3%	0.5%

MUSCLE SIZE/FORCE AND BMC/BONE STRENGTH



Bone. 2000;27(2):319-26. J Musculoskelet Neuronal Interct 2005;5(3):232-8.

DECLINE OF MUSCULAR STRENGTH AND BONE (1)

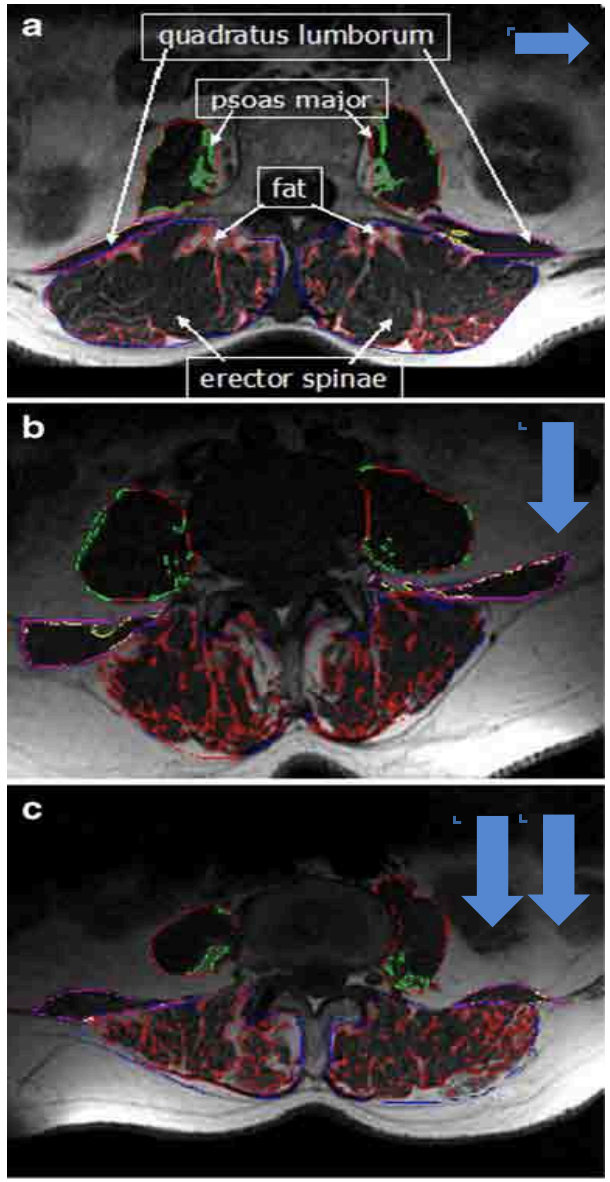


Table 2 Correlation between lean muscle mass of paravertebral muscles, BMC, and age

Pearson correlation coefficient

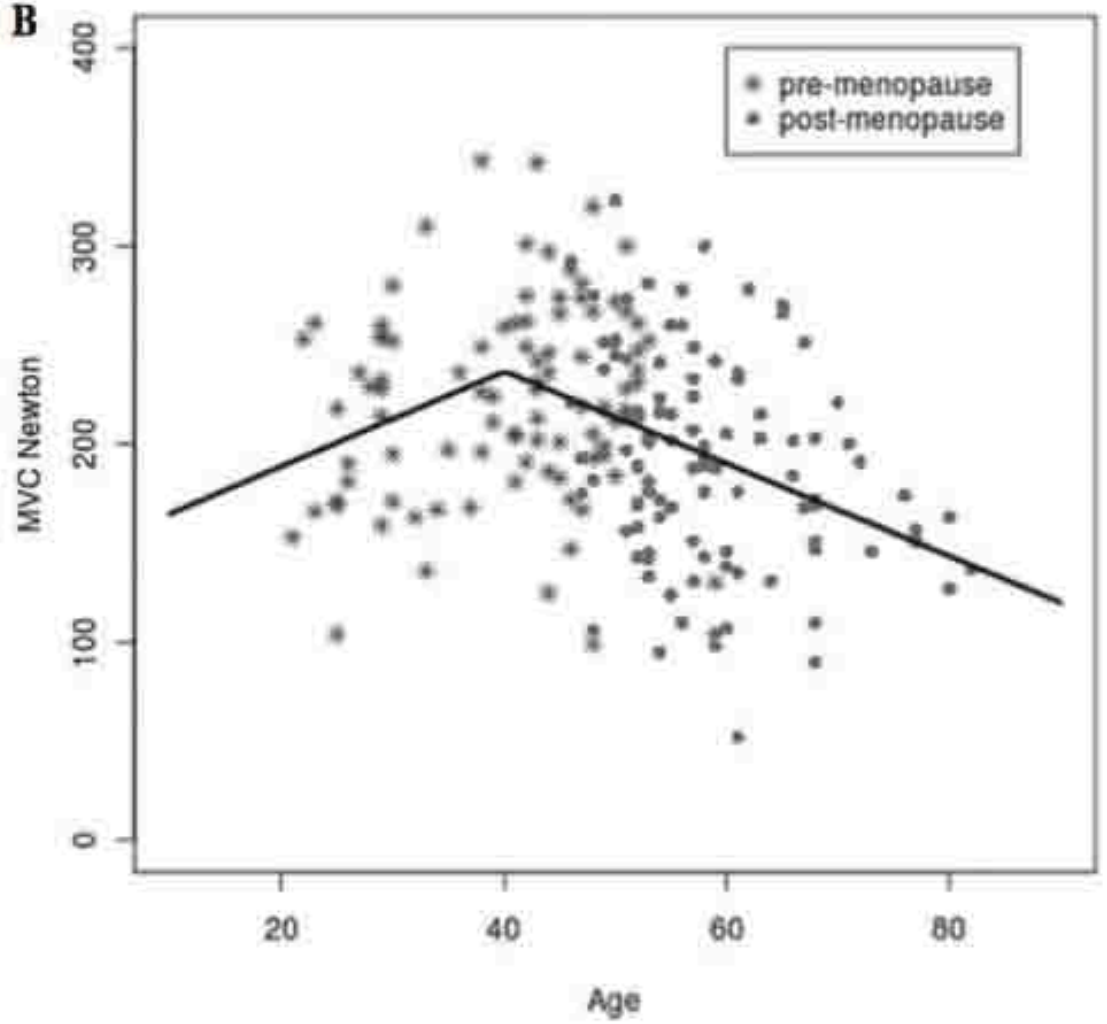
	Erector spinae	Psoas major	Qd. lumborum	Summated	Spine BMC
Spine BMC	0.28*	0.41*	0.36*	0.38*	1**
Age	−0.19*	−0.41**	−0.46**	−0.32**	−0.48**

As spine BMC decreases, muscle mass cross-sectional area decreases. As age increases, muscle mass decreases particularly in the psoas major and quadratus lumborum muscles

Qd. lumborum quadratus lumborum

* $p<0.01$, ** $p<0.001$

DECLINE OF MUSCULAR STRENGTH AND BONE (2)



MVC: Maximal Voluntary Contraction (Newton, N) by Hand Grip Dynamometer,

Table 2. Correlation matrix between MVC, densitometric and ultrasonometric parameters in the whole sample and in the sample subdivided according to gonadal status

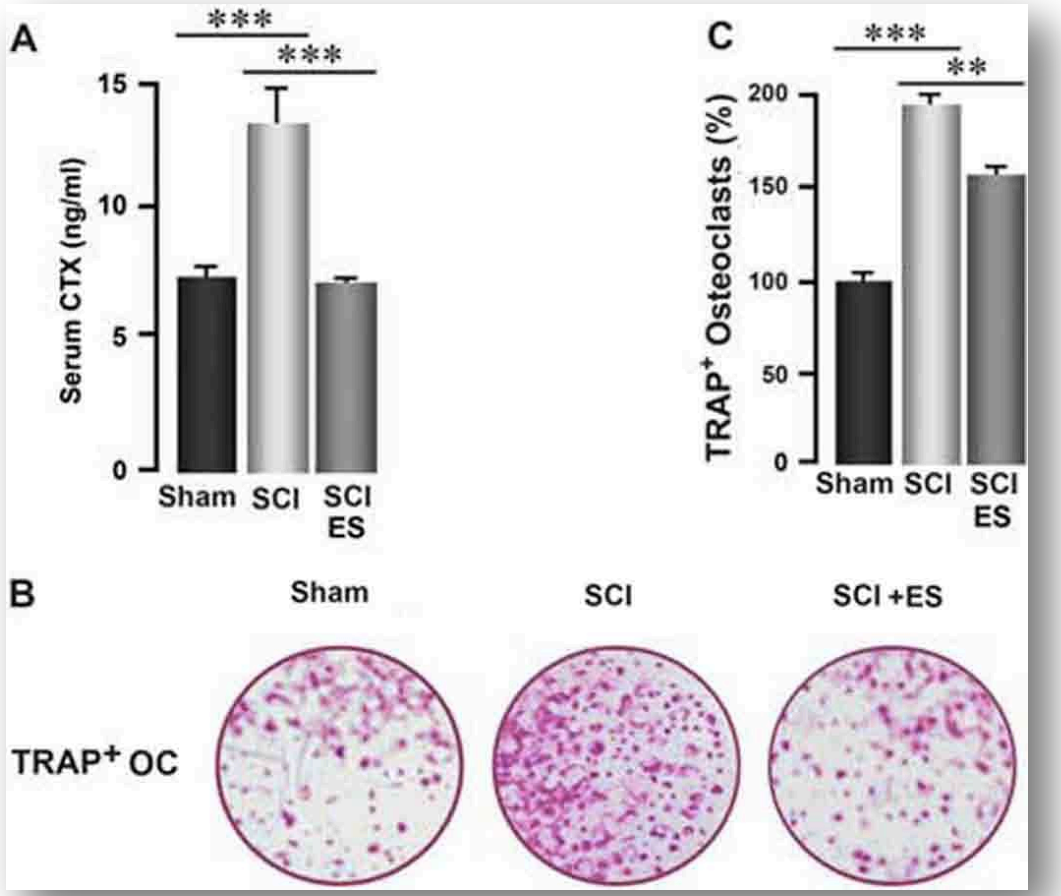
		Whole sample (n=194)	Premenopausal (n=92)	Postmenopausal (n=102)
Parameters		MVC[a] (N)	MVC (N)	MVC (N)
R-BMD[b] (g/cm²)	r	0.354	0.111	0.354
	p[c]	0.0001	0.290	0.0001
ADSoS[d] (m/s)	r	0.294	-0.187	0.307
	p	0.0001	0.07	0.01
UBPI[e]	r	0.311	-0.033	0.319
	p	0.0001	0.753	0.01

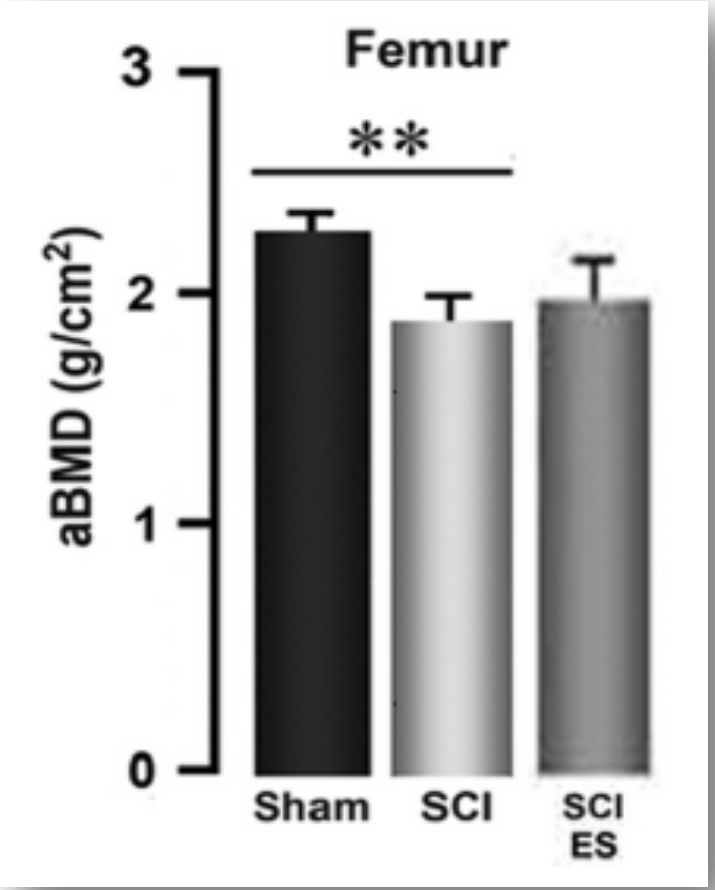
[a]Maximal voluntary contraction, [b]Bone mineral density at one third of the radius, [c]Spearman correlation coefficient, [d]Amplitude-dependent speed of sound, [e]Ultrasound bone profile index.

The *decline of muscular strength* is significantly correlated with *quantitative* and *qualitative* bone features

Hormones (Athens). 2012;11:325-32.

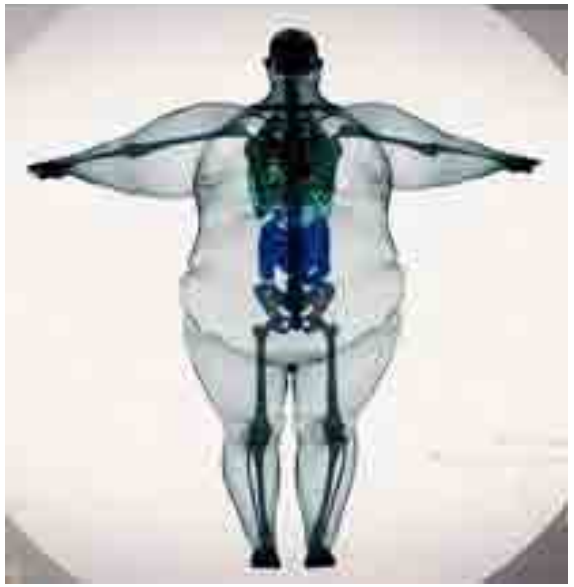
ANTI-BONE-RESORPTIVE ACTIVITY OF MUSCLE CONTRACTION



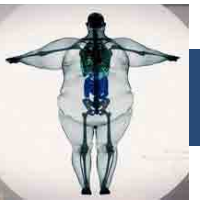


SCI: spinal corde injury; **ES**: electrical stimulation

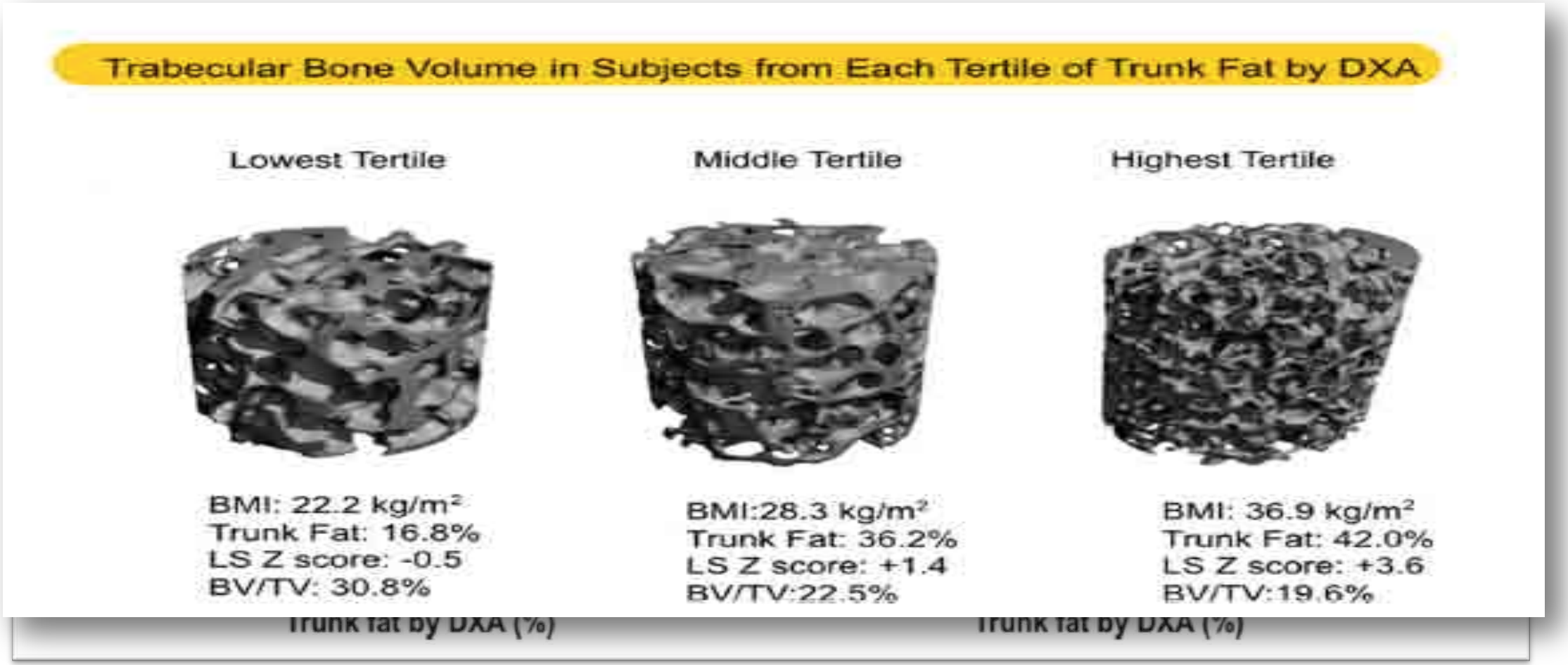
J Biol Chem. 2013;288(19):13511-21



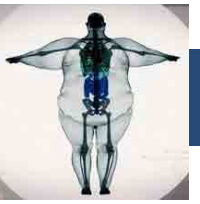
BONE AND FAT



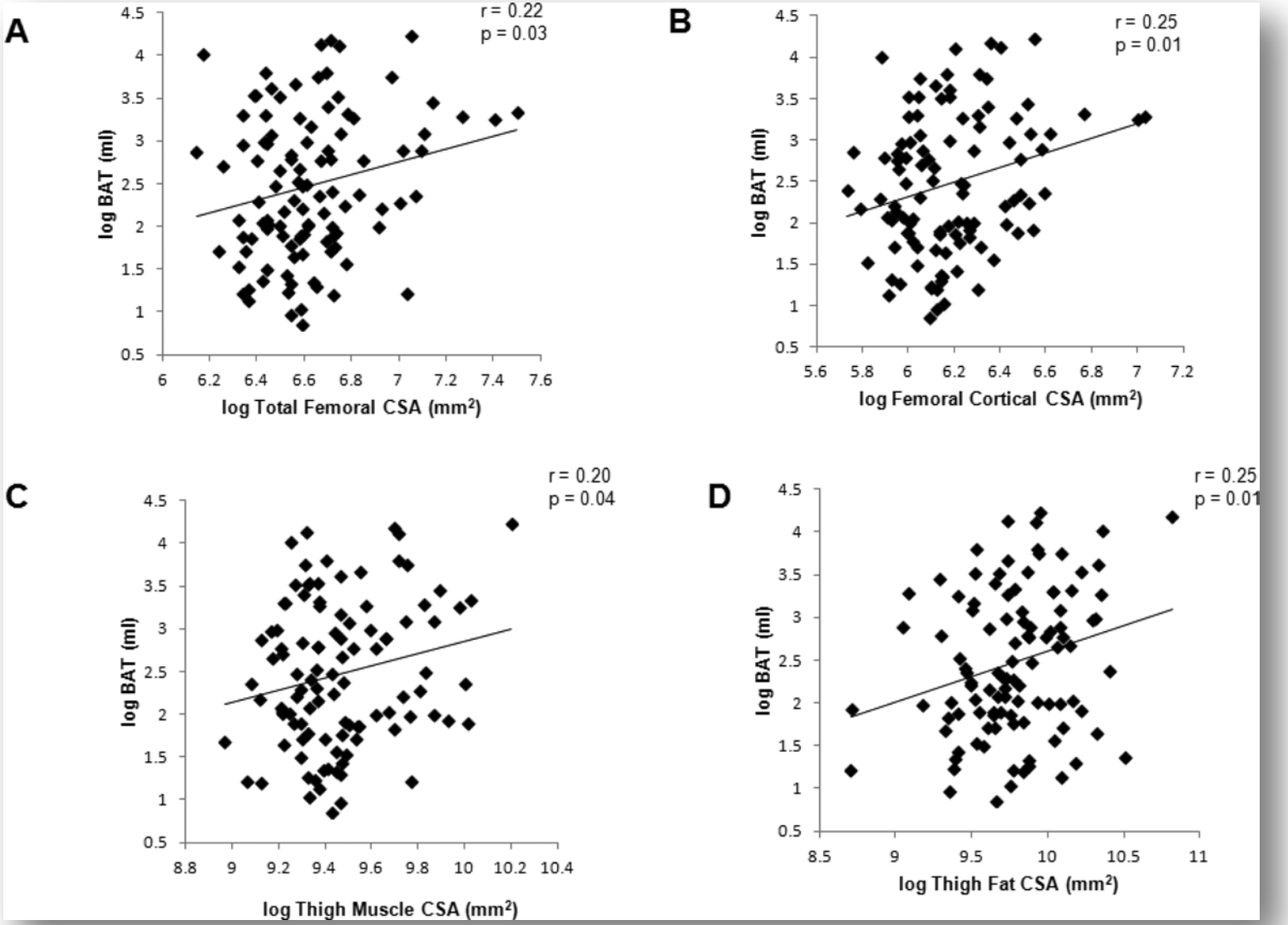
TRUNK/VISCERAL FAT AND BONE QUALITY

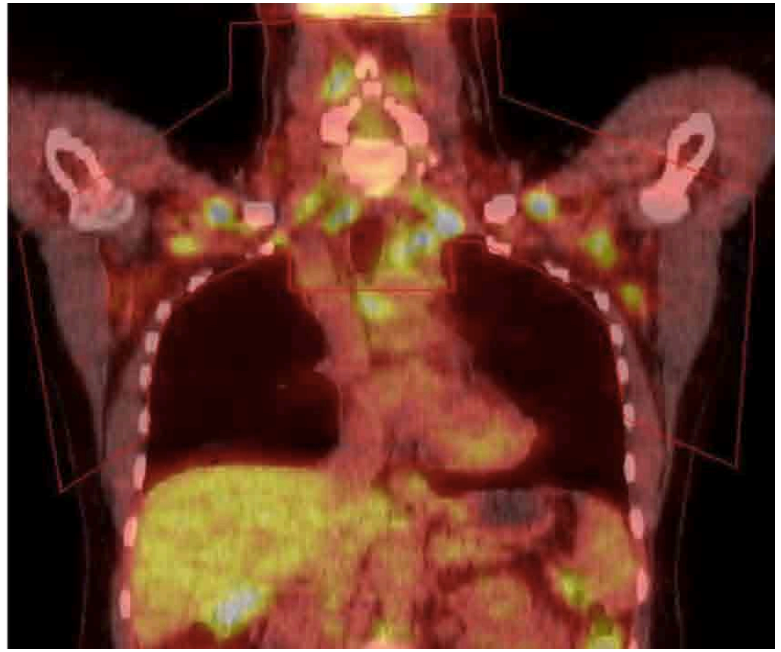


Trabecular bone structure assessed by CT of transiliac crest bone biopsy samples obtained from representative subjects within each DXA trunk fat tertile. Subjects are chosen to represent the mean BV/TV seen in each tertile



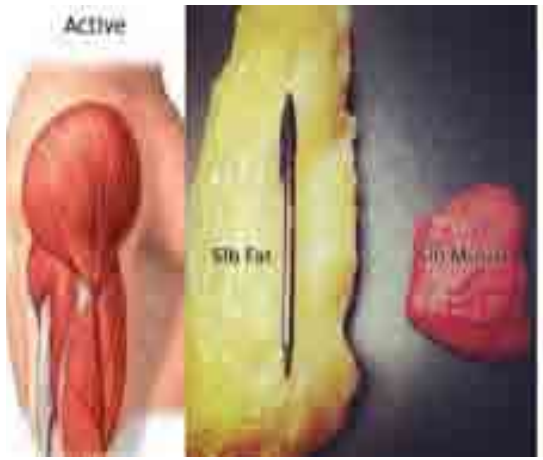
BROWN ADIPOSE TISSUE and FEMORAL BONE STRUCTURE



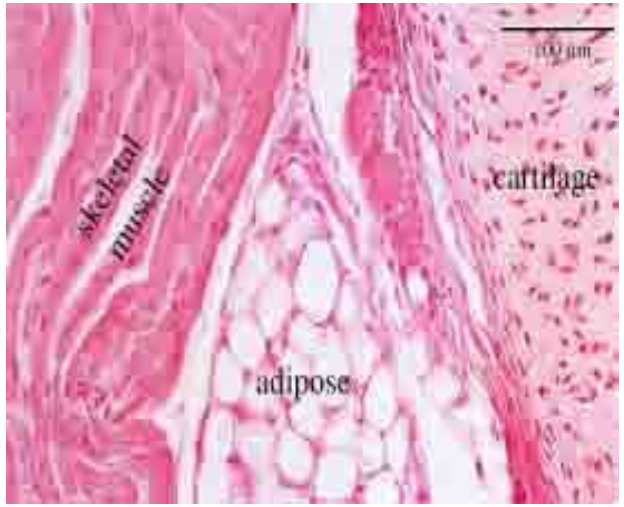


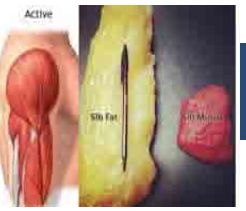
105 patients (19 m, 86 f. mean age 45 ±16 years) who underwent 18-FDG PET/CT for benign etiologies (*n=20*) or follow-up of successfully treated malignancies (*n=85*);

J Clin Endocrinol Metab 2013;98(6):2562–2572

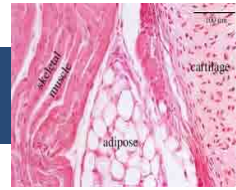


MUSCLE AND FAT





PHYSICAL ACTIVITY ON MUSCLE STRENGTH AND FAT INFILTRATION



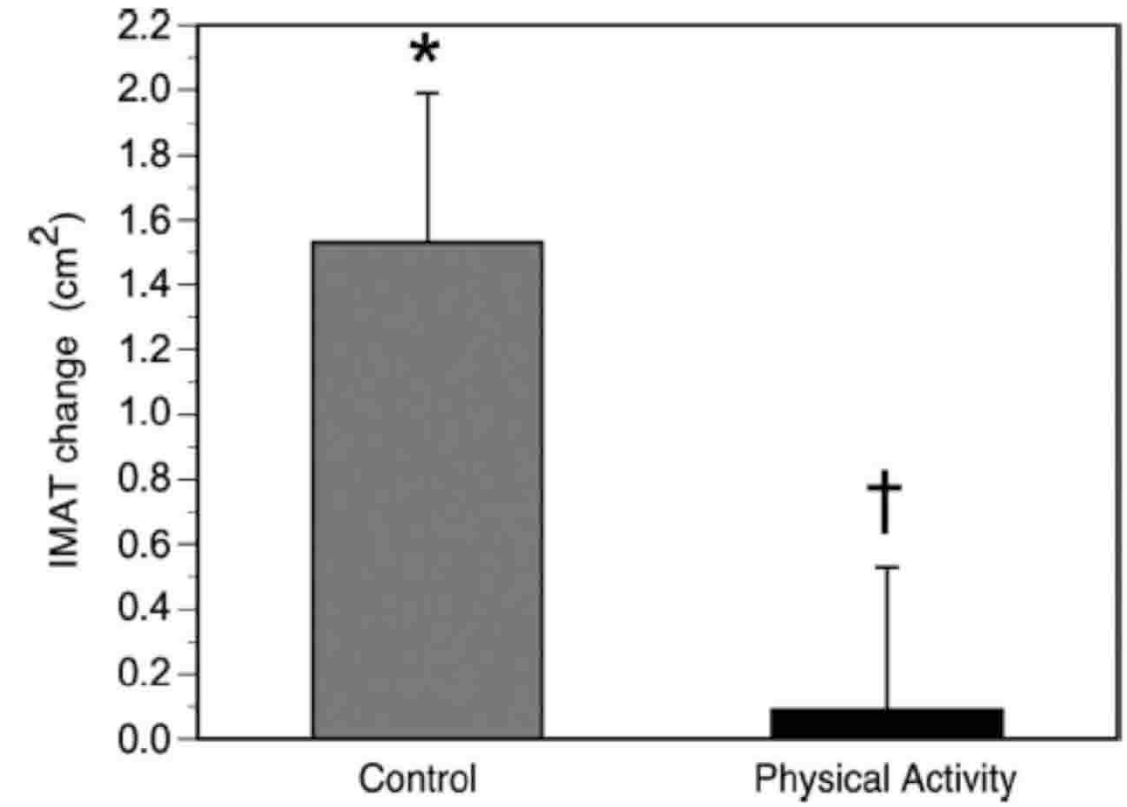
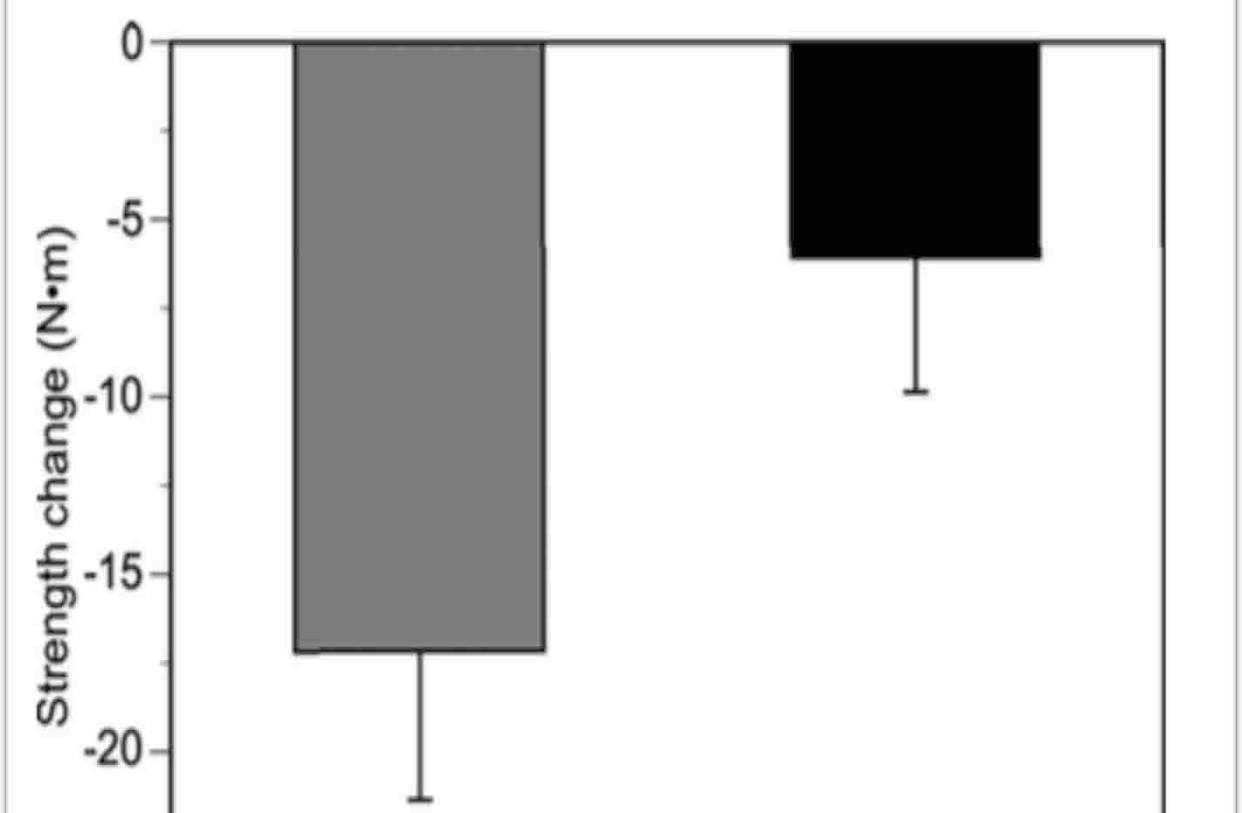


Fig. 2. Changes in midthigh intermuscular adipose tissue (IMAT) in the physical activity and control groups. IMAT increased in the control group (within-group change: $*P < 0.05$, adjusting for multiple comparisons) but not in the physical activity group ($\dagger P < 0.05$ for between-group change).



J Appl Physiol 2008; 105: 1498–1503

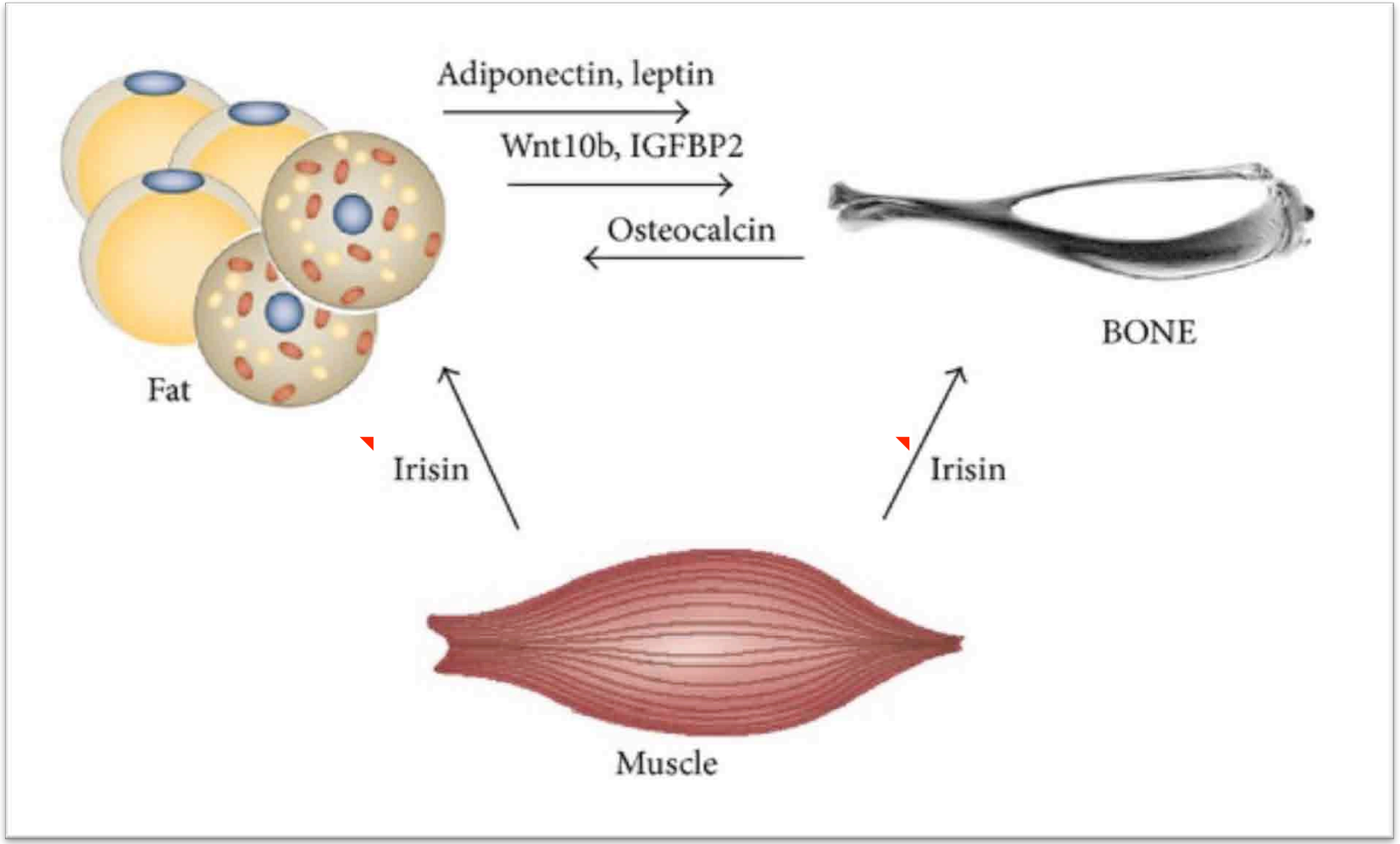
- ACKNOWLEDGEMENTS
- *FAT, BONE AND MUSCLE CORRELATION*: **EVIDENCE BASED OBSERVATIONS**
- *FAT, MUSCLE AND BONE CORRELATION*: **FROM BASIC OBSERVATIONS TO POTENTIAL MECHANISMS OF INTERACTION**
- TAKE HOME **MESSAGES**

MUSCLE – FAT – BONE AXIS

Factor	Brief description and effects on growth factors	Effect on muscle	Effect on fat	Effect on bone	Reference
PPARγ	Required for adipogenesis, adipocyte maturation and metabolism, lipid accumulation, may cause trans-differentiation of pre-myocytes into adipocytes, retinoid X receptor (RXR) binding ↓ IGF-1, ↓ Runx2 (PPARγ ‡ Runx2), ↓ MyoD, ↓ myogenin	↓ myogenesis	↑↑ adipogenesis	↓ osteoblasto-genesis	Ackert-Bicknell and Rosen, 2006; Aleshin et al., 2009; Hu et al., 1995; Lecka-Czernik and Suva, 2006; Metzger et al., 2005; Singh et al., 2007; Takazawa et al., 2009; Yu and Reddy, 2007
TNFα	Regulator of cell metabolism, high levels produced by adipocytes (visceral), considered proinflammatory Increases osteoclastogenesis (bone resorption) ↓ Runx2, ↓ osteocalcin, ↓↓ MyoD, ↑↑ myogenin, ↑ MAFbx, ↑ Murf-1	↓ myogenesis	↑↑ adipogenesis	↓ osteoblasto-genesis	Cawthorn and Sethi, 2008; Chen et al., 2007; Hikiji et al., 2008; Langen et al., 2004; Mukai et al., 2007; Robinson et al., 2007; Zahorska-Markiewicz et al., 2000
Cbfa-1 (RUNX2)	Required for osteoblastogenesis, osteoblast maturation and differentiation, and genomic stability, enhanced by estrogen, regulated by PGE_2 ↑↑ OC, ALP; ↑ aromatase, PPARγ; ‡ Runx2	↓ myogenesis	↓ adipogenesis	↑↑ osteoblasto-genesis	Ismmann et al., 2007; Jeong et al., 2010; McCarthy et al., 2003; Yu and Reddy, 2007; Zaidi et al., 2007
TGFβ	Master cell regulatory factor, maintains MSC population, bone remodeling, elevated in obesity (visceral fat), regulated by PGE_2 ↑ Wnt pathway, ↓ PPARγ	↑ myogenesis	↓↓ adipogenesis	↑↑ osteoblasto genesis	Araujo-Jorge et al., 2012; Cao, 2007; Clarke and List, 2008; Fain, 2006; Ng et al., 2008; Zhao et al., 2008
IGF-1	Anabolic agent Reduced in obesity and osteoporosis ↑↑ Myogenin, ↑↑ MyoD	↑↑ myogenesis	↓ adipogenesis	↑↑ osteoblasto-genesis	Chen et al., 2007; Kaaks, 2004; Landin-Wilhelmsen et al., 1999; Sandhu et al., 2004
Maf	Osteoblast lineage commitment Aging and oxidative stress ↓↓ Maf	↓ myogenesis	↓↓ adipogenesis	↑↑ osteoblasto-genesis	Nishikawa et al., 2010
MyoD	Required for myogenesis, differentiation of MSC/satellite cell to myocyte ↓↓ TNFα	↑↑ myogenesis	↓↓ adipogenesis	↓↓ osteoblasto-genesis	Chen et al., 2007; Langen et al., 2004; Scheele et al., 2012
Myogenin	Required for myogenesis, differentiation of MSC/satellite cell to myocyte	↑↑ myogenesis	↓↓ adipogenesis	↓↓ osteoblasto-genesis	Chen et al., 2007; Langen et al., 2004

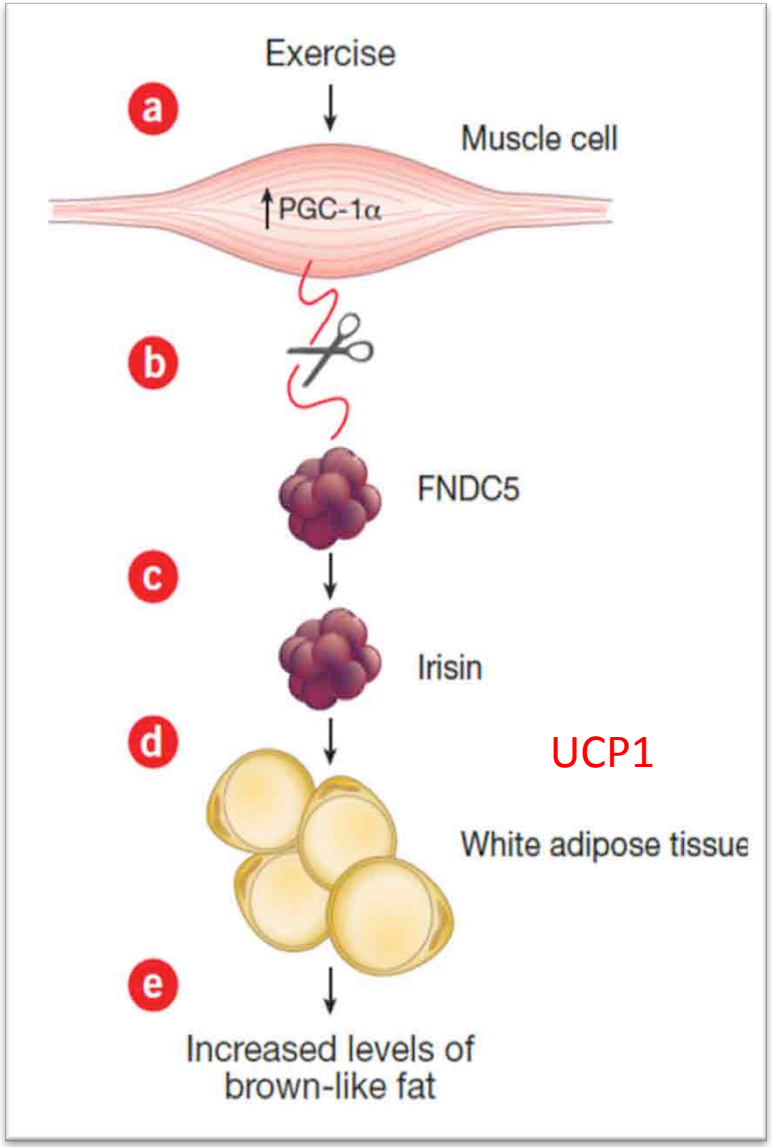
↑↑: strong inducer, ↓↓: strong inhibitor, ↑: inducer, ↓: inhibitor, ↔: interdependent, ‡: inversely proportional.

MYOKINE: IRISIN



Int J Endocrinol. 2014;2014:984-86

MYOKINE: IRISIN



researchers have identified a new hormone, irisin, which mediates some of the benefits exercise has on metabolism.

Exercise induces increased expression of peroxisome proliferation–activated receptor-γ coactivator 1α (PPARGC1A; PGC-1α) [**a**], which boosts expression of the membrane protein fibronectin type III domain containing 5 (FNDC5) [**b**]. FNDC5 is proteolytically cleaved, resulting in the release of irisin [**c**], which is carried in the blood to white adipose tissue [**d**], where it stimulates the browning of white fat [**e**].

In mice fed a high-fat diet, greater expression of irisin decreased weight gain and increased glucose tolerance compared with normal irisin expression.

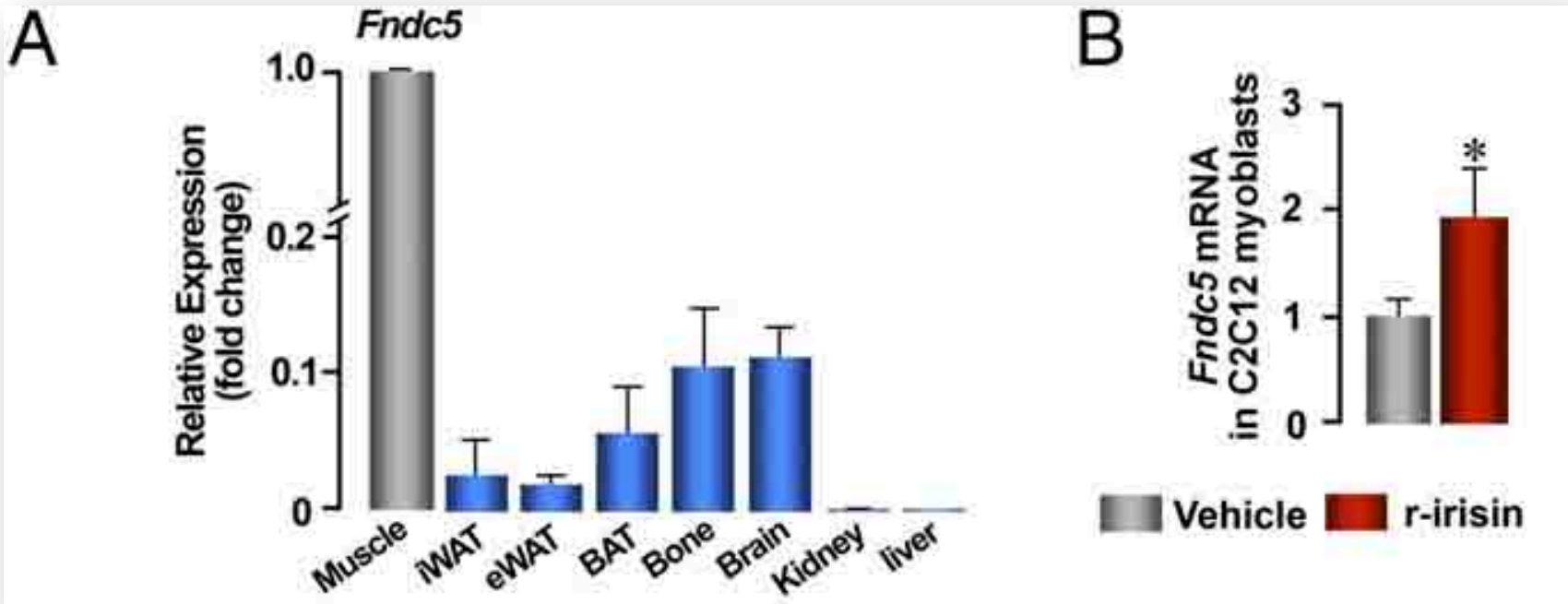
Kotz et al. SciBX 2012. Browning fat

The myokine irisin increases cortical bone mass

Graziana Colaianni[a,1], Concetta Cuscito[a,1], Teresa Mongelli[a], Paolo Pignataro[a], Cinzia Buccoliero[a], Peng Liu[b], Ping Lu[b], Loris Sartini[c], Mariasevera Di Comite[a], Giorgio Mori[d], Adriana Di Benedetto[d], Giacomina Brunetti[a], Tony Yuen[b], Li Sun[b], Janne E. Reseland[e], Silvia Colucci[a], Maria I. New[b,2], Mone Zaidi[b,2], Saverio Cinti[c], and Maria Grano[a,2]

[a]Department of Basic Medical Science, Neuroscience and Sense Organs, University of Bari, 70124 Bari, Italy; [b]The Mount Sinai Bone Program, Departments of Medicine and Pediatrics, Mount Sinai School of Medicine, New York, NY 10029; [c]Department of Experimental and Clinical Medicine, Center of Obesity, United Hospitals, University of Ancona, 60020 Ancona, Italy; [d]Department of Clinical and Experimental Medicine, University of Foggia, 71100 Foggia, Italy; and [e]Department of Biomaterials, Institute for Clinical Dentistry, University of Oslo, Blindern, N-0317 Oslo, Norway

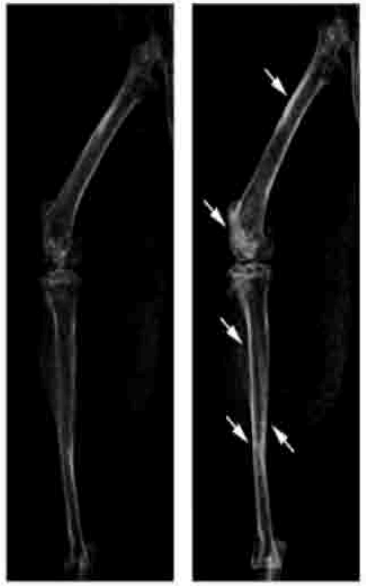
Contributed by Maria I. New, August 21, 2015 (sent for review May 21, 2015; reviewed by Christopher Huang and Carlos M. Isales)



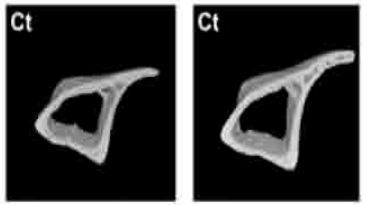
IRISIN AS A REGULATOR OF BONE AND GLUCOSE METABOLISM

Tibia

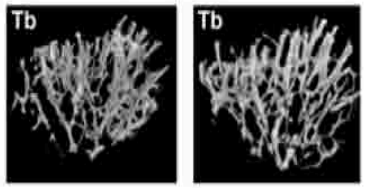
A



B



C

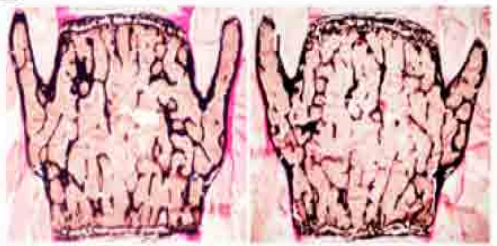


D

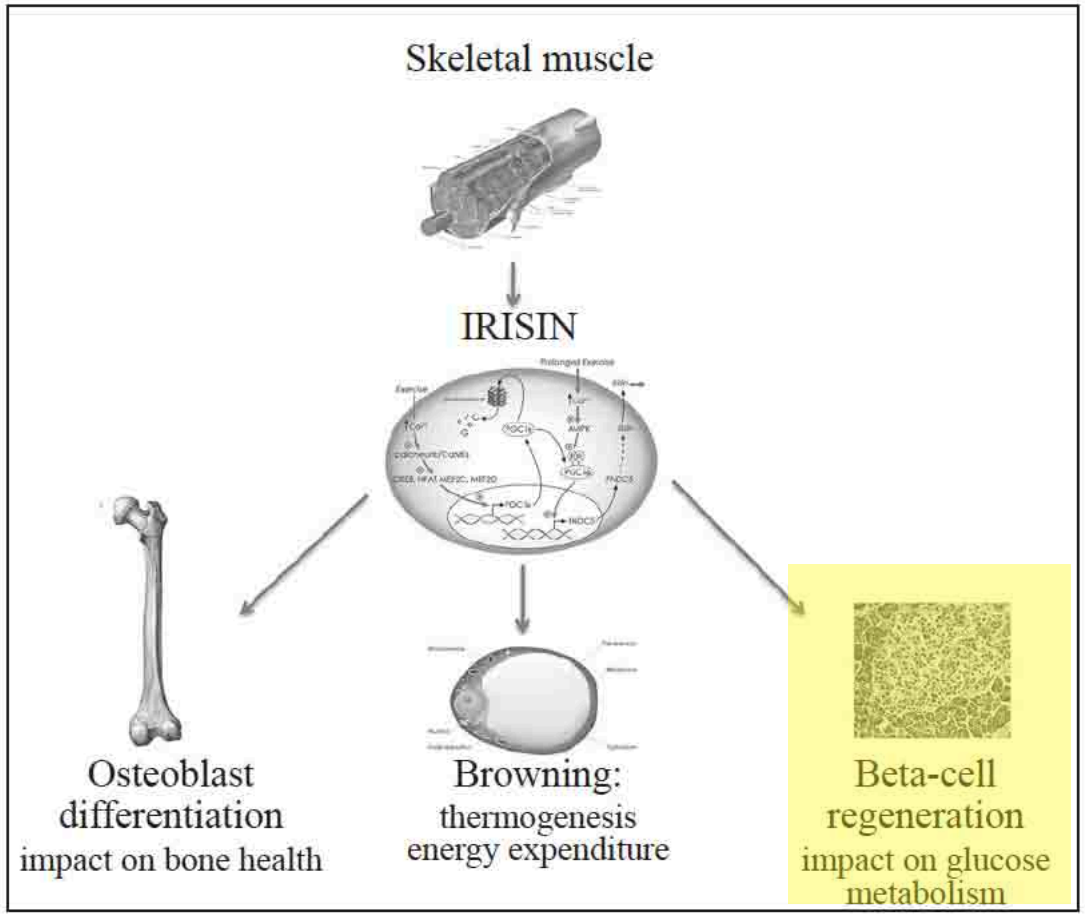
Injection	Vehicle	r-irisin	*P value*
TMD Cortical (gHA/cm³)	1.01 ±0.02	1.08 ±0.01	*0.01*
pMOI (mm⁴)	0.42 ±0.02	0.50 ±0.01	*0.01*
Ct.BS (mm²)	14.13 ±0.26	15.20 ±0.27	*0.02*
Ct.Pm (mm)	12.01 ±0.23	12.89 ±0.26	*0.03*
Tt.Area (mm²)	1.71 ±0.02	1.80 ±0.03	*0.04*
Marrow Area (mm²)	0.96 ±0.02	1.05 ±0.03	*0.03*
Ct.Th (mm)	0.13 ±0.004	0.12 ±0.01	*0.62*
BMD (gHA/cm³)	0.13 ±0.01	0.14 ±0.01	*0.37*
BV/TV (%)	51.13 ±2.26	44.32 ±2.60	*0.07*
Tb.Th (µm)	31.71 ±0.80	32.21 ±1.60	*0.78*
Tb.N (1/µm)	0.002 ±0.0001	0.001 ±0.0001	*0.09*
Tb.Sp (µm)	218.97 ±7.11	235.55 ±11.47	*0.23*

Vertebrae

E



	Vehicle	r-irisin
BV/TV (%)	18.2 ± 1.15	17.6 ± 0.2
Tb.N (1/mm)	25.3 ± 0.7	26.1 ± 0.3
Tb.Th (mm)	0.7 ± 0.1	0.7 ± 0.0
Tb.Sp (mm)	3.3 ± 0.1	3.2 ± 0.0



Minerva End. 2017 doi: 10.23736/S0391

Research Article

Irisin Enhances Osteoblast Differentiation *In Vitro*

Graziana Colaianni,[1] Concetta Cuscito,[1] Teresa Mongelli,[1] Angela Oranger,[1]
Giorgio Mori,[2] Giacomina Brunetti,[1] Silvia Colucci,[1] Saverio Cinti,[3] and Maria Grano[1]

Osteoporos Int
DOI 10.1007/s00198-014-2673-x

ORIGINAL ARTICLE

Circulating irisin is associated with osteoporotic fractures in postmenopausal women with low bone mass but is not affected by either teriparatide or denosumab treatment for 3 months

A. D. Anastasilakis · S. A. Polyzos · P. Makras · A. Gkiomisi · I. Bisbinas · A. Katsarou · A. Filippaios · C. S. Mantzoros

Irisin is associated with osteoporotic fractures independently of bone mineral density, body composition or daily physical activity

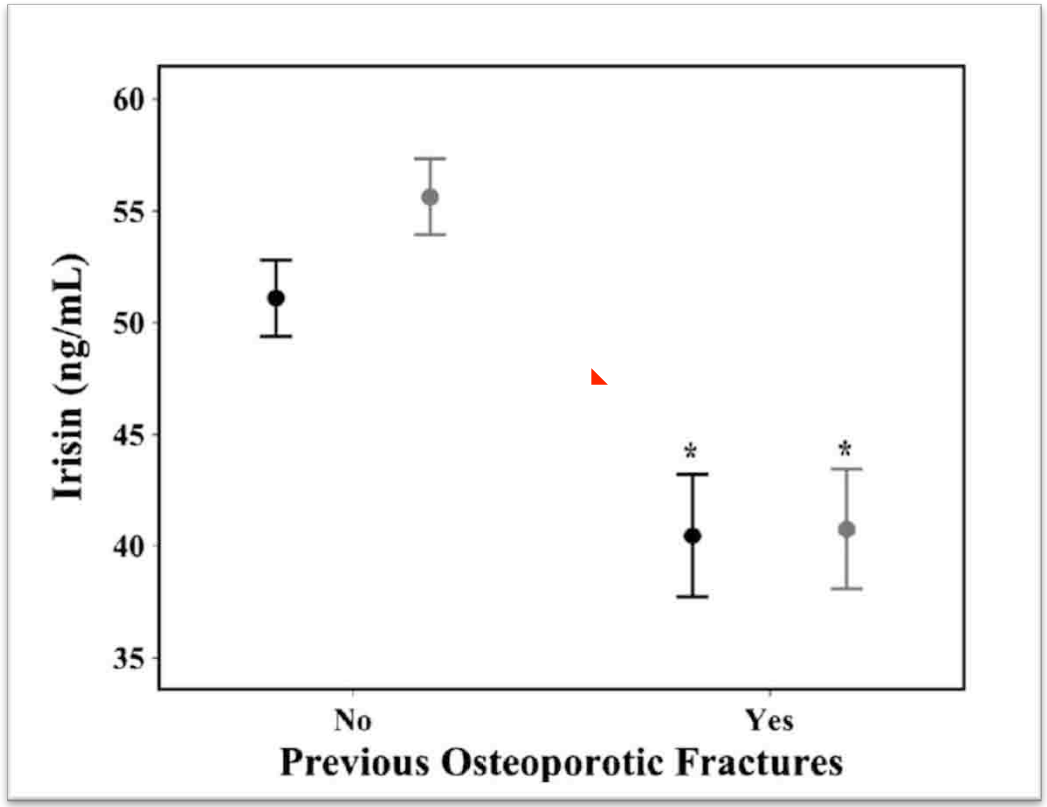
Andrea Palermo*, Rocky Strollo*, Ernesto Maddaloni*, Dario Tuccinardi*, Luca D'Onofrio*, Silvia Irina Briganti*, Giuseppe Defeudis*, Mariangela De Pascalis*, Maria Concetta Lazzaro*, Georgia Colleluori*, Silvia Manfrini*, Paolo Pozzilli*†‡ and Nicola Napoli Clinical Endocrinology (2015) **82**, 615–619

Osteoporos Int
DOI 10.1007/s00198-014-2673-x

ORIGINAL ARTICLE

Circulating irisin is associated with osteoporotic fractures in postmenopausal women with low bone mass but is not affected by either teriparatide or denosumab treatment for 3 months

A. D. Anastasilakis · S. A. Polyzos · P. Makras · A. Gkiomisi · I. Bisbinas · A. Katsarou · A. Filippaios · C. S. Mantzoros



PNAS

The myokine irisin increases cortical bone mass

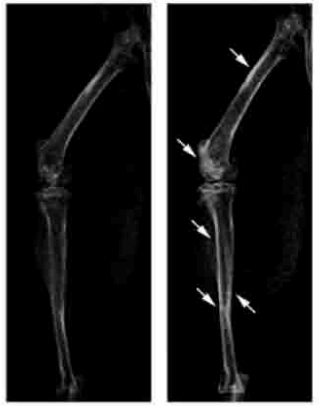
Graziana Colaianni[a,1], Concetta Cuscito[a,1], Teresa Mongelli[a], Paolo Pignataro[a], Cinzia Buccoliero[a], Peng Liu[b], Ping Lu[b], Loris Sartini[c], Mariasevera Di Comite[a], Giorgio Mori[d], Adriana Di Benedetto[d], Giacomina Brunetti[a], Tony Yuen[b], Li Sun[b], Janne E. Reseland[e], Silvia Colucci[a], Maria I. New[b,2], Mone Zaidi[b,2], Saverio Cinti[c], and Maria Grano[a,2]

[a]Department of Basic Medical Science, Neuroscience and Sense Organs, University of Bari, 70124 Bari, Italy; [b]The Mount Sinai Bone Program, Departments of Medicine and Pediatrics, Mount Sinai School of Medicine, New York, NY 10029; [c]Department of Experimental and Clinical Medicine, Center of Obesity, United Hospitals, University of Ancona, 60020 Ancona, Italy; [d]Department of Clinical and Experimental Medicine, University of Foggia, 71100 Foggia, Italy; and [e]Department of Biomaterials, Institute for Clinical Dentistry, University of Oslo, Blindern, N-0317 Oslo, Norway

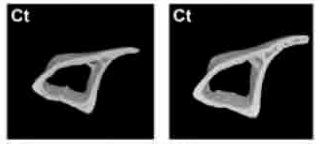
Contributed by Maria I. New, August 21, 2015 (sent for review May 21, 2015; reviewed by Christopher Huang and Carlos M. Isales)

Tibia

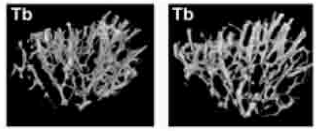
A



B



C



D

Injection	Vehicle	r-irisin	*P value*
TMD Cortical (gHA/cm³)	1.01 ±0.02	1.08 ±0.01	*0.01*
pMOI (mm⁴)	0.42 ±0.02	0.50 ±0.01	*0.01*
Ct.BS (mm²)	14.13 ±0.26	15.20 ±0.27	*0.02*
Ct.Pm (mm)	12.01 ±0.23	12.89 ±0.26	*0.03*
Tt.Area (mm²)	1.71 ±0.02	1.80 ±0.03	*0.04*
Marrow Area (mm²)	0.96 ±0.02	1.05 ±0.03	*0.03*
Ct.Th (mm)	0.13 ±0.004	0.12 ±0.01	*0.62*
BMD (gHA/cm³)	0.13 ±0.01	0.14 ±0.01	*0.37*
BV/TV (%)	51.13 ±2.26	44.32 ±2.60	*0.07*
Tb.Th (μm)	31.71 ±0.80	32.21 ±1.60	*0.78*
Tb.N (1/μm)	0.002 ±0.0001	0.001 ±0.0001	*0.09*
Tb.Sp (μm)	218.97 ±7.11	235.55 ±11.47	*0.23*

Vertebrae

E

	Vehicle	r-irisin
BV/TV (%)	18.2 ± 1.15	17.6 ± 0.2
Tb.N (1/mm)	25.3 ± 0.7	26.1 ± 0.3
Tb.Th (mm)	0.7 ± 0.1	0.7 ± 0.0
Tb.Sp (mm)	3.3 ± 0.1	3.2 ± 0.0

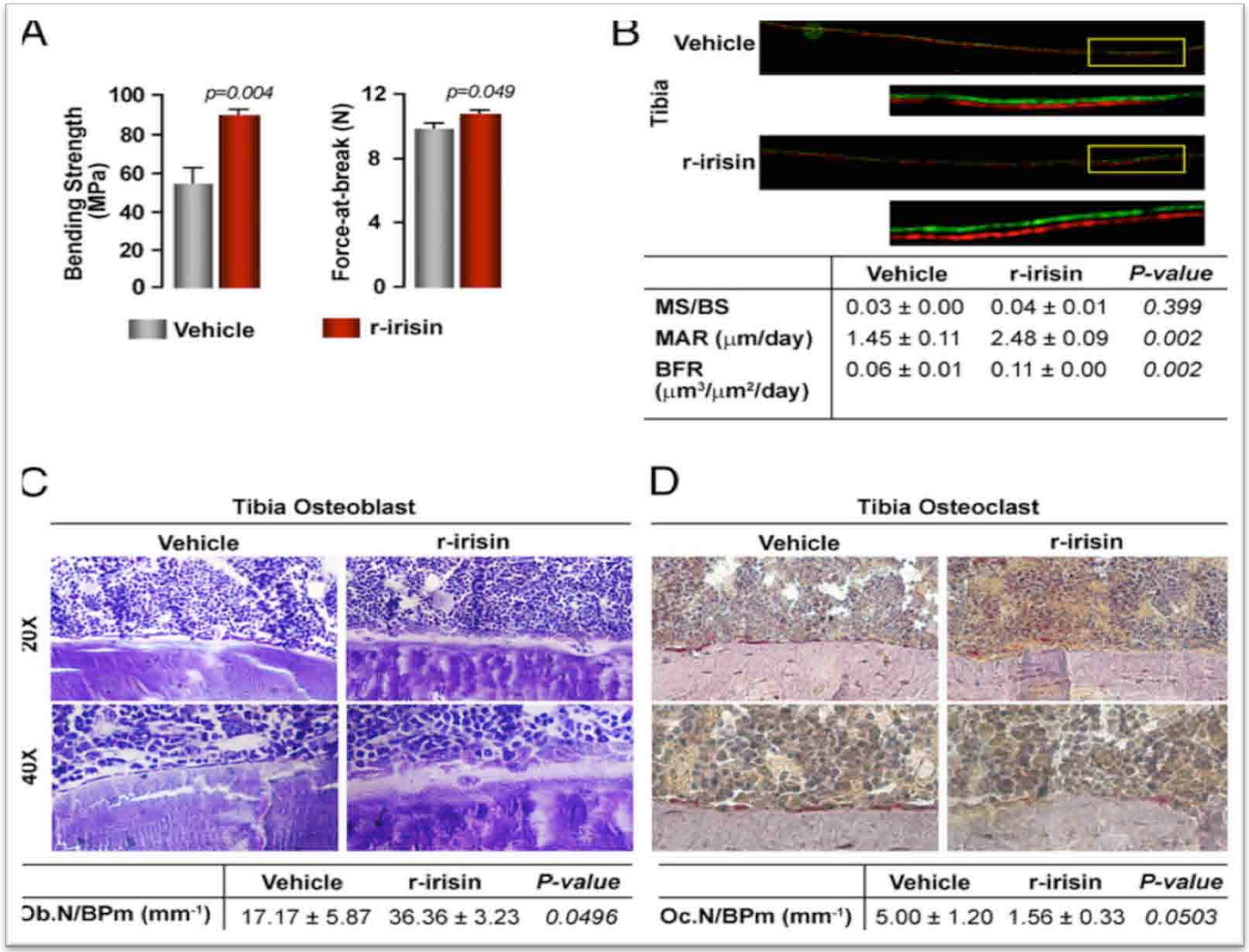
PNAS

The myokine irisin increases cortical bone mass

Graziana Colaianni[a,1], Concetta Cuscito[a,1], Teresa Mongelli[a], Paolo Pignataro[a], Cinzia Buccoliero[a], Peng Liu[b], Ping Lu[b], Loris Sartini[c], Mariasevera Di Comite[a], Giorgio Mori[d], Adriana Di Benedetto[d], Giacomina Brunetti[a], Tony Yuen[b], Li Sun[b], Janne E. Reseland[e], Silvia Colucci[a], Maria I. New[b,2], Mone Zaidi[b,2], Saverio Cinti[c], and Maria Grano[a,2]

[a]Department of Basic Medical Science, Neuroscience and Sense Organs, University of Bari, 70124 Bari, Italy; [b]The Mount Sinai Bone Program, Departments of Medicine and Pediatrics, Mount Sinai School of Medicine, New York, NY 10029; [c]Department of Experimental and Clinical Medicine, Center of Obesity, United Hospitals, University of Ancona, 60020 Ancona, Italy; [d]Department of Clinical and Experimental Medicine, University of Foggia, 71100 Foggia, Italy; and [e]Department of Biomaterials, Institute for Clinical Dentistry, University of Oslo, Blindern, N-0317 Oslo, Norway

Contributed by Maria I. New, August 21, 2015 (sent for review May 21, 2015; reviewed by Christopher Huang and Carlos M. Isales)



	Vehicle	r-irisin	*P-value*
MS/BS	0.03 ± 0.00	0.04 ± 0.01	*0.399*
MAR (μm/day)	1.45 ± 0.11	2.48 ± 0.09	*0.002*
BFR ($\mu m^3/\mu m^2$/day)	0.06 ± 0.01	0.11 ± 0.00	*0.002*

	Vehicle	r-irisin	*P-value*
Ob.N/BPm (mm^{-1})	17.17 ± 5.87	36.36 ± 3.23	*0.0496*

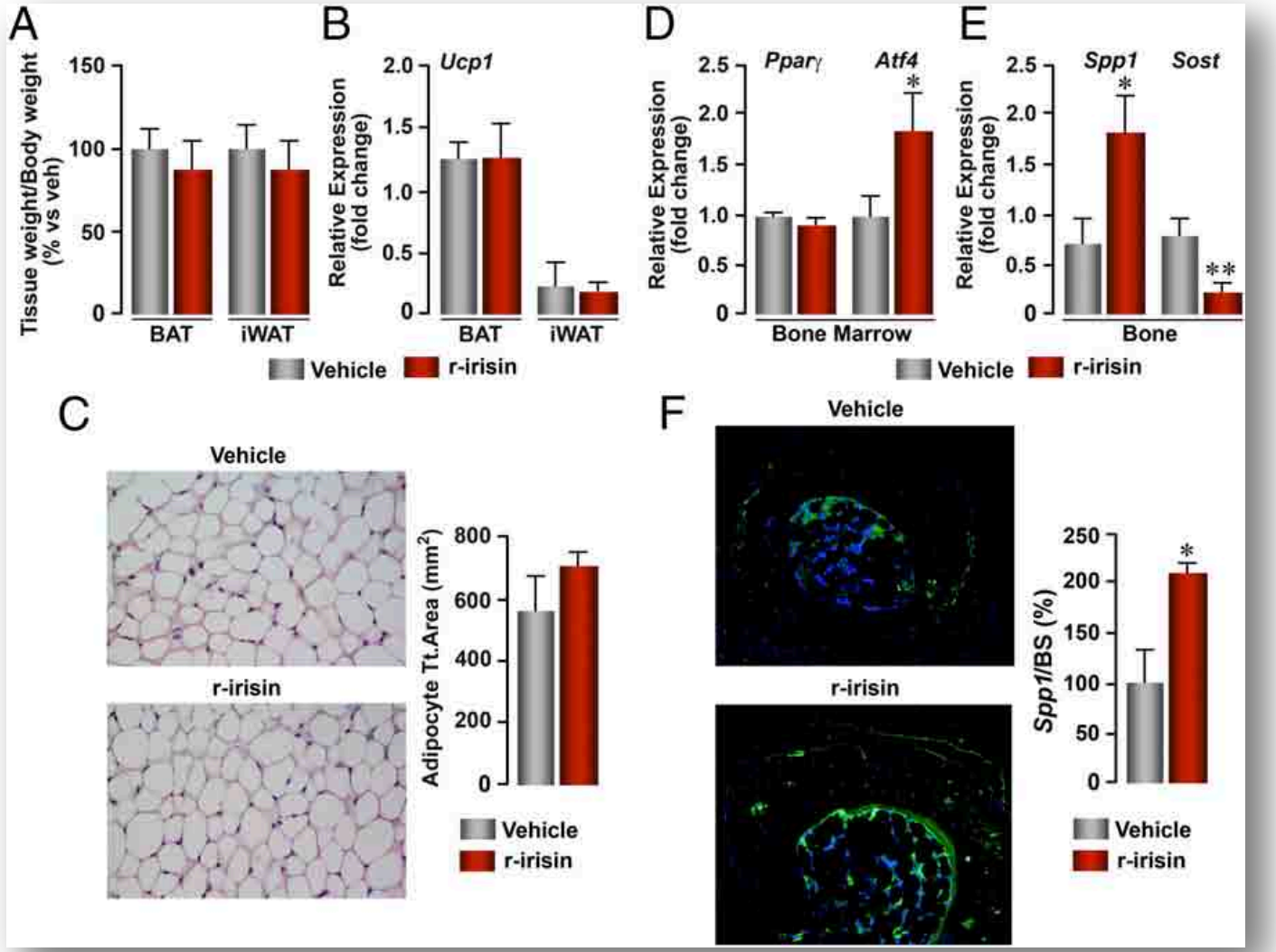
	Vehicle	r-irisin	*P-value*
Oc.N/BPm (mm^{-1})	5.00 ± 1.20	1.56 ± 0.33	*0.0503*

The myokine irisin increases cortical bone mass

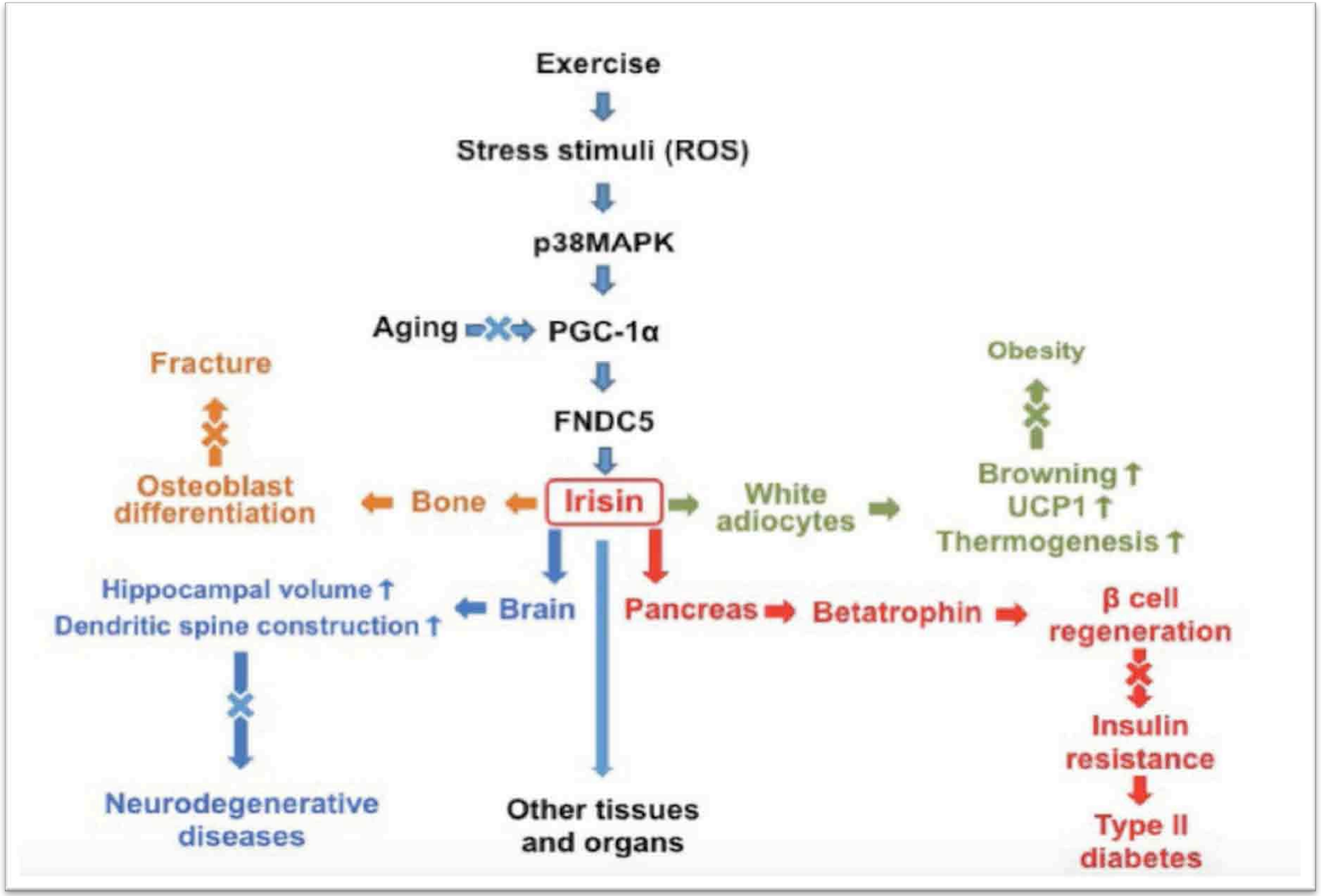
Graziana Colaianni[a,1], Concetta Cuscito[a,1], Teresa Mongelli[a], Paolo Pignataro[a], Cinzia Buccoliero[a], Peng Liu[b], Ping Lu[b], Loris Sartini[c], Mariasevera Di Comite[a], Giorgio Mori[d], Adriana Di Benedetto[d], Giacomina Brunetti[a], Tony Yuen[b], Li Sun[b], Janne E. Reseland[e], Silvia Colucci[a], Maria I. New[b,2], Mone Zaidi[b,2], Saverio Cinti[c], and Maria Grano[a,2]

[a]Department of Basic Medical Science, Neuroscience and Sense Organs, University of Bari, 70124 Bari, Italy; [b]The Mount Sinai Bone Program, Departments of Medicine and Pediatrics, Mount Sinai School of Medicine, New York, NY 10029; [c]Department of Experimental and Clinical Medicine, Center of Obesity, United Hospitals, University of Ancona, 60020 Ancona, Italy; [d]Department of Clinical and Experimental Medicine, University of Foggia, 71100 Foggia, Italy; and [e]Department of Biomaterials, Institute for Clinical Dentistry, University of Oslo, Blindern, N-0317 Oslo, Norway

Contributed by Maria I. New, August 21, 2015 (sent for review May 21, 2015; reviewed by Christopher Huang and Carlos M. Isales)



IRISIN: DIFFERENT METABOLIC ACTIONS



Diabetes Metab Res Rev. 2016;32(1):51-9

Available online at www.sciencedirect.com
SCIENCE DIRECT®

Medical Hypotheses (2003) **61**(5–6), 535–542

doi:10.1016/S0306-9877(03)00227-5

PTH excess may promote weight gain by impeding catecholamine-induced lipolysis-implications for the impact of calcium, vitamin D, and alcohol on body weight

Summary Increased free intracellular calcium ($[Ca^{2+}]_i$) in adipocytes blunts the lipolytic response to catecholamines by activating phosphodiesterase 3B – the same enzyme that mediates the antilipolytic effect of insulin – while also compromising the efficiency of insulin-stimulated glucose uptake. Physiological increases in parathyroid hormone (PTH) have been shown to increase $[Ca^{2+}]_i$ in adipocytes. These considerations may rationalize recent evidence that high dietary intakes of calcium and/or dairy products may reduce risk for obesity, diabetes, and insulin-resistance syndrome, and they predict that other dietary measures which down-regulate PTH – such as good vitamin D status, and moderation in phosphate and salt intakes – may likewise be beneficial in these respects. Consistent with this position are reports that body weight is elevated in elderly subjects with both primary and secondary hyperparathyroidism; furthermore, insulin resistance is a well-known complication of both forms of hyperparathyroidism. The fact that regular alcohol consumption is associated with decreased PTH secretion may help to explain why moderate drinkers are less prone to insulin resistance, diabetes, and – in women – obesity. Down-regulation of PTH cannot be expected to promote dramatic weight loss, but in the long-term it may lessen risk for significant weight gain and diabetes, and conceivably may potentiate the fat loss achievable with caloric restriction and/or exercise.

Aging Clin Exp Res (2013) 25:371–376
DOI 10.1007/s40520-013-0057-2

ORIGINAL ARTICLE

Parathyroid hormone is significantly associated with body fat compartment in men but not in women following a hip fracture

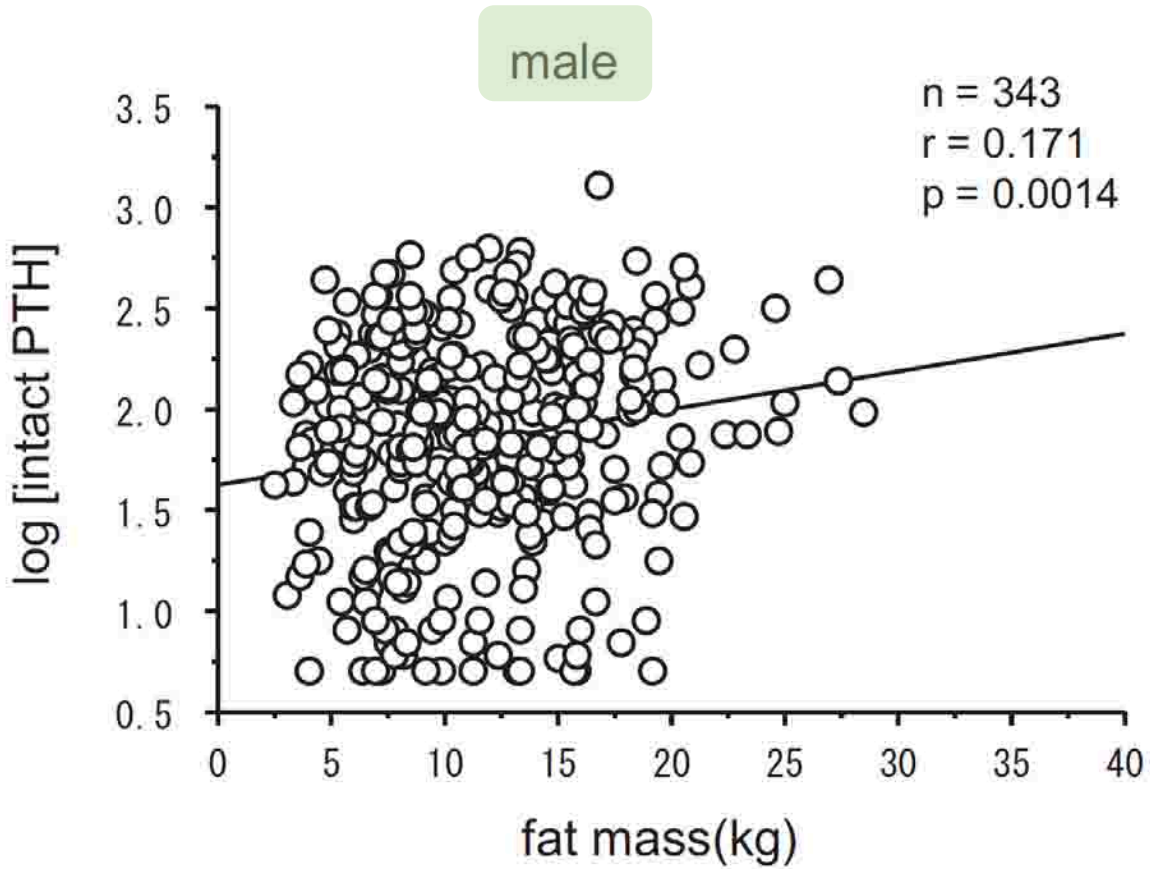
Table 3 Linear regression analysis in the 57 men and in the 518 women

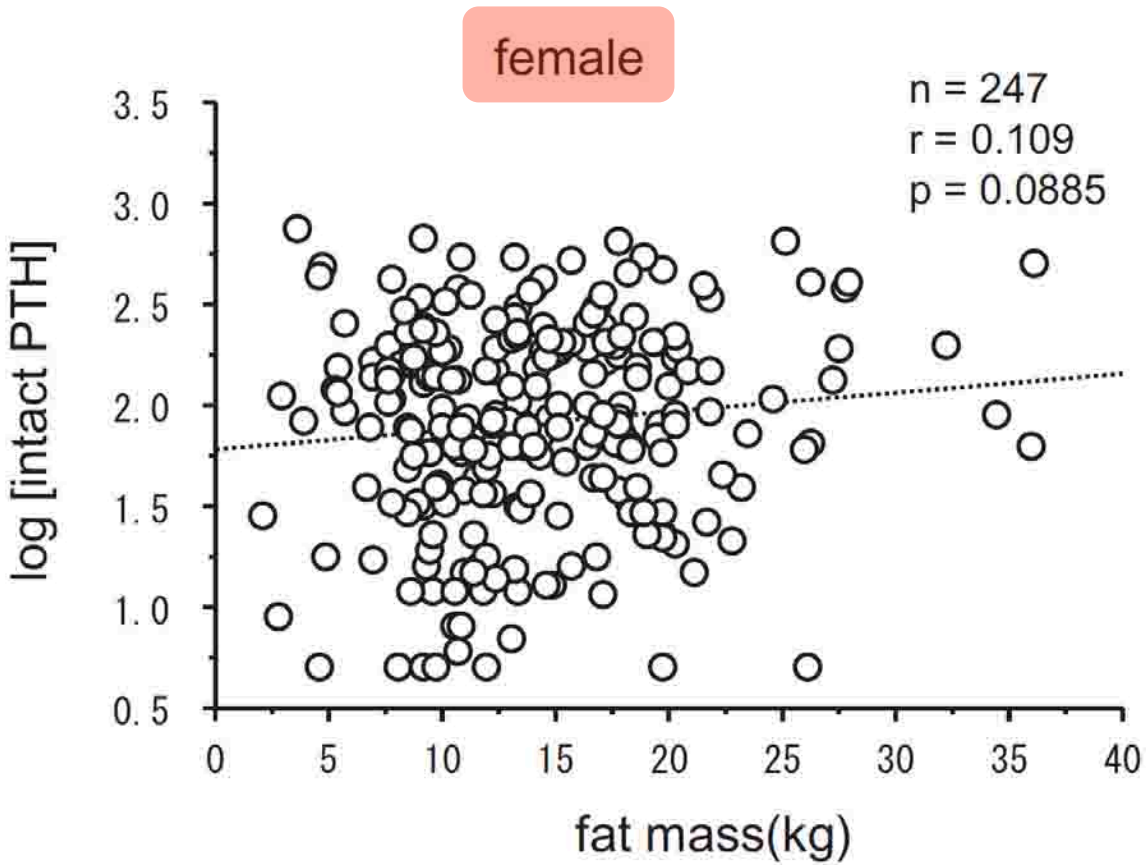
Independent variables	β	Partial correlation	p
Analysis in the 57 men ($r^2 = 0.43$; $F = 13.53$; $p < 0.001$)			
PTH	**0.46**	**0.51**	**<0.001**
Age	**−0.33**	**−0.38**	**0.004**
Phosphate	0.15	0.19	0.16
Albumin-adjusted calcium	−0.02	−0.03	0.85
Estimated GFR	−0.02	−0.03	0.83
Albumin	**−0.22**	**−0.27**	**0.047**
Barthel Index score	0.12	0.14	0.31

Results In the 57 men, we found a significant correlation between PTH and both body mass index (BMI) ($\rho = 0.37$; $p = 0.020$) and trunk fat percentage ($\rho = 0.62$; $p < 0.001$). After multiple adjustments, we confirmed a significant association between PTH and BMI ($r = 0.38$; $p = 0.004$) or trunk fat percentage ($r = 0.51$; $p < 0.001$). In the 518 women, we found a slightly significant correlation between PTH and BMI ($\rho = 0.09$; $p = 0.047$), but after adjustments the correlation coefficient dropped to

ORIGINAL ARTICLE
Endocrine Research
J Clin Endocrinol Metab, March 2013, 98(3):1264–1270

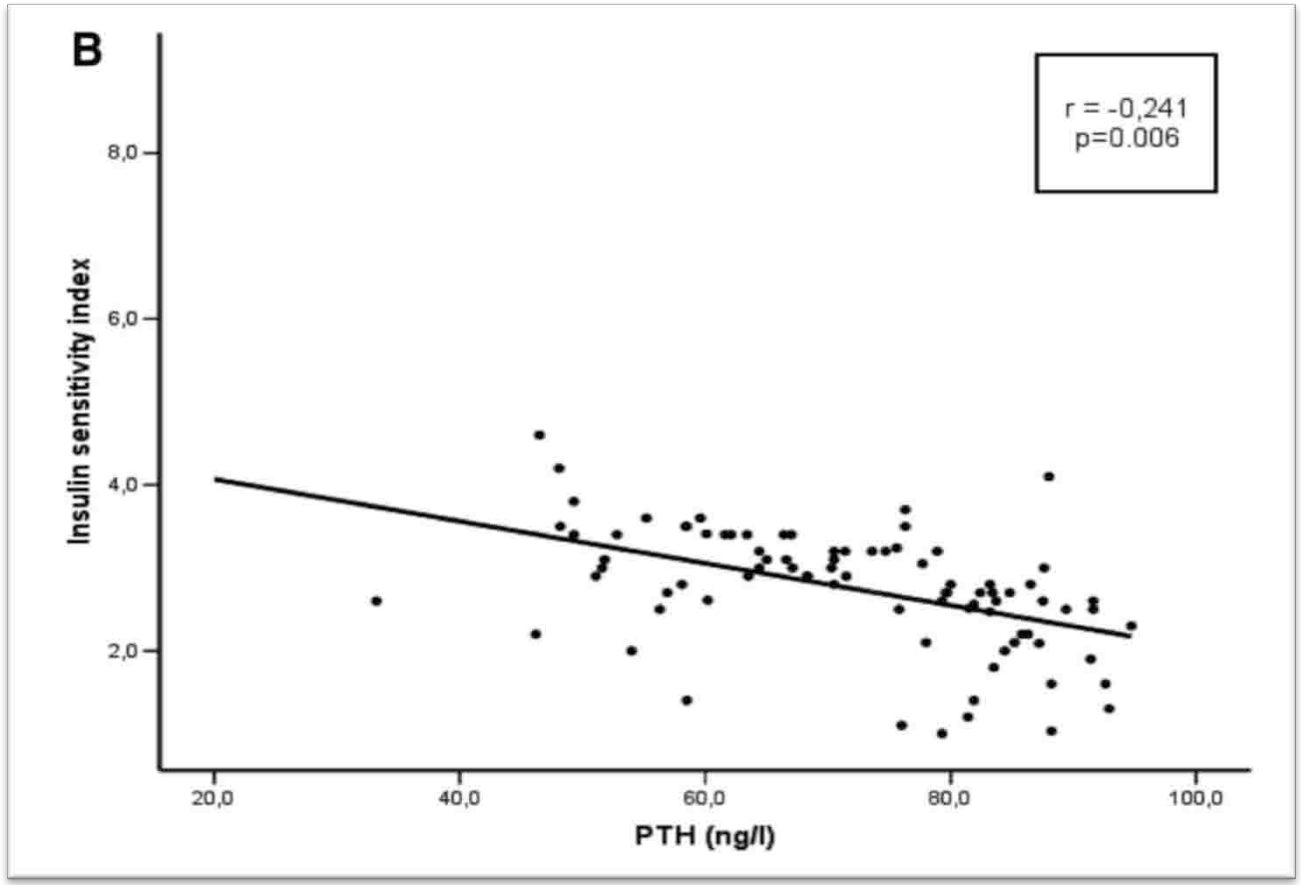
Significant Positive Association Between Parathyroid Hormone and Fat Mass and Lean Mass in Chronic Hemodialysis Patients



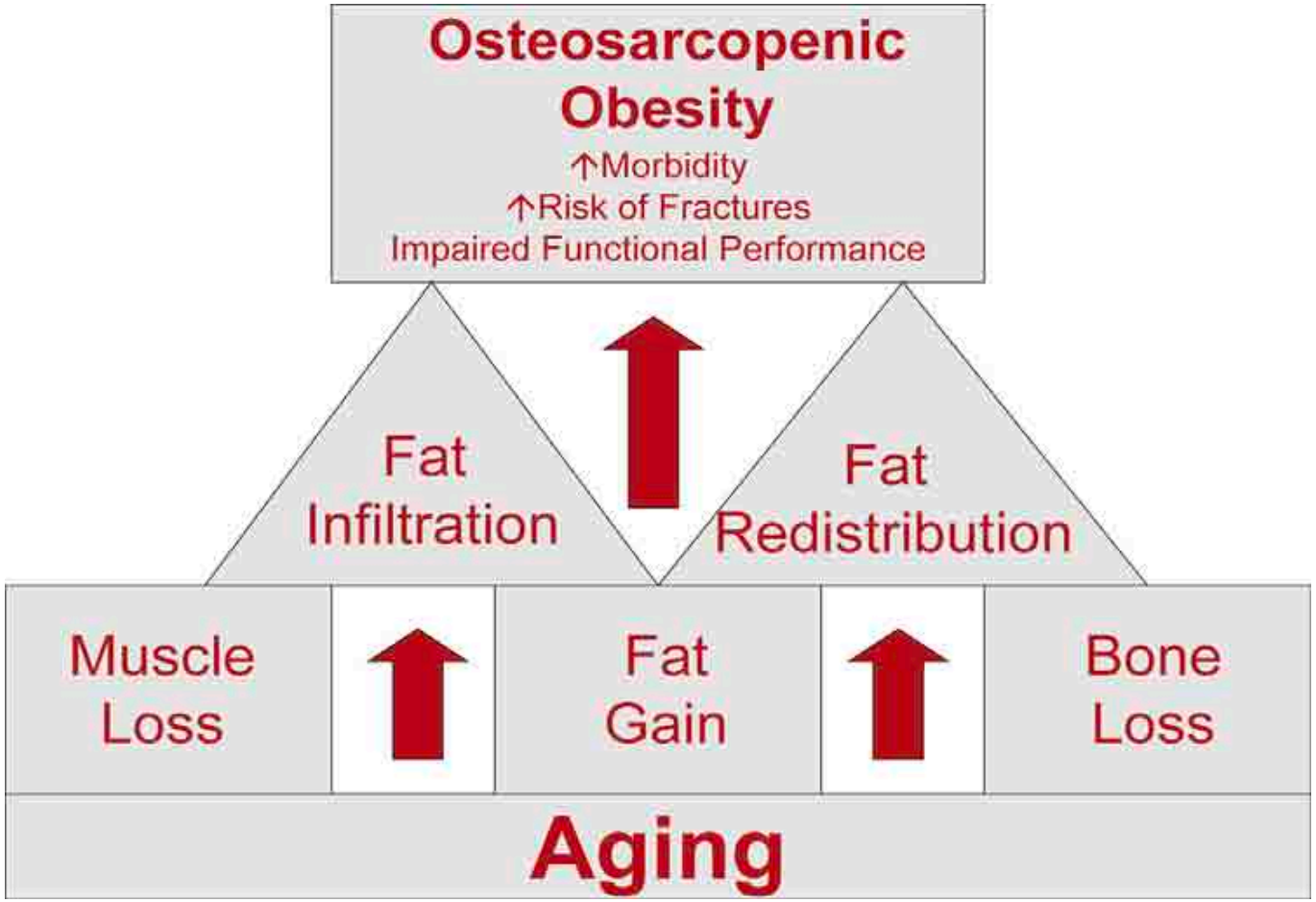


Parathyroid Hormone and Insulin Resistance in Distinct Phenotypes of Severe Obesity: A Cross-Sectional Analysis in Middle-Aged Men and Premenopausal Women

J Clin Endocrinol Metab, December 2012, 97(12):4724–4732



TAKE HOME MESSAGES



THANK YOU