LOS COBOS MEDICAL CENTER

compensar | UNIVERSIDAD EL BOSQUE

Vitamina D 50.000 UI: Correción rápida y manejo inteligente

Castillo

Jorge

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Los Cobos Medical Center
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www.eldoctorcastillo.com

Conflicto de interés

Conferencia disponible en

www.eldoctorcastillo.com

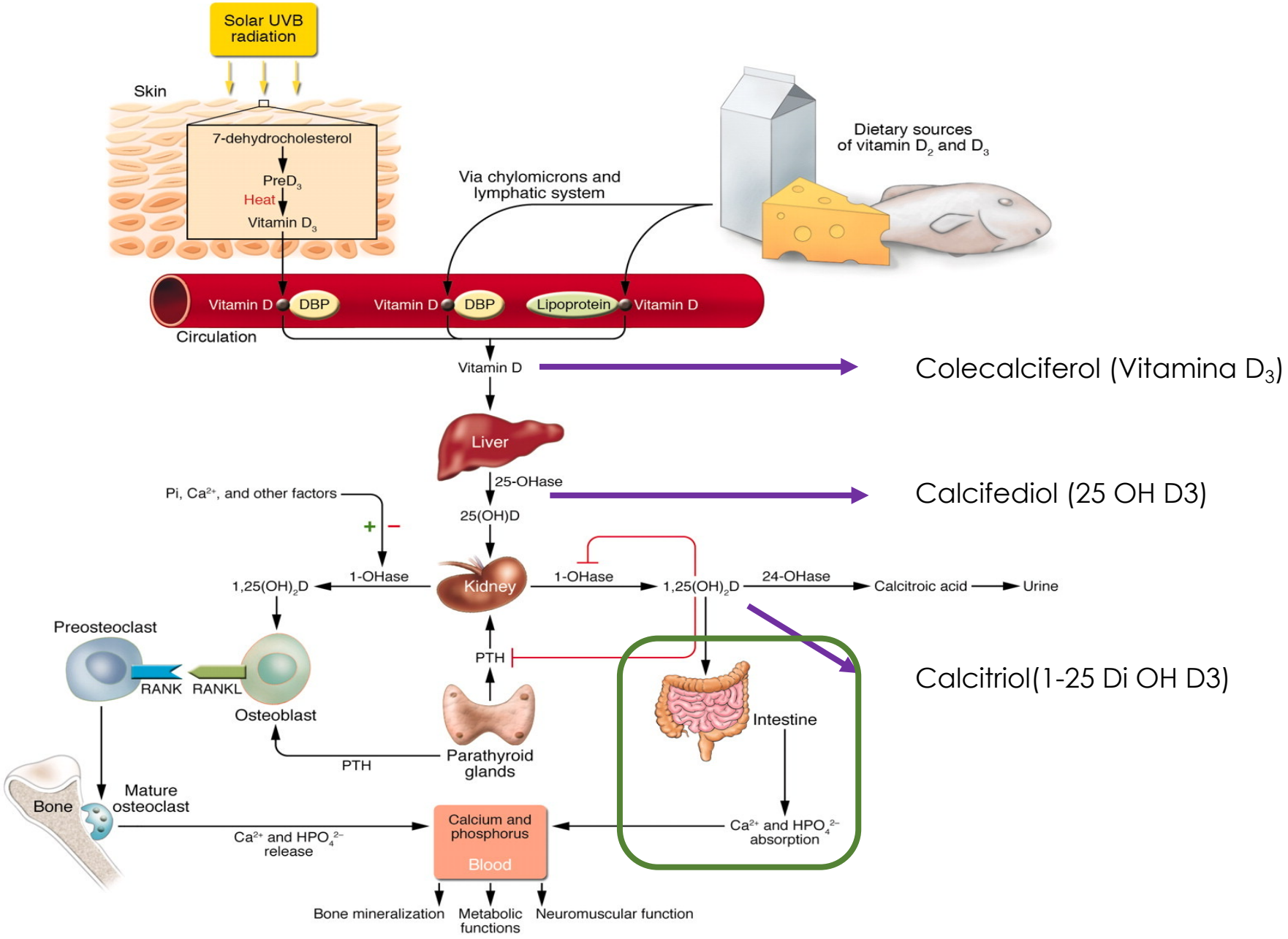
- ❑ Esta es una conferencia patrocinada por laboratorios **Procaps**
- ❑ Su contenido es producto de información científica no influenciada por el patrocinador
- ❑ He recibido honorarios como speaker de Amgen, Astra Zeneca, BD, Boeringher, Diabetrics, Euroetika, Gilead, Merck Serono, Merck Sharp and Dhome, Lilly, Novo Nordisk, Pharmatech, Pfizer, PTC, Procaps, Roche, Sanofi, Servier, Tecnofarma.

Efectos de la Vitamina D

(1) Efecto genómico: El complejo 1,25 (OH) 2D3-receptor de vitamina D (VDR)-receptor de ácido retinoide X (RXR) formado se transloca del citoplasma al núcleo, donde se une al elemento de respuesta a la vitamina D (VDRE) en los genes diana. En consecuencia, el complejo regula la expresión de numerosos genes, hasta un total de cientos.

(2) Efecto no genómico: la activación del VDR de membrana inicia una rápida reacción de cebado de membrana, lo que desencadena vías de señalización que contribuyen a las respuestas biológicas.

(3) Efectos epigenéticos: estos efectos implican la regulación de los miRNA, la metilación del ADN, la acetilación/desacetilación de histonas y la metilación/desmetilación de histonas, que, en conjunto, inciden en la regulación de la expresión génica.



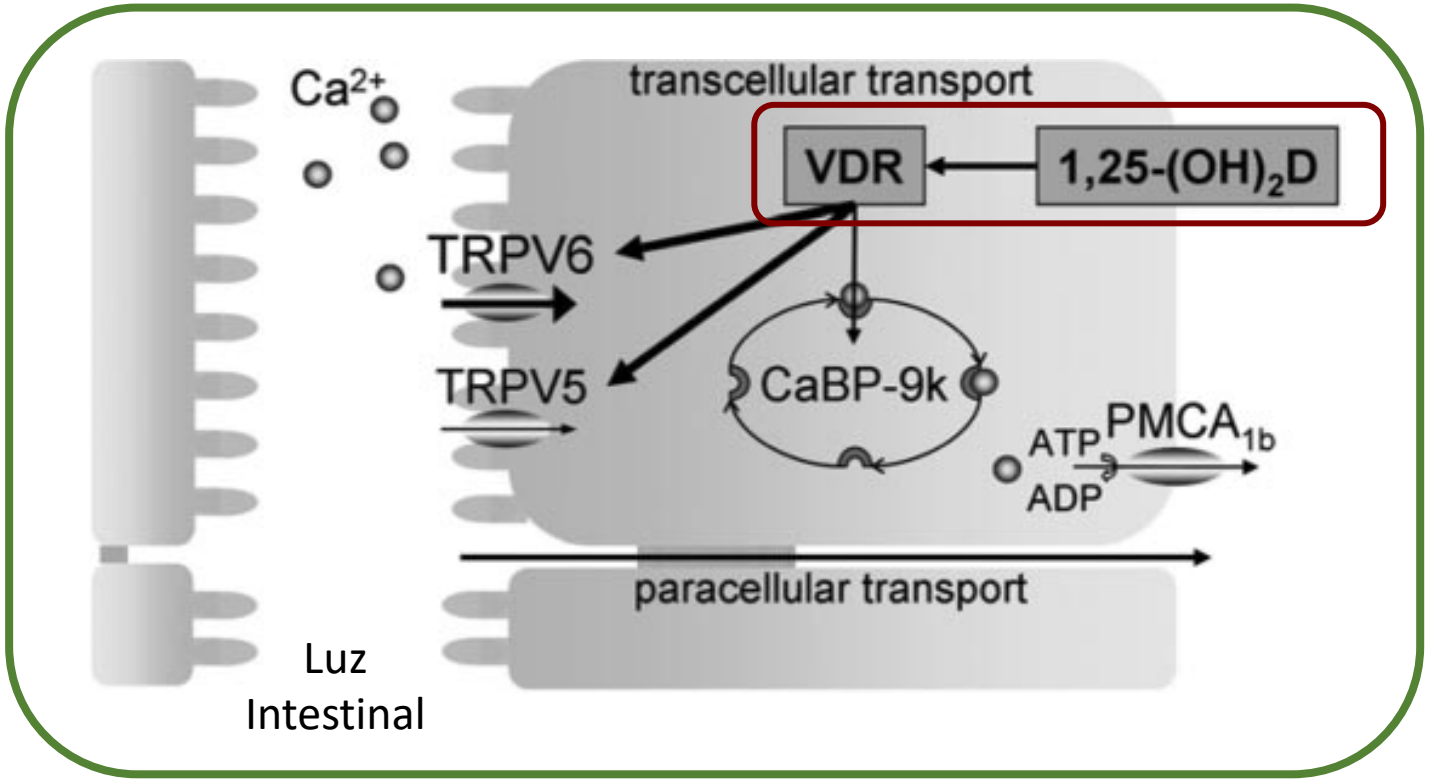
- Holick, M. F. J. Clin. Invest. 2006;116:2062-2072

0163-769X/08/$20.00/0
Printed in U.S.A.

Endocrine Reviews 29(6):726–776

doi: 10.1210/er.2008-0004

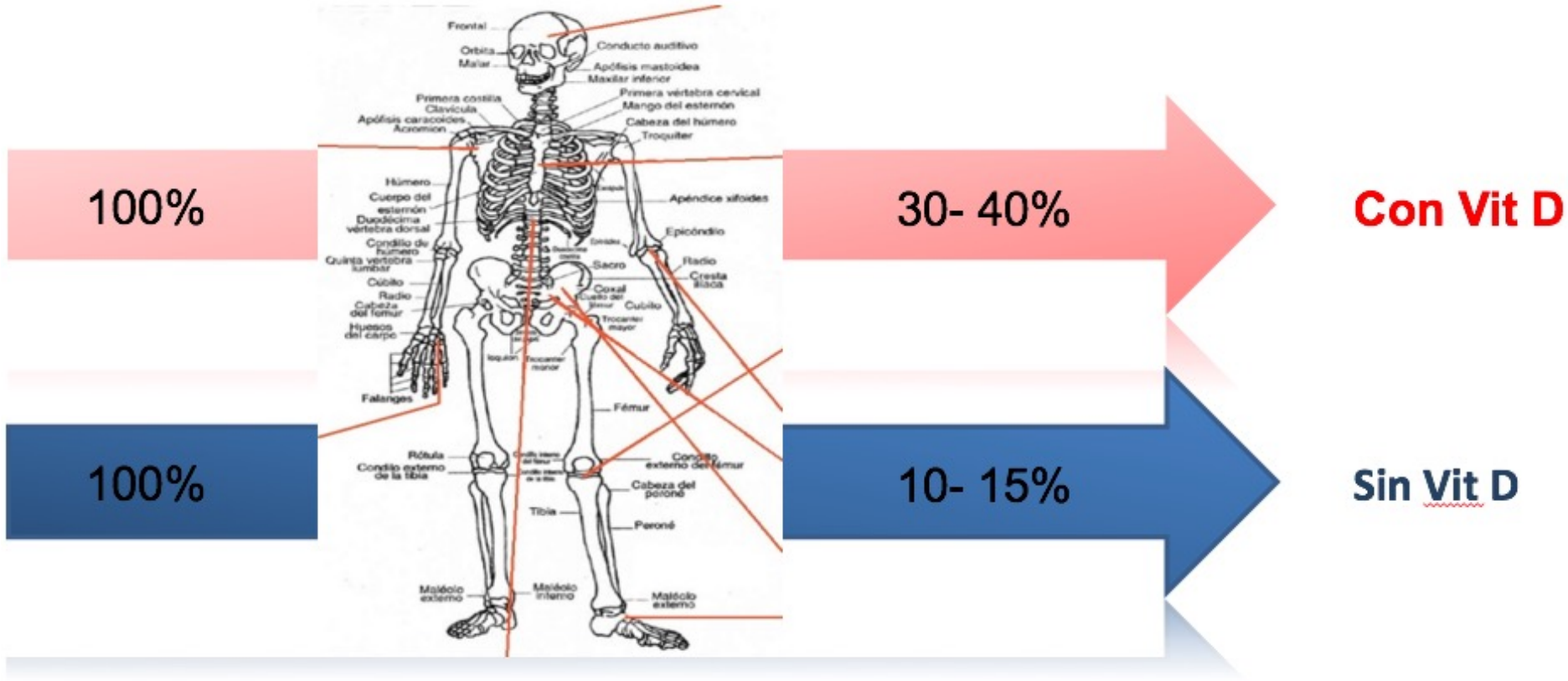
Vitamin D and Human Health: Lessons from Vitamin D Receptor Null Mice



Entre las pocas células o tejidos que presentan una expresión baja o nula del receptor de vitamina D (VDR) se incluyen los glóbulos rojos, el músculo estriado maduro y algunas células cerebrales altamente diferenciadas, como las células de Purkinje del cerebelo.

Endocrine Reviews 29(6):726–776. 2008

Absorción de Calcio



CLINICAL GUIDELINE

ACP American College of Physicians®
Leading Internal Medicine, Improving Lives

Treatment of Low Bone Density or Osteoporosis to Prevent Fractures in Men and Women: A Clinical Practice Guideline Update From the American College of Physicians

COMPARATIVE BENEFITS OF TREATMENT VERSUS PLACEBO FOR REDUCING FRACTURES IN PATIENTS WITH OSTEOPOROSIS

Calcium and vitamin D may be added as dietary supplements to osteoporosis treatment regimens, although the effectiveness of these regimens on fracture prevention is unclear.

Ann Intern Med. 2017;166:818-839

Table 2. Summary of Evidence on Pharmacologic Treatments for Low Bone Density and Osteoporosis

Treatment	Effect on Fracture Risk in Osteoporotic Women and Evidence Quality			Adverse Events and Evidence Quality	Fair Price for 1-Day Supply*
	Vertebral	Nonvertebral	Hip		
Bisphosphonates	Summarized individually below	Summarized individually below	Summarized individually below	As a class: atypical subtrochanteric fracture, osteonecrosis of the jaw (low-quality)	Summarized individually below
Alendronate	Improves; high-quality	Improves; high-quality	Improves; high-quality	Mild upper GI symptoms (high-quality)	Generic: $9 Brand-name (Fosamax): $130
Ibandronate	Improves; high-quality	Uncertain	Uncertain	Mild upper GI symptoms (high-quality); myalgias, cramps and limb pain	Generic: $60 Brand-name (Boniva): $588
Risedronate	Improves; high-quality	Improves; high-quality	Improves; high-quality	Mild upper GI symptoms (high-quality)	Generic: $136 Brand-name (Actonel): $337
Zoledronic acid	Improves; high-quality Improves in osteoporotic men; moderate quality	Improves; high-quality	Improves; high-quality	Mild upper GI symptoms, hypocalcaemia, influenza-like symptoms (high-quality); atrial fibrillation; arthritis and arthralgias, headaches, uveitis	Generic: $66 Brand-name (Reclast): $1105
Denosumab (injectable)	Improves; high-quality	Improves; high-quality	Improves; high-quality	Mild upper GI symptoms (high-quality), infection (moderate-quality); rash	Brand-name (Prolia): $1047
Teriparatide (injectable)	Improves; high-quality	Improves; high-quality	Unknown	Mild upper GI symptoms, headache, hypercalcemia (high-quality); hypercalciuria, renal adverse effects	Brand-name (Forteo): $2767
Raloxifene	Improves; high-quality	No effect	No effect	Hot flashes, thromboembolic events (high-quality); pulmonary embolism, cerebrovascular death	Generic: $2.40 Brand-name (Evista): $70
Calcium and vitamin D	Uncertain	Uncertain	Uncertain	Increased risk for hypercalcemia	NA

Ann Intern Med. 2017;166:818-839

- Amelioration of Osteoporosis and Hypovitaminosis D by Sunlight Exposure in Hospitalized, Elderly Women With Alzheimer's Disease: A Randomized Controlled Trial
    - Mitate Hospital, Tagawa, Japan;

TABLE 3. BIOCHEMICAL INDICES OF BONE AND CALCIUM METABOLISM BEFORE AND AFTER THE 12-MONTH PERIOD IN THE 243 SUBJECTS WHO COMPLETED THE STUDY

	Deprived group			*Exposed group*		
	Before (n = 132)	*After (n = 121)*	*p**	*Before (n = 132)*	*After (n = 122)*	*p**
Ionized calcium (mM)	1.15 ± 0.05	1.10 ± 0.051	<0.0001	1.15 ± 0.04	1.25 ± 0.05	<0.0001
Intact PTH (ng/liter)	55.8 ± 19.0	67.2 ± 13.8	<0.0001	55.1 ± 18.9	34.1 ± 11.0	<0.0001
25-OHD (nM)	24.0 ± 7.0	10.7 ± 5.2	<0.0001	24.0 ± 5.7	52.2 ± 9.7	<0.0001
1,25-$(OH)_2D$ (pM)	169.3 ± 52.0	214.5 ± 42.1	<0.0001	170.8 ± 50.0	141.2 ± 40.6	<0.0001
BGP (ng/ml)	15.5 ± 2.8	18.1 ± 3.5	<0.0001	15.8 ± 3.0	10.5 ± 2.2	<0.0001
Deoxypyridinoline (μmol/mol creatinine)	10.7 ± 2.9	135 ± 3.4	<0.0001	10.7 ± 2.7	7.1 ± 2.2	<0.0001

Values are the mean ± SD
* Paired *t*-test.

- JBMR Vol 20, No 8, 2005: 1327-33

- Amelioration of Osteoporosis and Hypovitaminosis D by Sunlight Exposure in Hospitalized, Elderly Women With Alzheimer's Disease: A Randomized Controlled Trial
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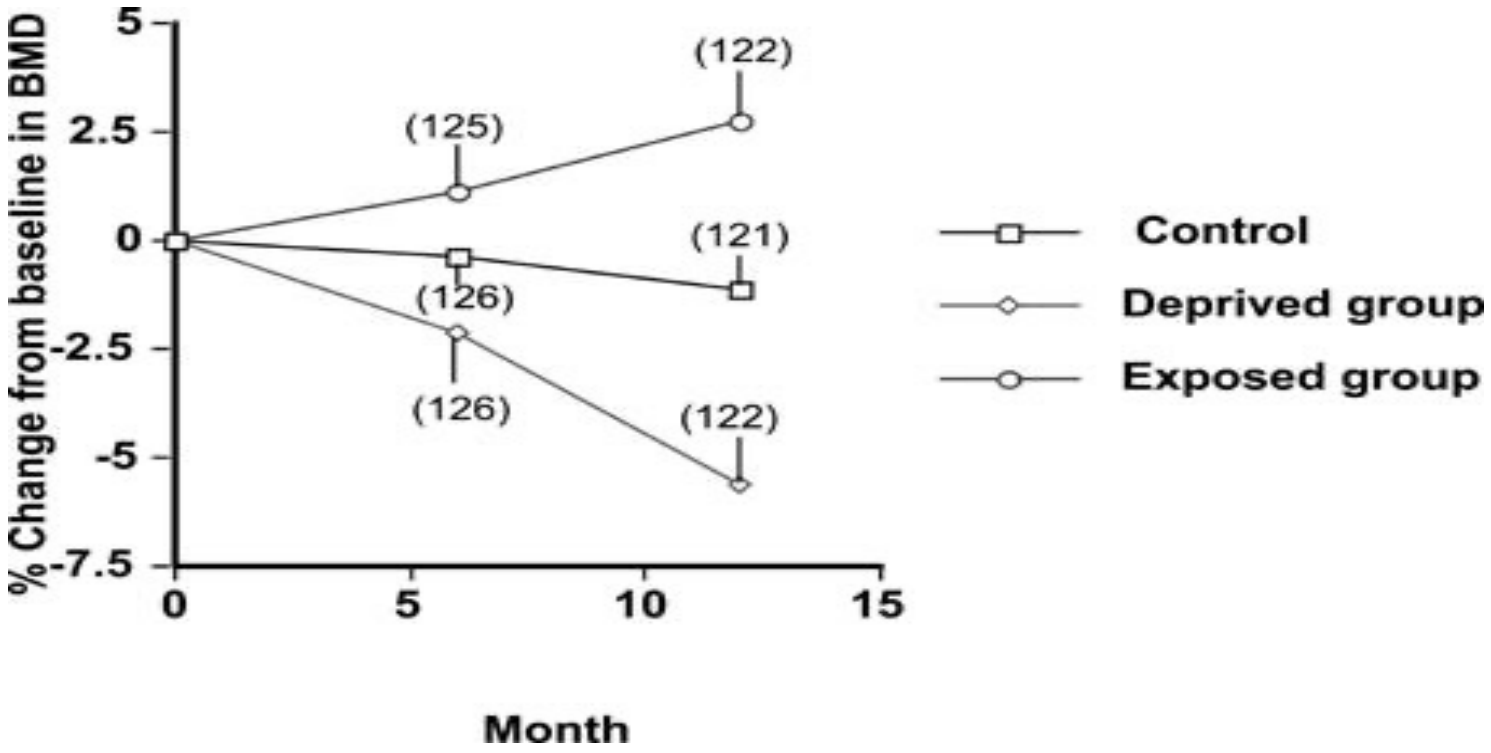

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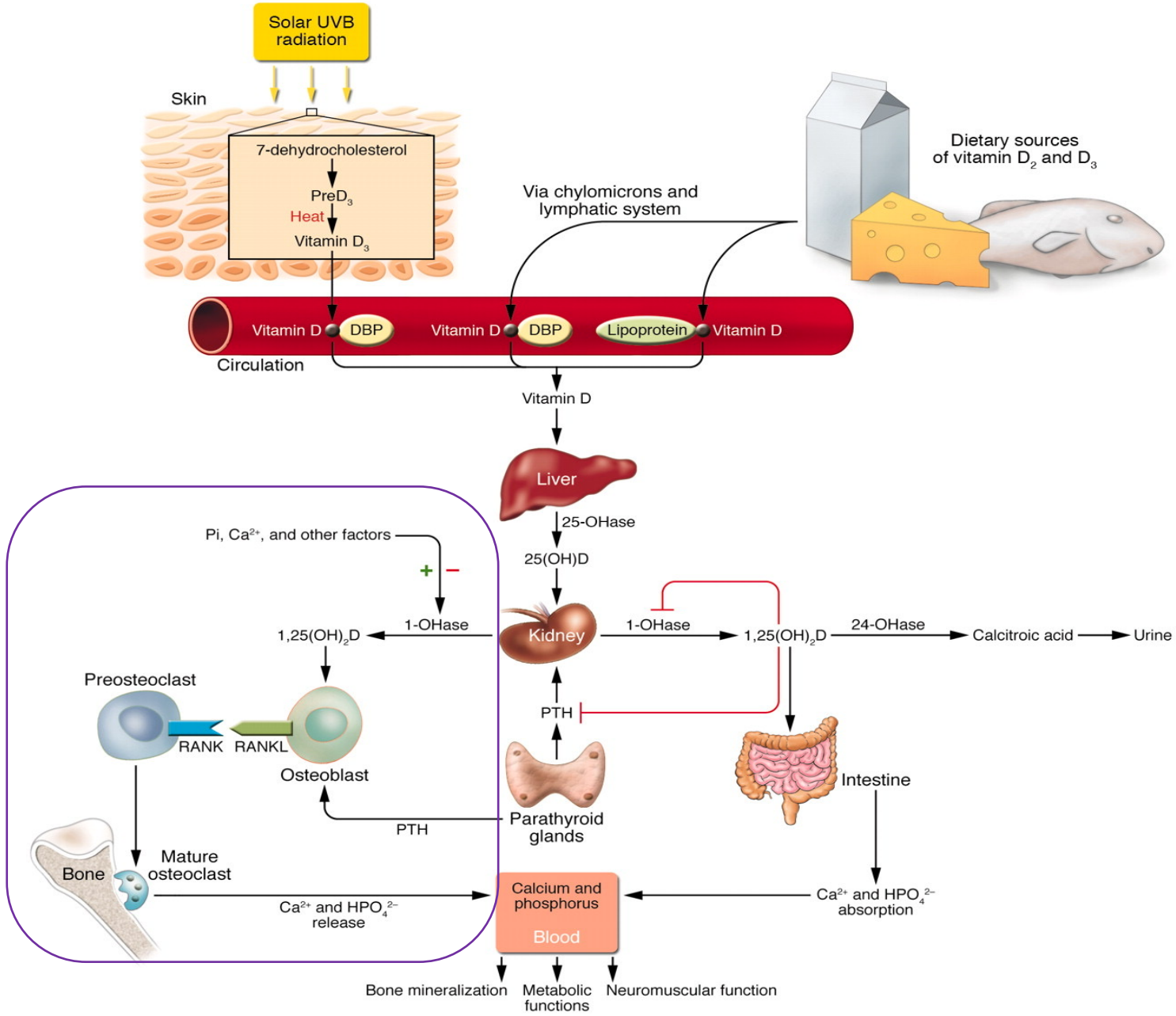

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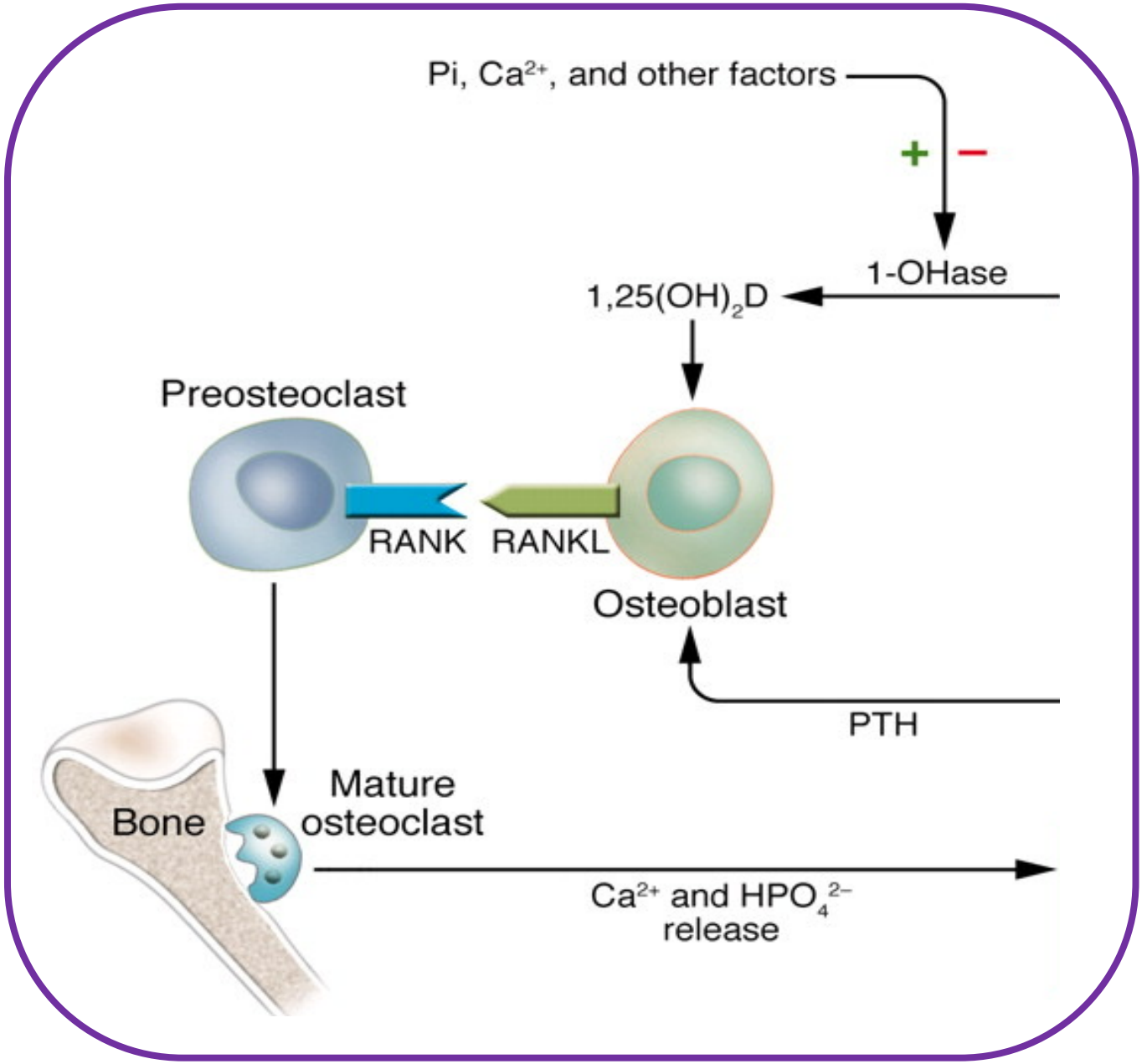

- Holick, M. F. J. Clin. Invest. 2006;116:2062-2072

1765

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Article

Vitamin D and Calcium Are Required during Denosumab Treatment in Osteoporosis with Rheumatoid Arthritis

Yukio Nakamura [1,*], Takako Suzuki [1], Tomohiko Yoshida [2], Hideshi Yamazaki [3] and Hiroyuki Kato [1]

Retrospectivo

Table 1. Patient characteristics at baseline. Data are expressed as mean ± standard error.

Characteristic	Denosumab (n = 22)	Combination (n = 21)	p-Value
Age (years)	70.9 ± 1.8	70.6 ± 2.3	0.9161
Gender (F:M)	22:0	21:00	
BMI (kg/m^2)	20.8 ± 0.9	20.0 ± 0.9	0.5396
Serum corrected Ca (mg/dL)	9.4 ± 0.1	9.2 ± 0.1	0.2156
Serum P (mg/dL)	3.7 ± 0.1	3.5 ± 0.1	0.2378
Serum BAP (μg/L)	13.4 ± 0.6	13.8 ± 1.1	0.7631
Serum TRACP-5b (mU/dL)	302.9 ± 16.7	312.3 ± 29.7	0.7873
Urinary NTX (nmol BCE/mmol/CRE)	28.4 ± 2.5	26.7 ± 1.8	0.6015
1,25(OH)2D3 (pg/mL)	62.8 ± 4.9	60.7 ± 5.7	0.7847
P1NP (μg/L)	37.3 ± 4.2	36.0 ± 4.5	0.8239
Serum whole PTH (pg/dL)	29.7 ± 2.9	30.1 ± 4.2	0.9429
BP use, n (%)	22 (100)	21 (100)	
Period of BP use	5.8 ± 1.0	5.5 ± 1.0	0.8476
L-BMD (g/cm^2)	0.71 ± 0.04	0.68 ± 0.02	0.4197
H-BMD (g/cm^2)	0.487 ± 0.03	0.502 ± 0.02	0.6971
MTX, n (mg/week)	12 (6.7 ± 0.75)	10 (6.6 ± 0.85)	0.9536
PSL, n (mg/day)	2 (4.5 ± 0.5)	1 (5.0 ± 0.0)	
MMP-3	92.2 ± 22.2	94.3 ± 15.5	0.9392
Disease duration (years)	16.6 ± 2.9	18.5 ± 3.2	0.6815
DAS28-CRP	3.1 ± 0.3	3.0 ± 0.3	0.9090
SDAI	4.3 ± 1.0	4.7 ± 1.0	0.7987
HAQ-DI	0.44 ± 0.2	0.39 ± 0.2	0.8215

Each patient received denosumab (60 mg, s.c.) once every 6 months in both groups.
In the combination group, we gave newly approved vitamin D supplementation tablets (762.5 mg of precipitated calcium carbonate, 200 IU of cholecalciferol, 59.2 mg of magnesium carbonate) twice daily to all patients after denosumab administration.

Nutrients 2017, 9, 428; doi:10.3390

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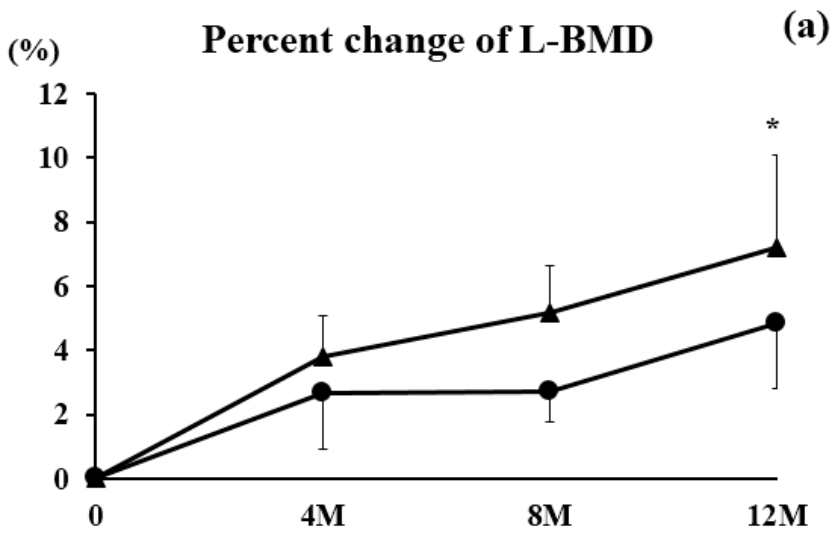
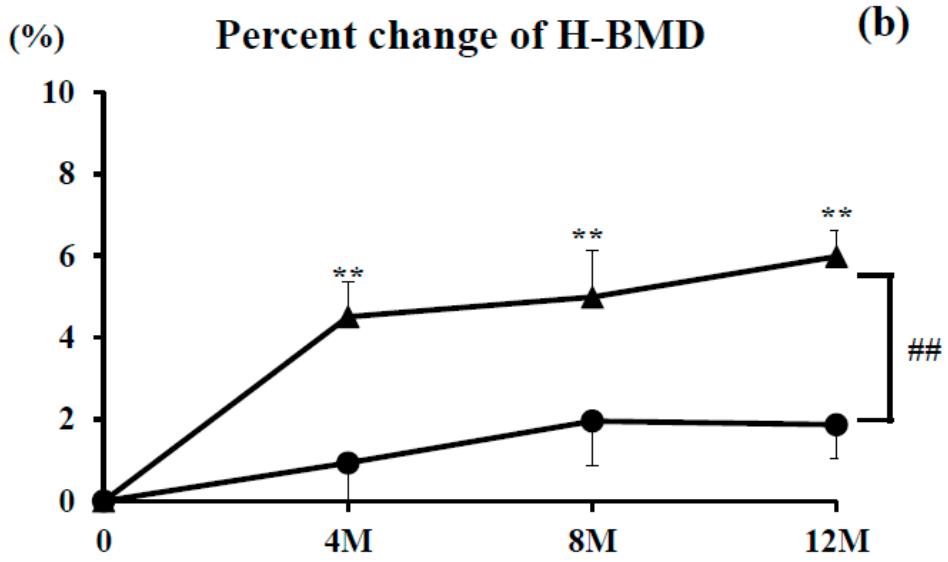
▲ Combinada

● Solo Denosumab





Nutrients 2017, 9, 428; doi:10.3390

American Society for Bone and Mineral Research (ASBMR) 2011 Annual Meeting

This coverage is not sanctioned by, nor a part of, the American Society for Bone and Mineral Research.

From Medscape Medical News

Bisphosphonates Most Effective With Higher Vitamin D Levels

Nancy A. Melville

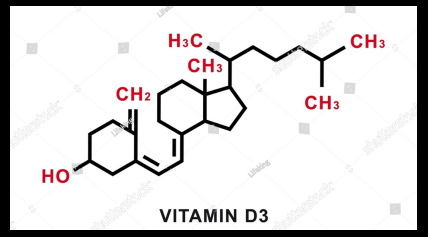
n= 210
Bisfosfonato por 5 años
AL: 50%; 25% RESD; 18% AZ

25 OH Vit D

NO RESPONDEDORES ← **33 ng/ml** → RESPONDEDORES

↓ 1 ng/ml ↓ 5% respuesta

OR 4.5 p<0.0001



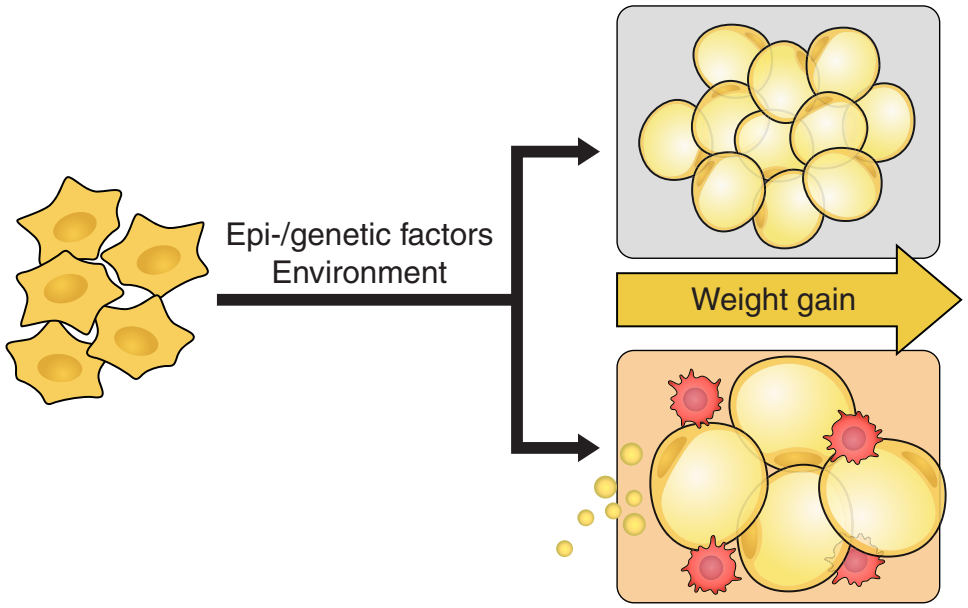
• Por qué una vitamina que ayuda al hueso es liposoluble?

Entra fácilmente a las células (difusión pasiva)
Se une a receptores intracelulares (VDR)
Modula expresión génica

•Se almacena en **tejido adiposo y músculo**
•Permite una **reserva a largo plazo**

Esto es clave porque:
•La síntesis cutánea depende del sol (variable)
•La dieta suele ser insuficiente
Funciona como un "**buffer fisiológico**" para evitar deficiencia en periodos sin exposición solar.

Adipogénesis



Adipocyte hyperplasia
Normal adipocyte function
and lipid storage
Healthy metabolism

Adipocyte hypertropy
↓Adipogenesis
Adipose tissue dysfunction and inflammation
Impaired lipid storage capacity
Adverse secretome and cross-talk with other tissues
Etopic lipid accumulation

Lipogénesis

Sin R.I

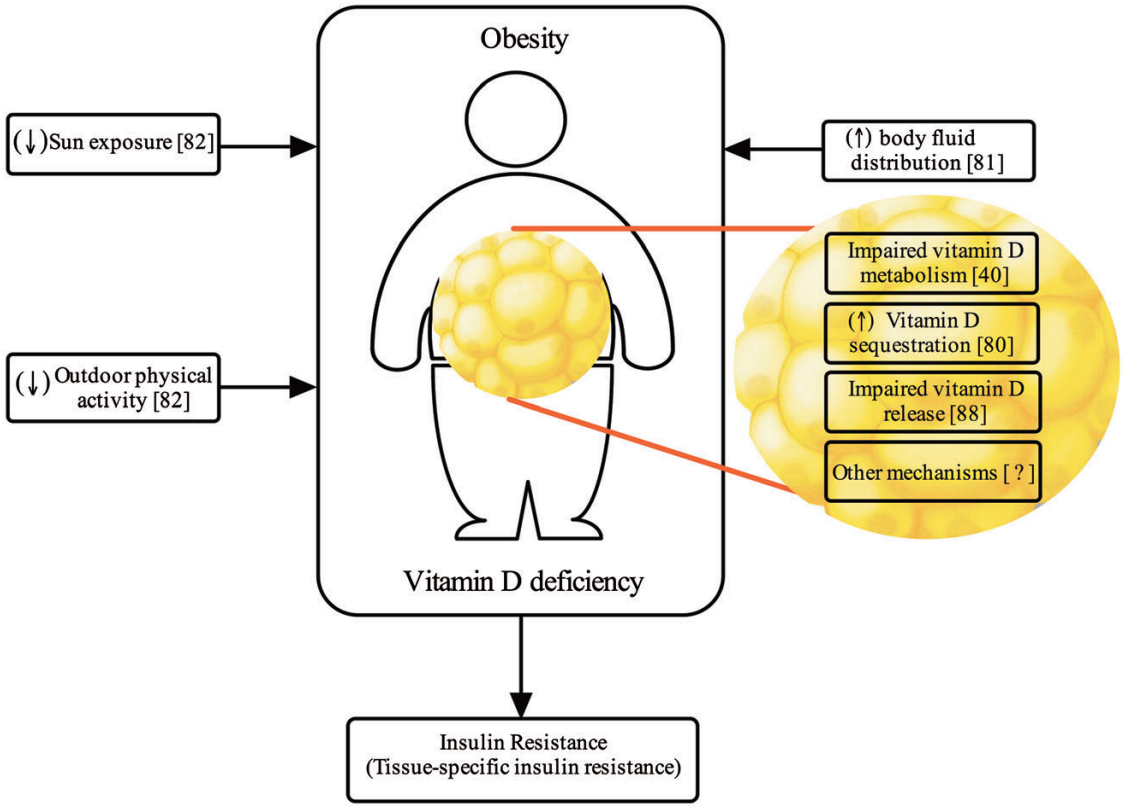
Con R.I

REVIEW ARTICLE

WILEY

Vitamin D deficiency in the aetiology of obesity-related insulin resistance

Adriyan Pramono[1,2] | Johan W.E. Jocken[1] | Ellen E. Blaak[1]



VDR visceral > VDR s.c.

http://dx.doi.org/10.1016/B978-0-12-809965-0.00045-8

Journal of Steroid Biochemistry & Molecular Biology 165 (2017) 369–381

Contents lists available at ScienceDirect

Journal of Steroid Biochemistry & Molecular Biology

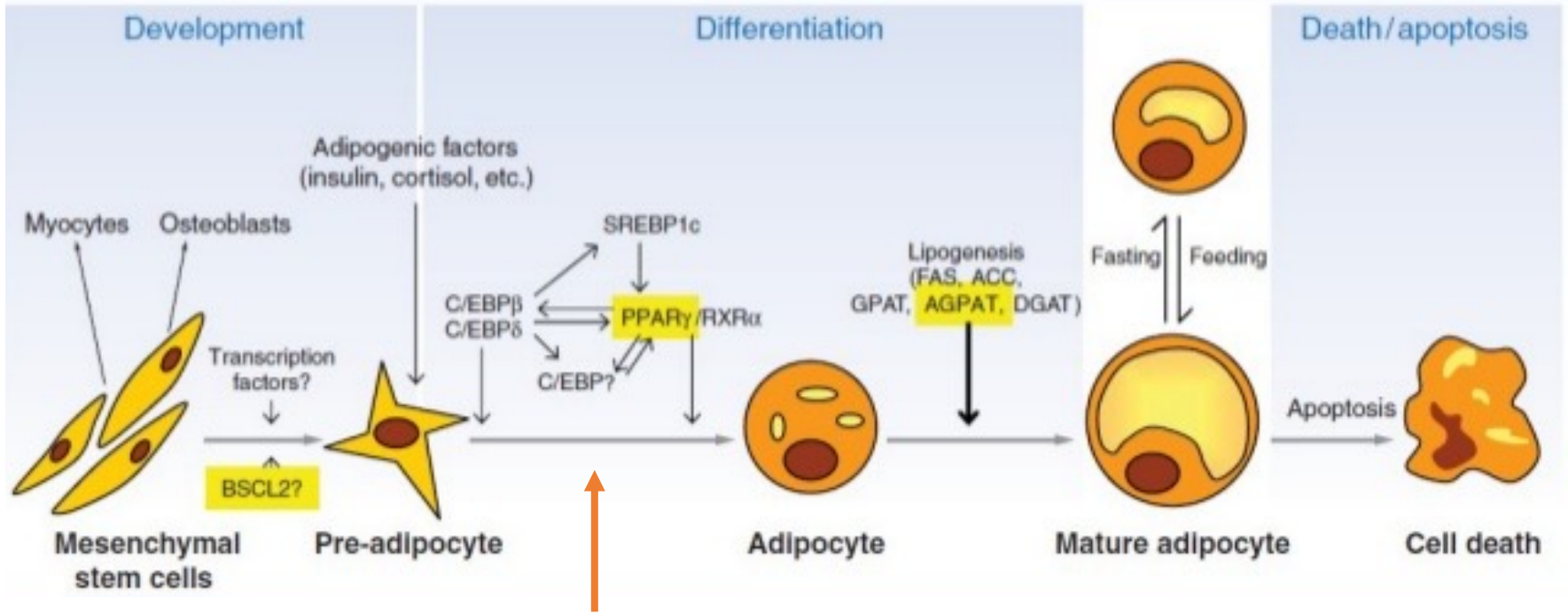
journal homepage: www.elsevier.com/locate/jsbmb

Review

Physiological functions of Vitamin D in adipose tissue

Manal A. Abbas

Efecto de la Vitamina D en la Adipogenesis



Vita D

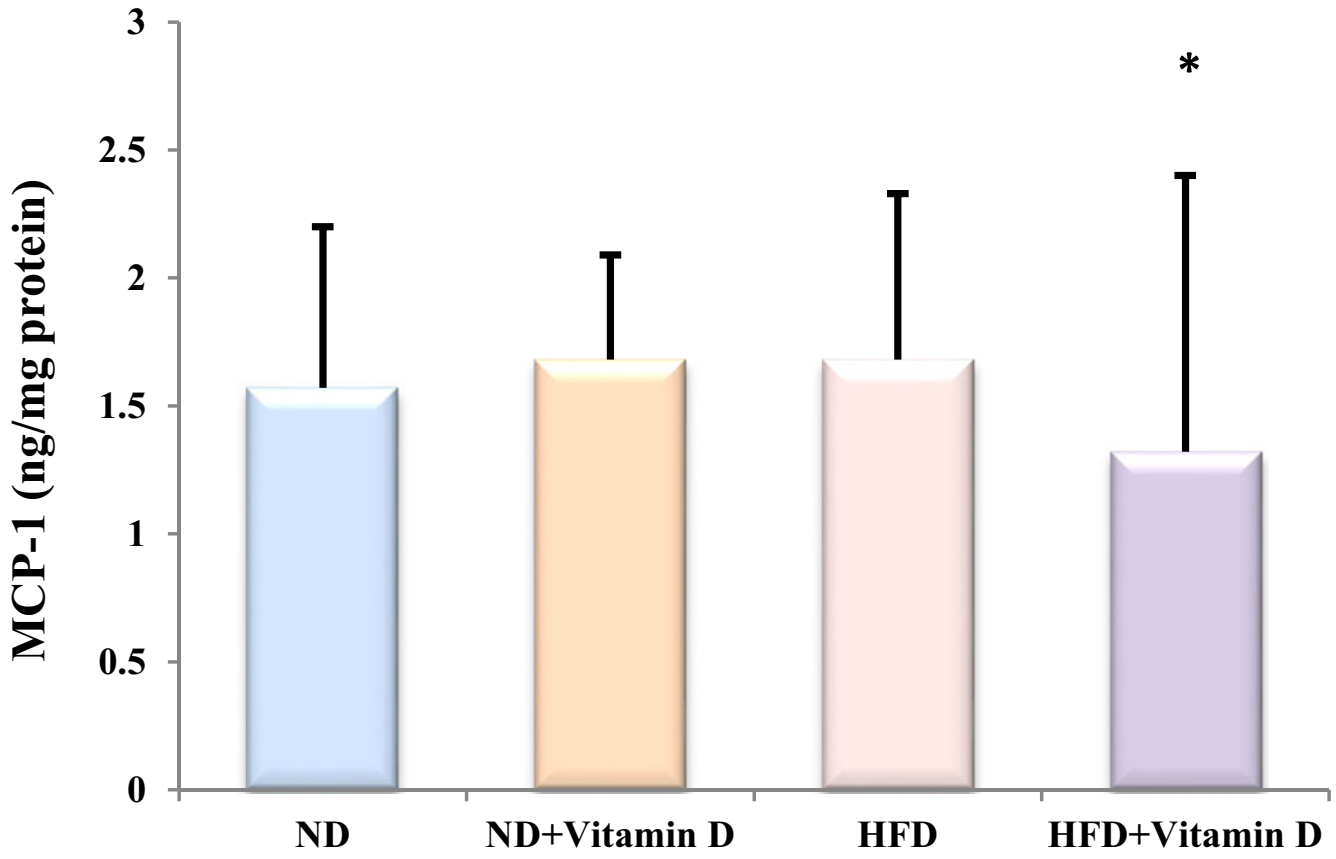
Inflammation (© 2017)
DOI: 10.1007/s10753-017-0610-9

ORIGINAL ARTICLE

Adipose Tissue Inflammation and Oxidative Stress: the Ameliorative Effects of Vitamin D

Mahdieh Abbasalizad Farhangi,[1,5] Mehran Mesgari-Abbasi,[1] Ghazaleh Hajiluian,[2] Ghazaleh Nameni,[3] and Parviz Shahabi[4]

Monocyte Chemoattractant Protein (MCP)-1



INFLAMMATION, 3 July 2017

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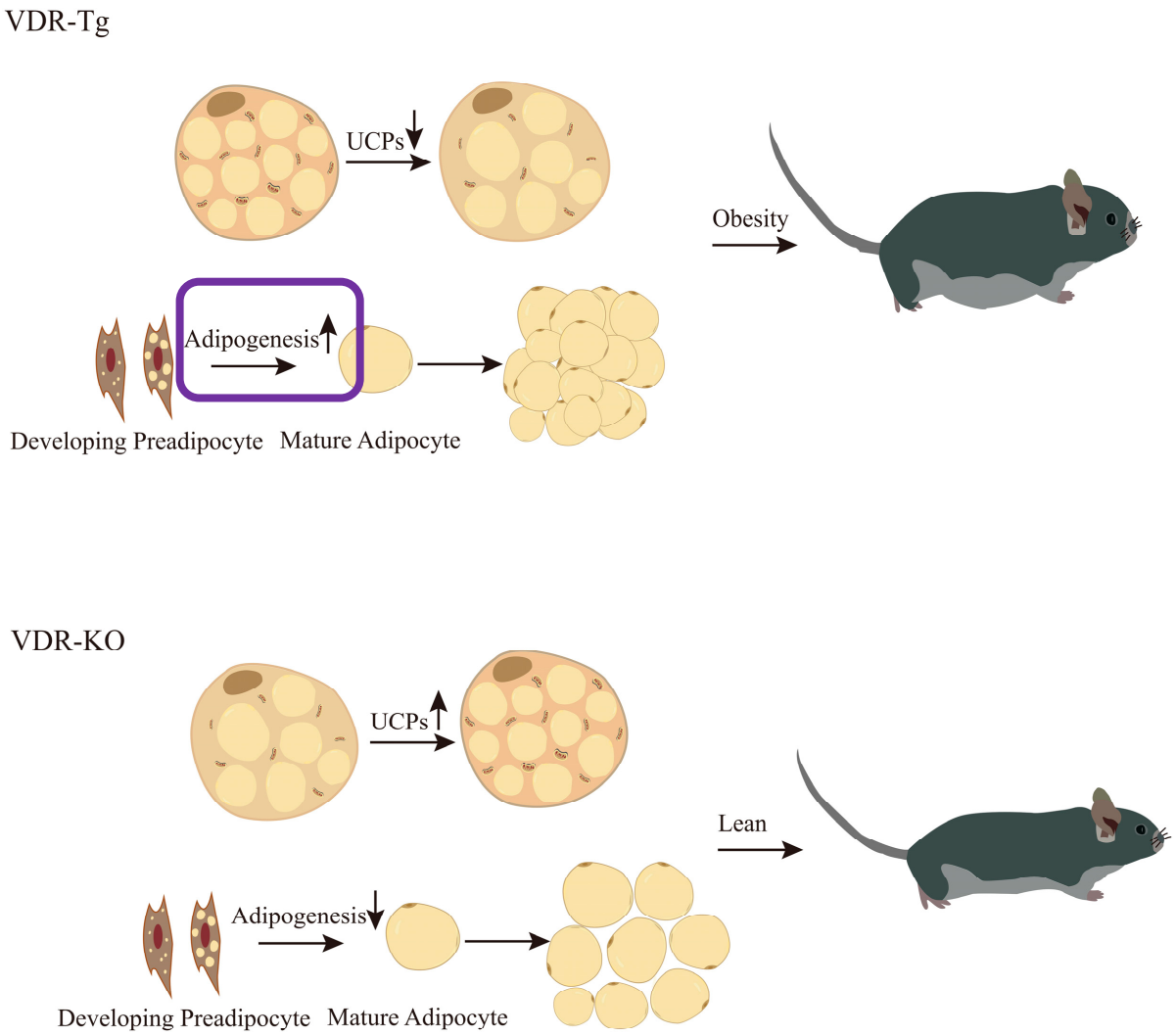
Review

Interplay between Vitamin D and Adipose Tissue: Implications for Adipogenesis and Adipose Tissue Function

Shiqi Lu and Zhen-Bo Cao *



Mecanismos de protección celular de baja energía celular, para guardar exceso energía para futuras ocasiones

mTOR	ChREBP	GOAT	AMPK	Sirtuínas
a.a. Ramificados (leucina)	Glucosa	Ácidos Grasos Cadena media	Energía	NAD+/NADH

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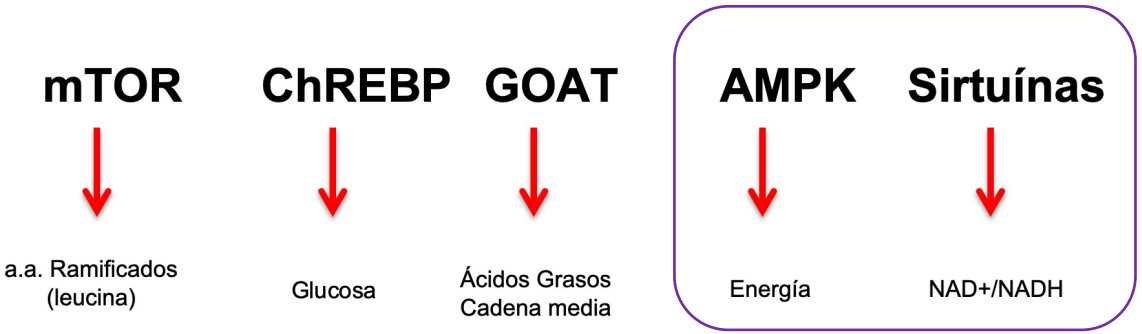
Article

Vitamin D Insufficiency Exacerbates Adipose Tissue Macrophage Infiltration and Decreases AMPK/SIRT1 Activity in Obese Rats

Eugene Chang and Yangha Kim *

Nutrients **2017**, 9, 338; doi:10.3390/nu9040338

Mecanismos de protección celular de baja energía celular, para guardar exceso energía para futuras ocasiones



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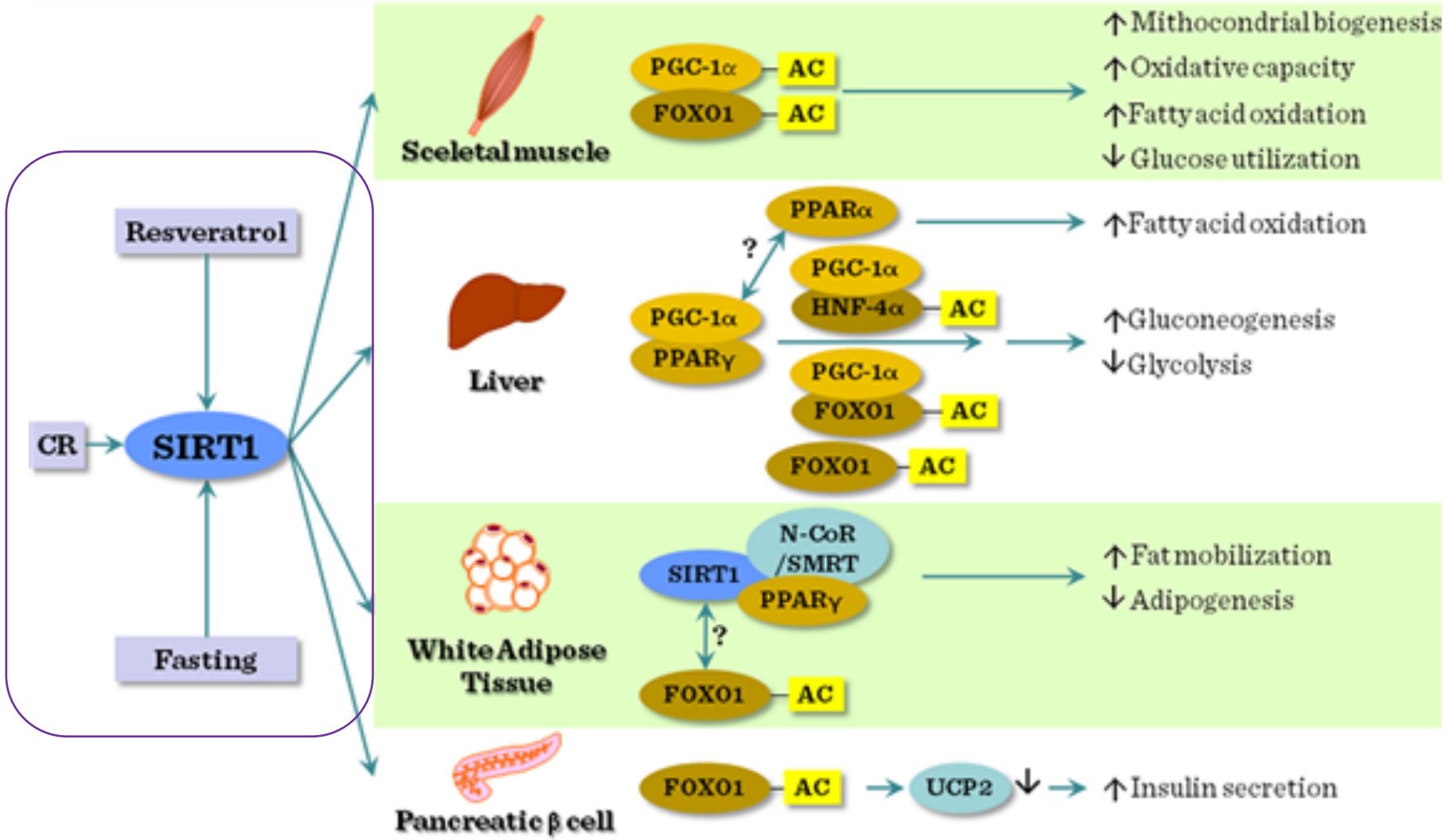
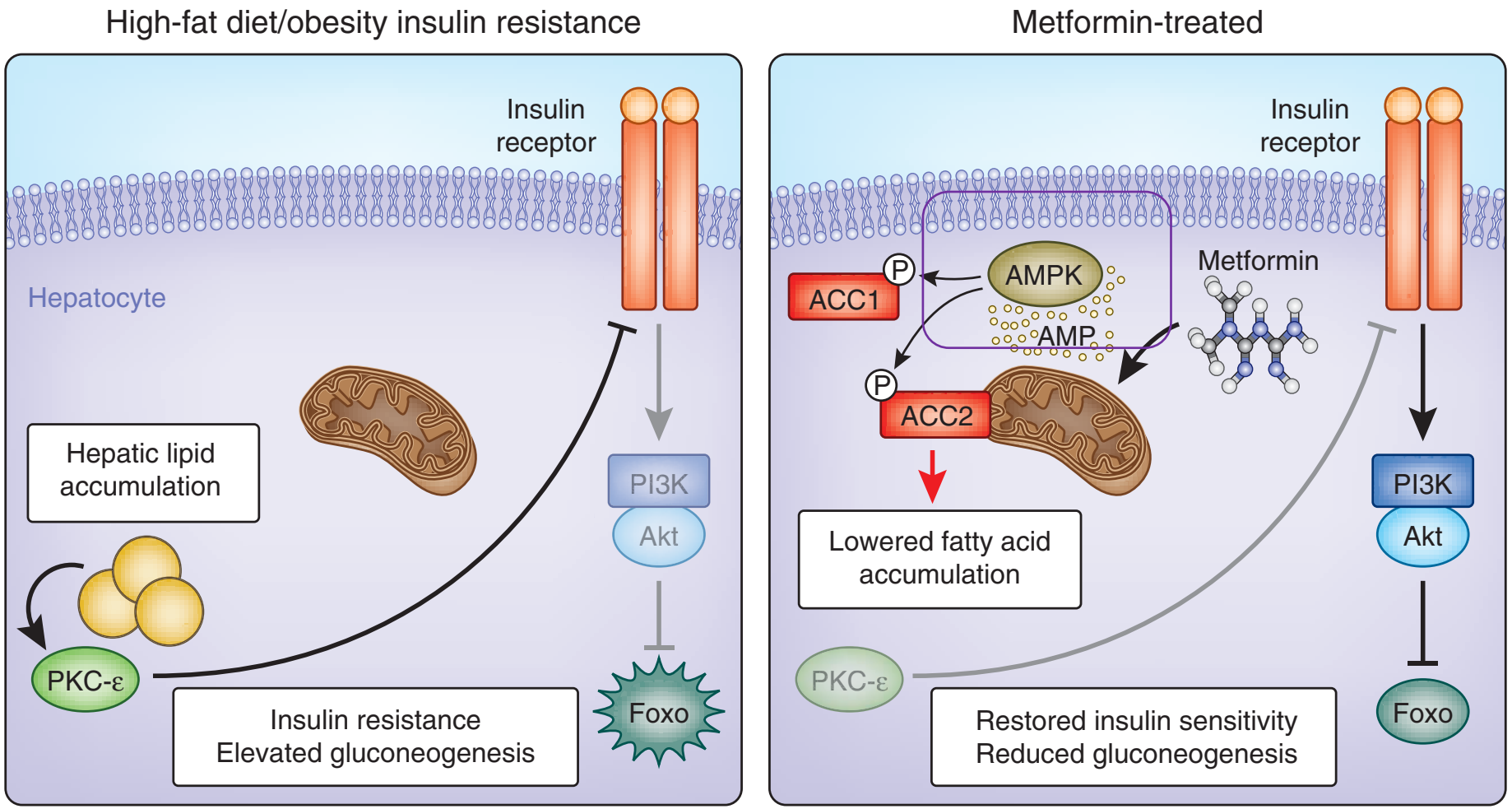
Sirtuinas


Resveratrol
CR
SIRT1
Fasting
Sceletal muscle
PGC-1α
AC
FOXO1
AC
↑Mithocondrial biogenesis
↑Oxidative capacity
↑Fatty acid oxidation
↓Glucose utilization
Liver
PPARα
?
PGC-1α
PPARγ
PGC-1α
HNF-4α
AC
PGC-1α
FOXO1
AC
FOXO1
AC
↑Fatty acid oxidation
↑Gluconeogenesis
↓Glycolysis
White Adipose Tissue
N-CoR /SMRT
SIRT1
PPARγ
?
FOXO1
AC
↑Fat mobilization
↓Adipogenesis
Pancreatic β cell
FOXO1
AC
UCP2
↑Insulin secretion


High-fat diet/obesity insulin resistance
Insulin receptor
Hepatocyte
Hepatic lipid accumulation
PI3K
Akt
PKC-ε
Foxo
Insulin resistance
Elevated gluconeogenesis
Metformin-treated
Insulin receptor
Metformin
AMPK
AMP
P
ACC1
P
ACC2
Lowered fatty acid accumulation
PI3K
Akt
PKC-ε
Foxo
Restored insulin sensitivity
Reduced gluconeogenesis

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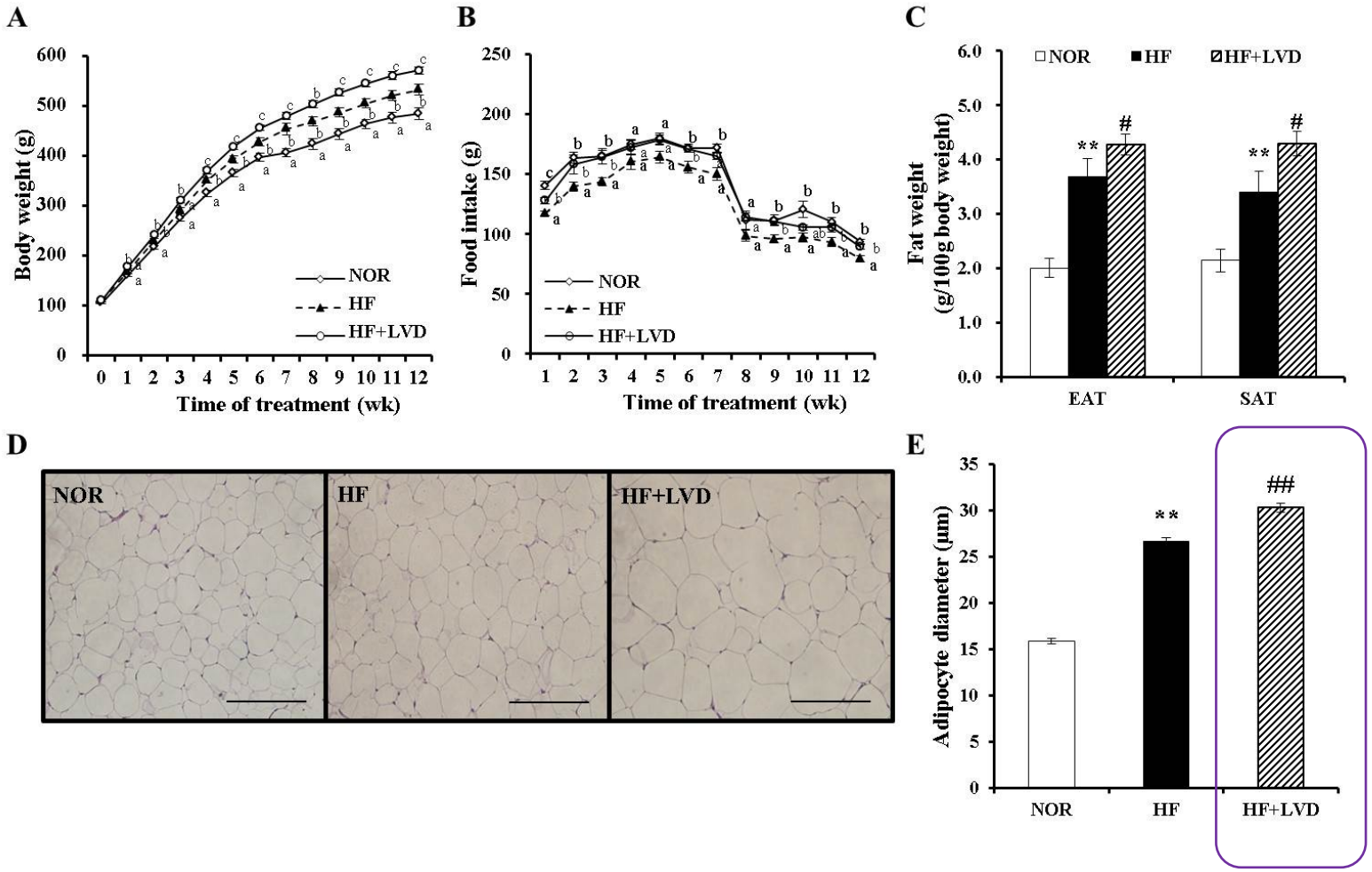
Article

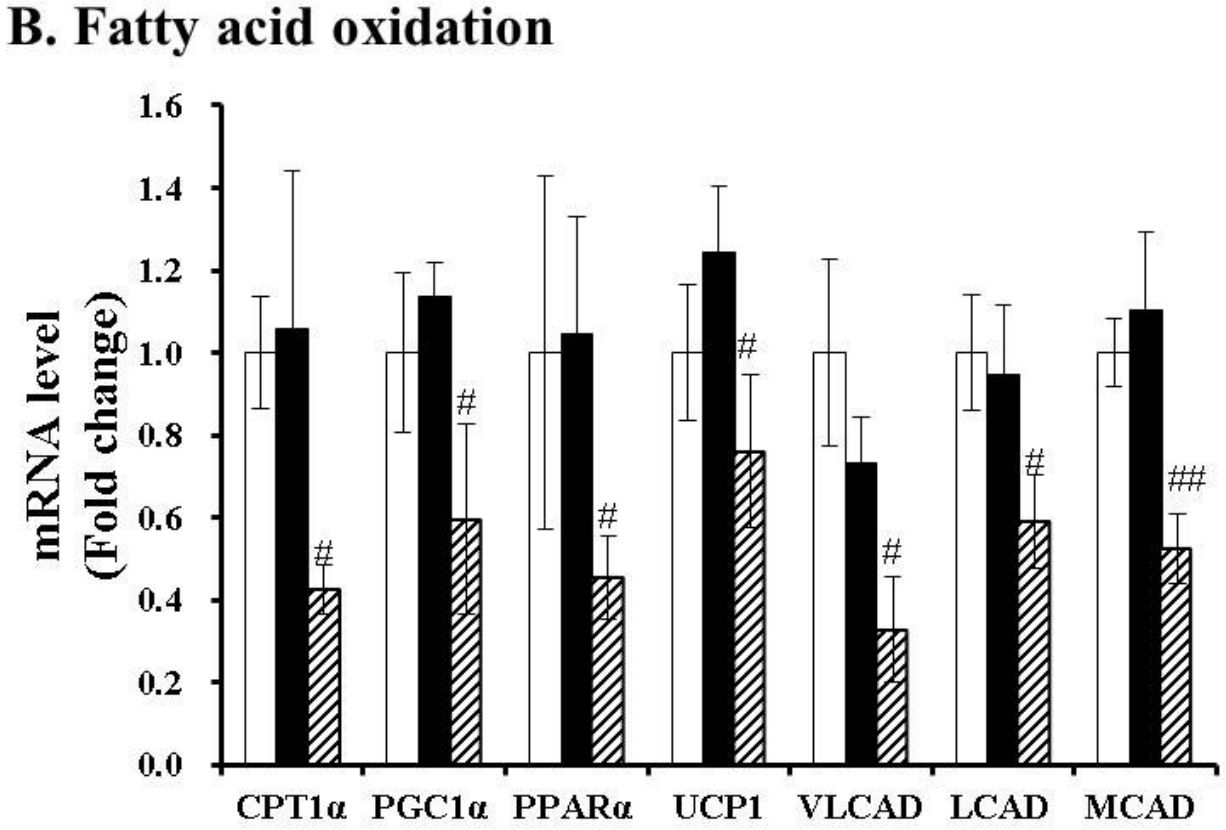
Vitamin D Insufficiency Exacerbates Adipose Tissue Macrophage Infiltration and Decreases AMPK/SIRT1 Activity in Obese Rats

Eugene Chang and Yangha Kim *



1000 UI/Kg

#p<0.05;##p<0.01compared to HF



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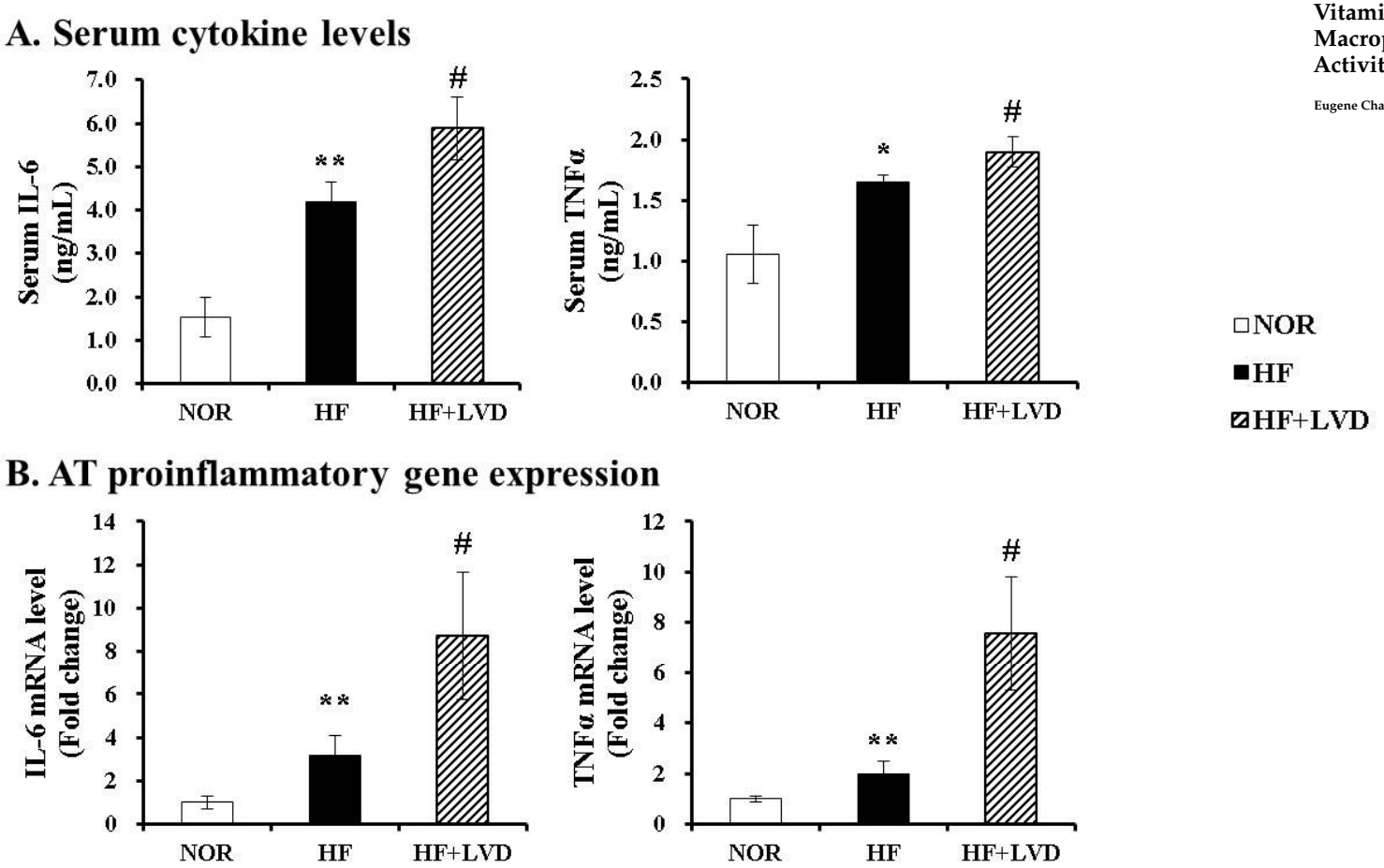

#*p*<0.05;##*p*<0.01compared to HF

Crown-Like Structure (CLS) Quantification monoclonal anti-mouse F4/80 antibody

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Article

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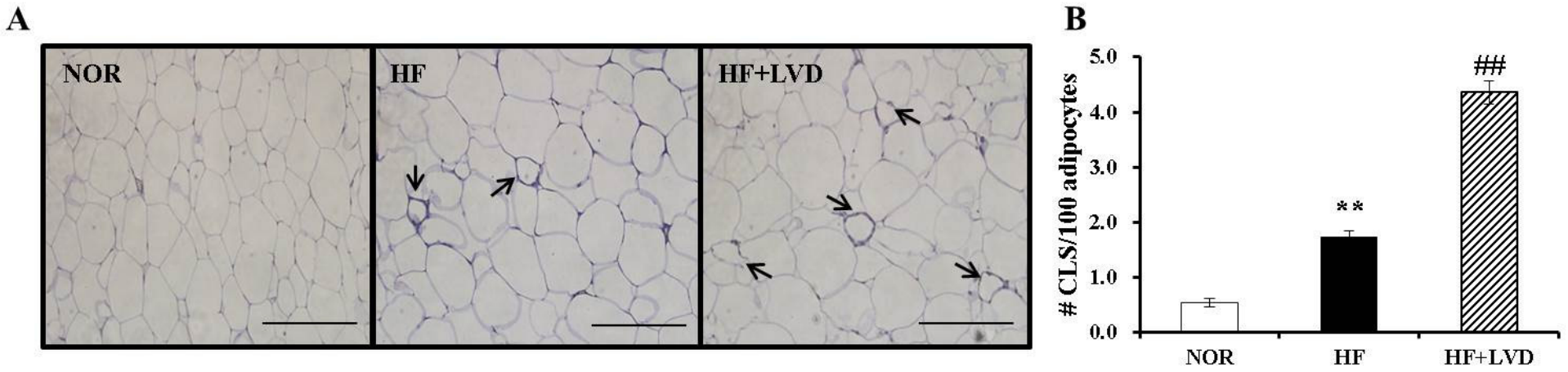

#*p*<0.05;##*p*<0.01compared to HF

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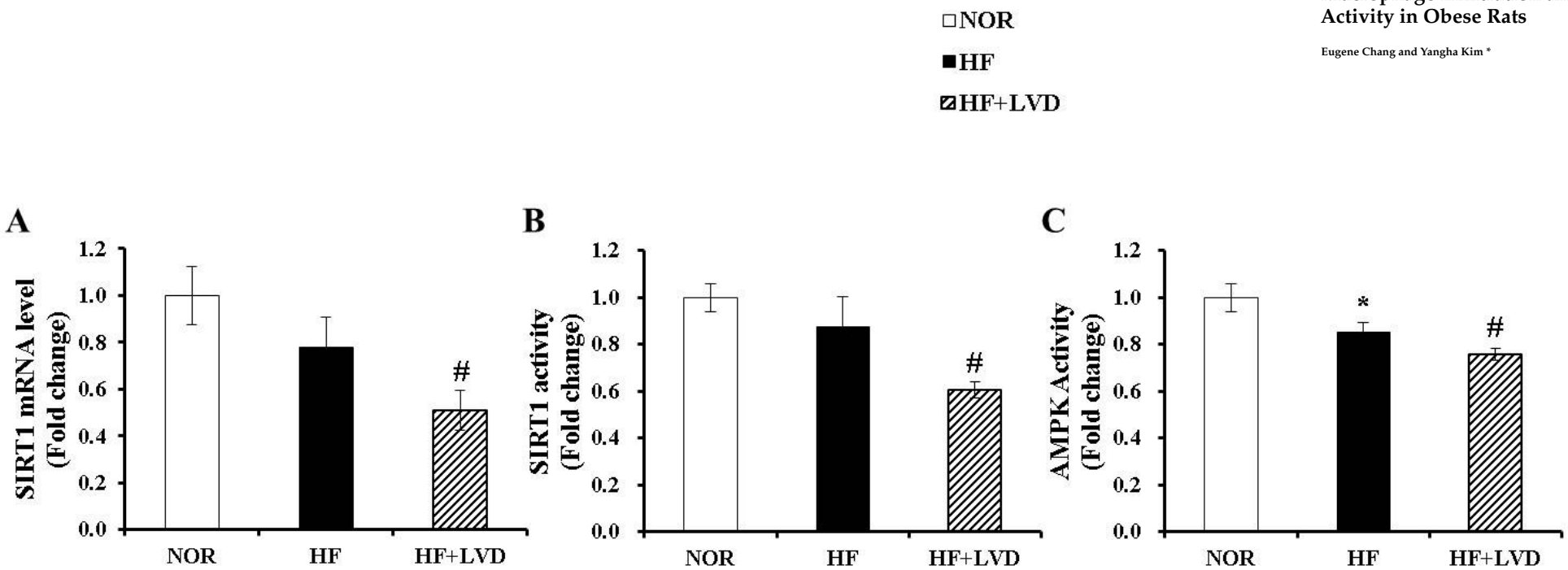

#*p*<0.05;##*p*<0.01compared to HF

Nutrition Research 133 (2025) 148–160

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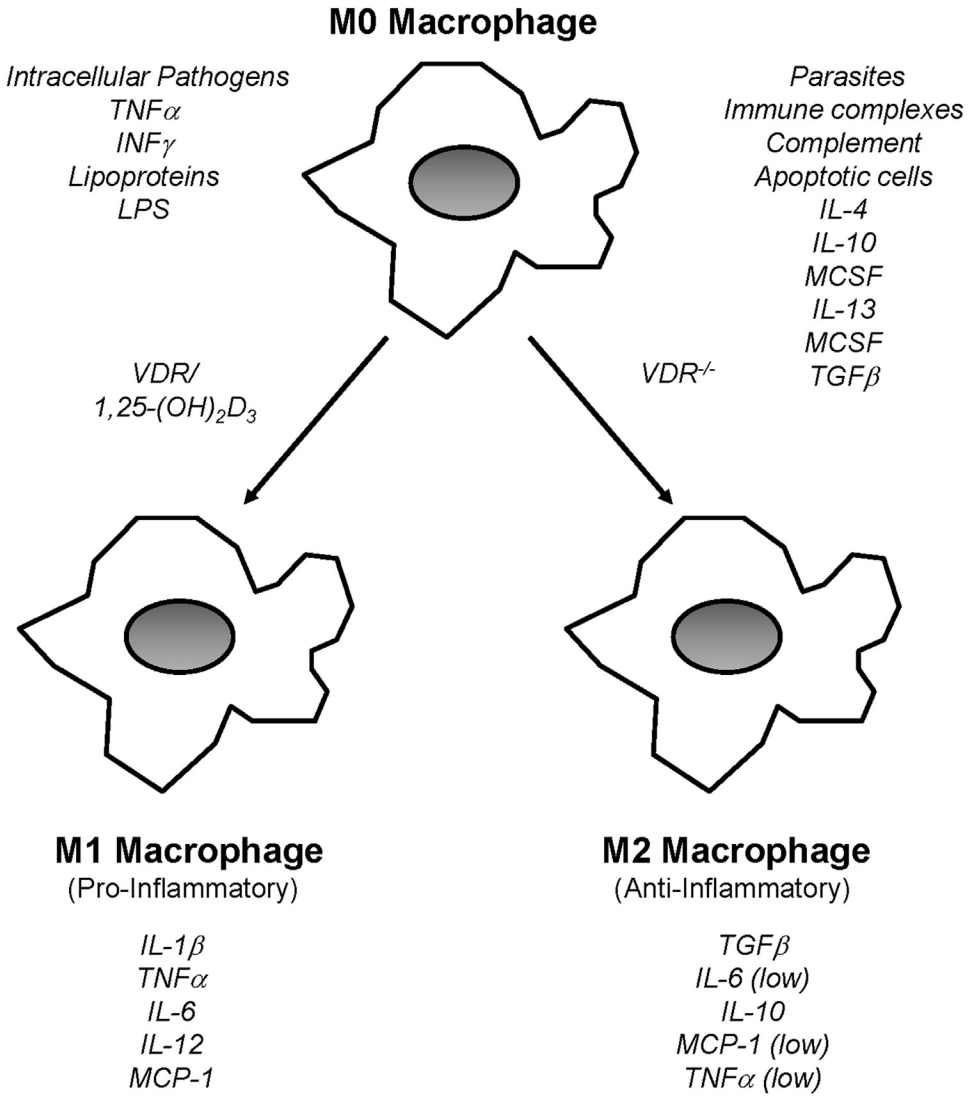
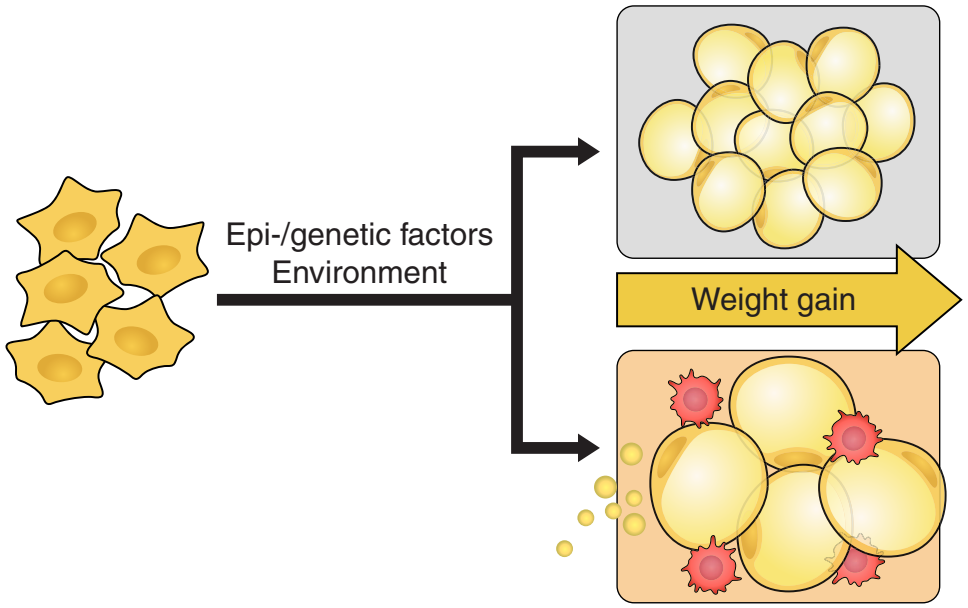
Review

Vitamin D, immune function, and atherosclerosis. Where are we now?

Ailyn Rivero, Kent R. Wehmeier, Michael J. Haas, Arshag D. Mooradian*



Adipogénesis



Adipocyte hyperplasia
Normal adipocyte function
and lipid storage
Healthy metabolism

Adipocyte hypertropy
↓Adipogenesis
Adipose tissue dysfunction and inflammation
Impaired lipid storage capacity
Adverse secretome and cross-talk with other tissues
Etopic lipid accumulation

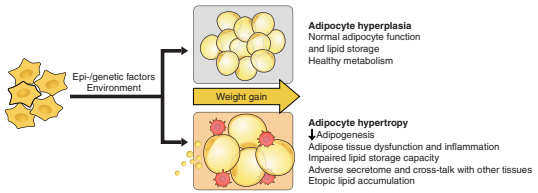
Lipogénesis

Sin R.I

Con R.I

1908

Adipogénesis



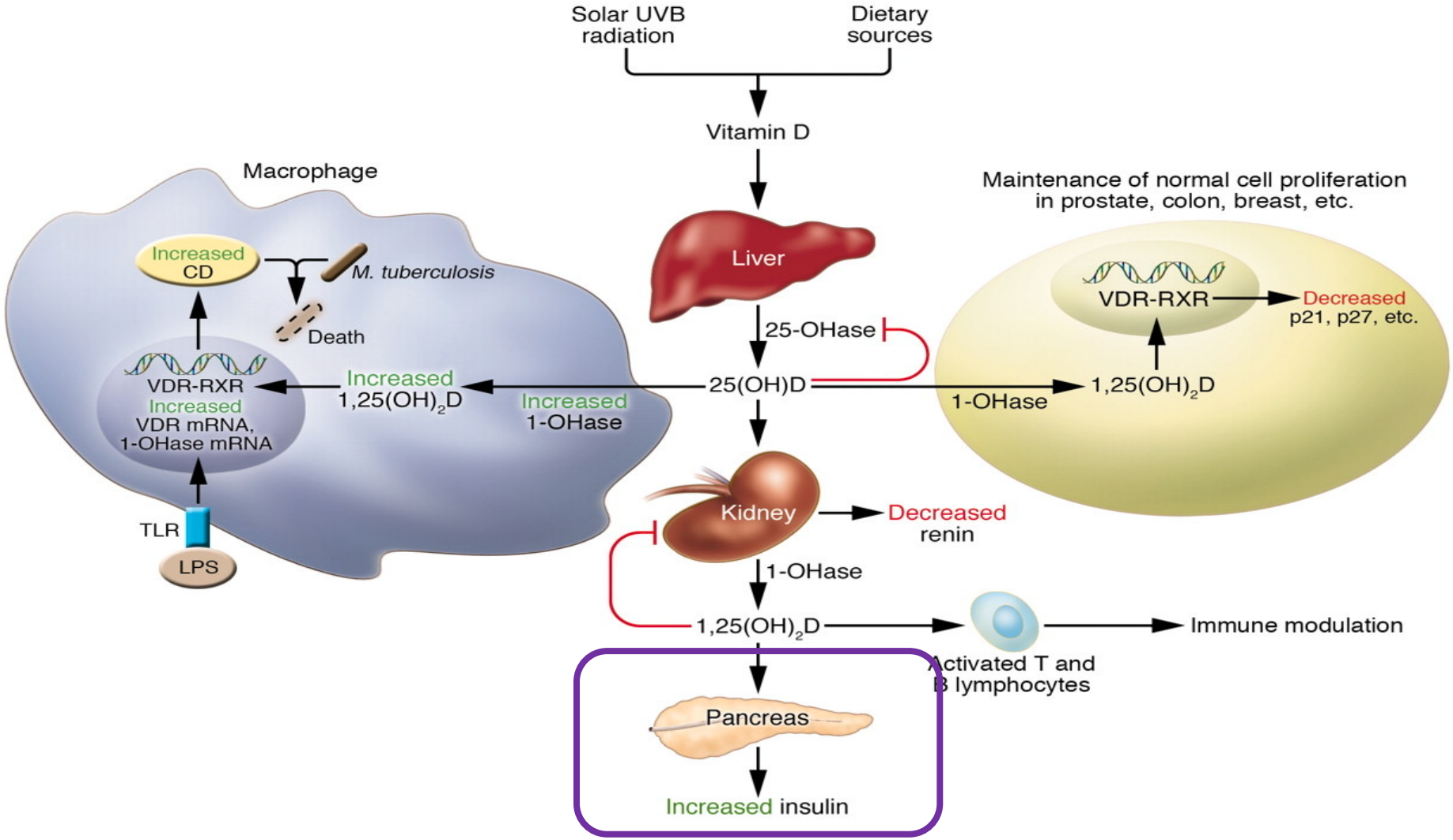
Lipogénesis

Sin R.I

Con R.I

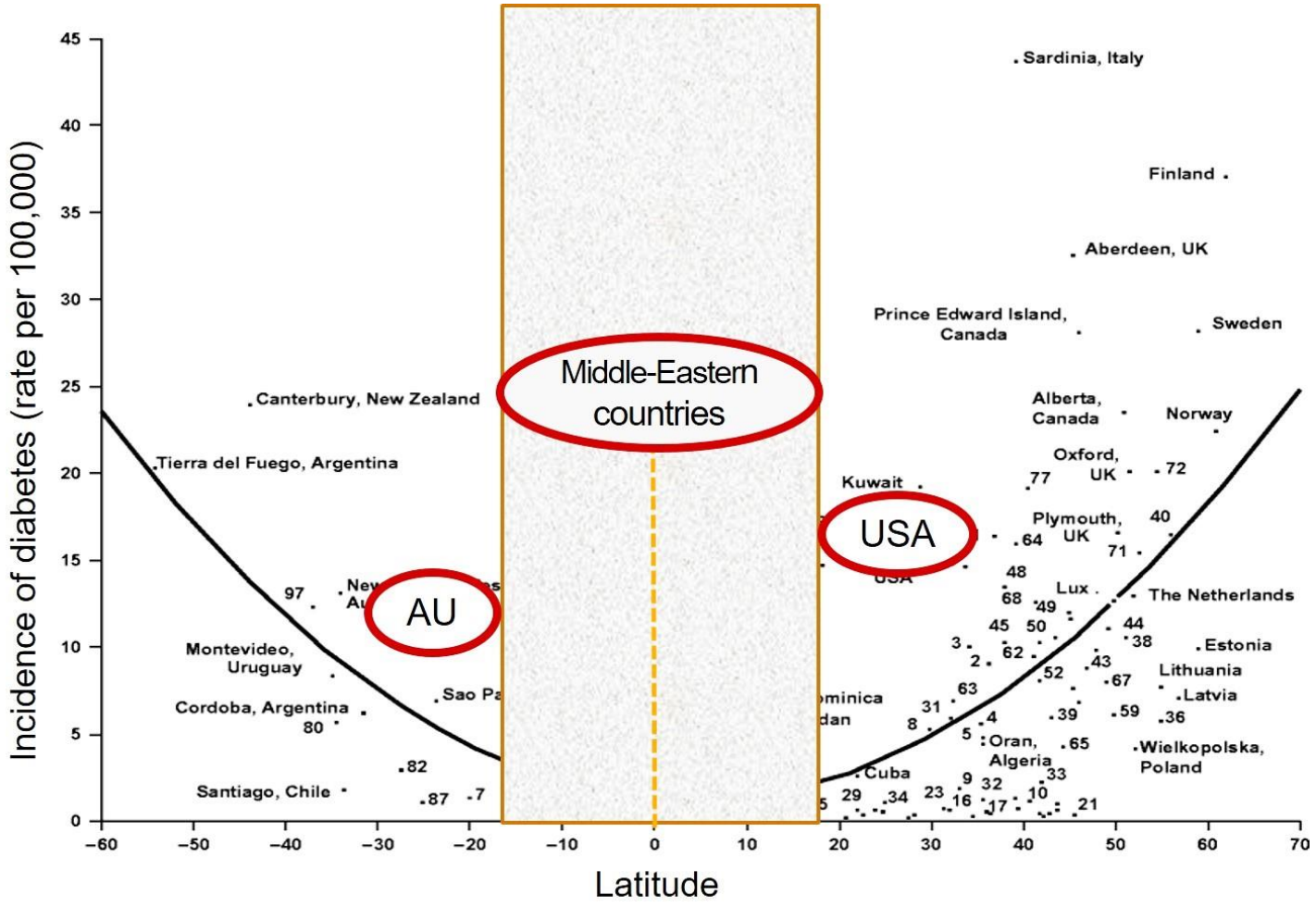
Vit D

Vit D



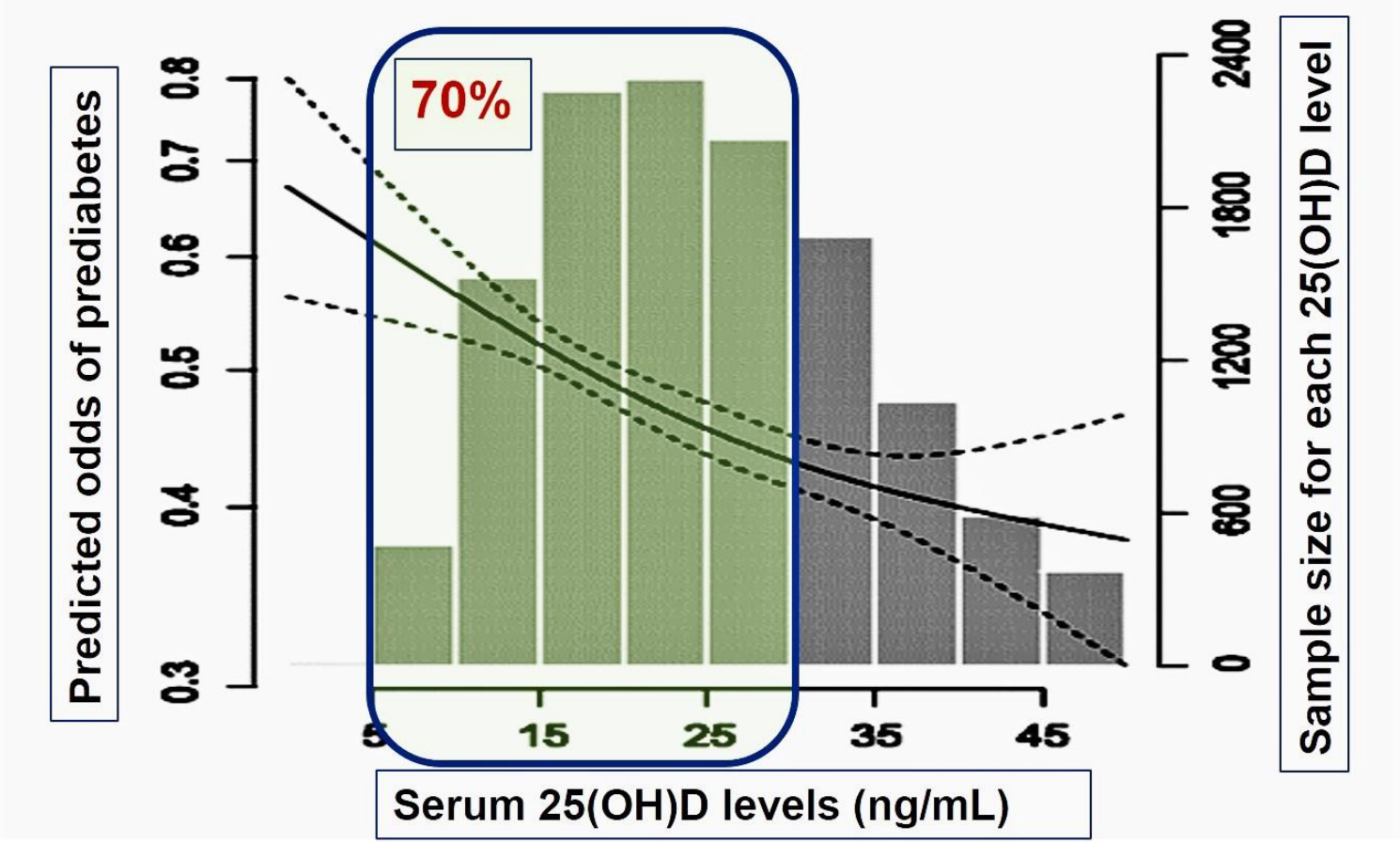
Holick, M. F. J. Clin. Invest. 2006;116:2062-2072

Incidencia de Diabetes tipo 2



Journal of Steroid Biochemistry & Molecular Biology Volume 175, January 2018, Pages 177-189

Las personas sanas con niveles bajos de 25(OH)D en suero presentan una mayor prevalencia de prediabetes.



Journal of Steroid Biochemistry & Molecular Biology Volume 175, January 2018, Pages 177-189

Vitamin D Supplementation, Glycemic Control, and Insulin Resistance in Prediabetics: A Meta-Analysis

Naghmeh Mirhosseini,[1] Hassanali Vatanparast,[2] Mohsen Mazidi,[3,4] and Samantha M. Kimball[1,5]

HbA1c

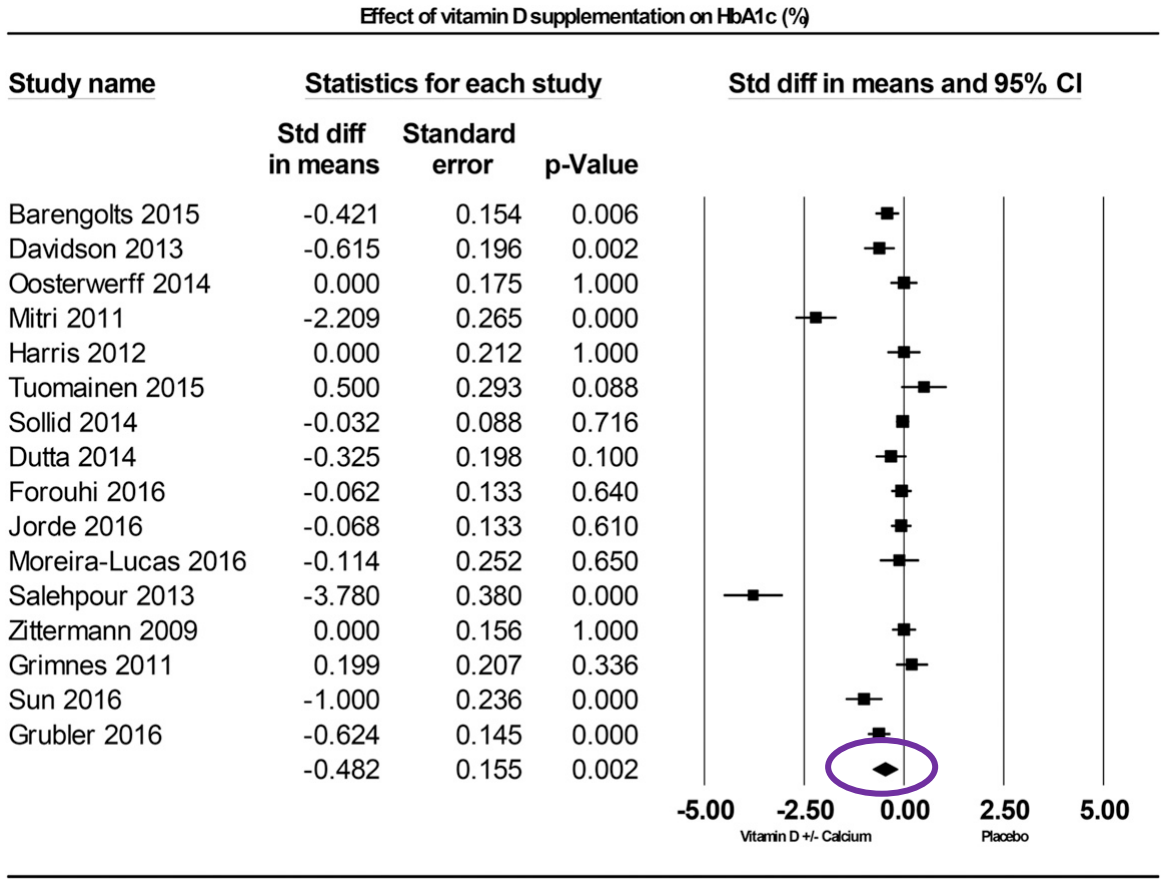


Figure 3. Forest plot of mean change from baseline in HbA1c (%) between vitamin D supplementation and control.

Vitamin D Supplementation, Glycemic Control, and Insulin Resistance in Prediabetics: A Meta-Analysis

Naghmeh Mirhosseini,[1] Hassanali Vatanparast,[2] Mohsen Mazidi,[3,4] and Samantha M. Kimball[1,5]

Glucosa ayunas

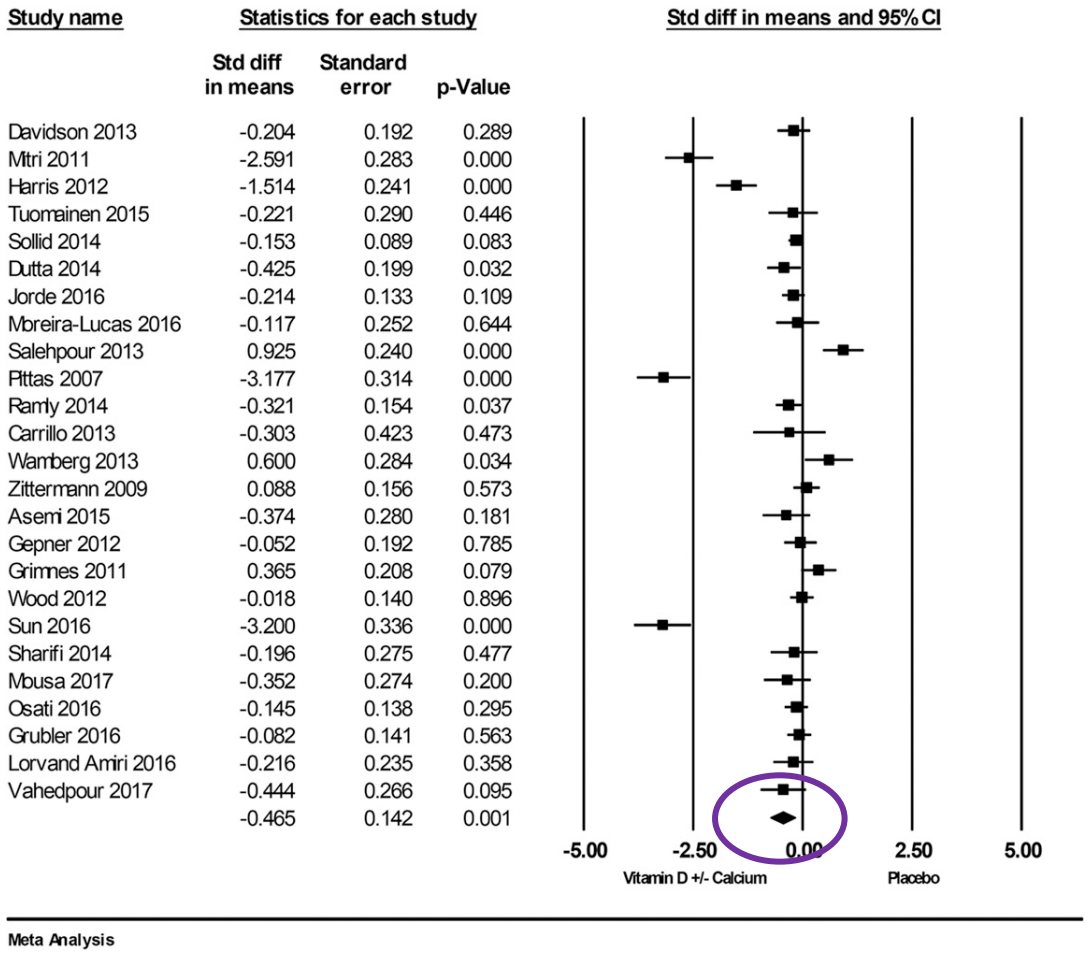


Figure 4. Forest plot of mean change from baseline in FPG (mmol/L) between vitamin D supplementation and control.

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Naghmeh Mirhosseini,[1] Hassanali Vatanparast,[2] Mohsen Mazidi,[3,4] and Samantha M. Kimball[1,5]

HOMA-IR

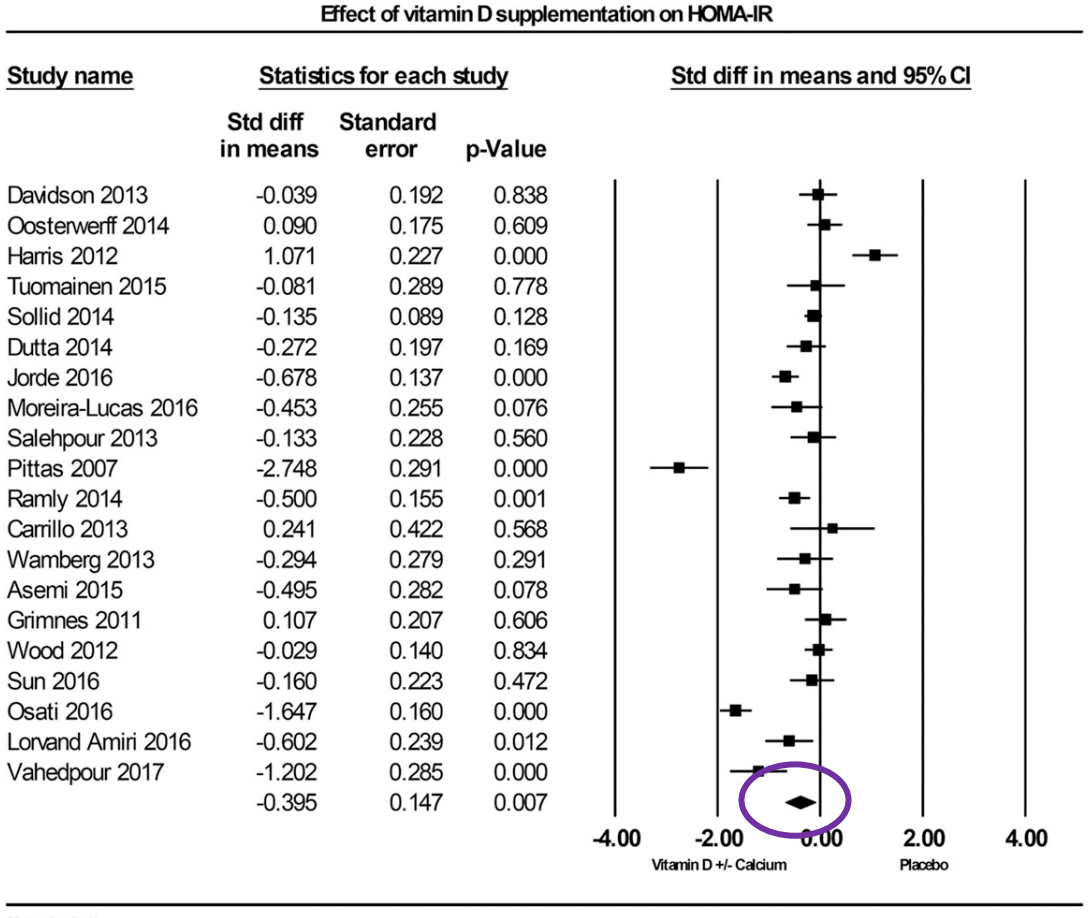


Figure 5. Forest plot of mean change from baseline in HOMA-IR between vitamin D supplementation and control.

Vitamin D Supplementation, Glycemic Control, and Insulin Resistance in Prediabetics: A Meta-Analysis

Naghmeh Mirhosseini,[1] Hassanali Vatanparast,[2] Mohsen Mazidi,[3,4] and Samantha M. Kimball[1,5]

Glucosa pos 2h

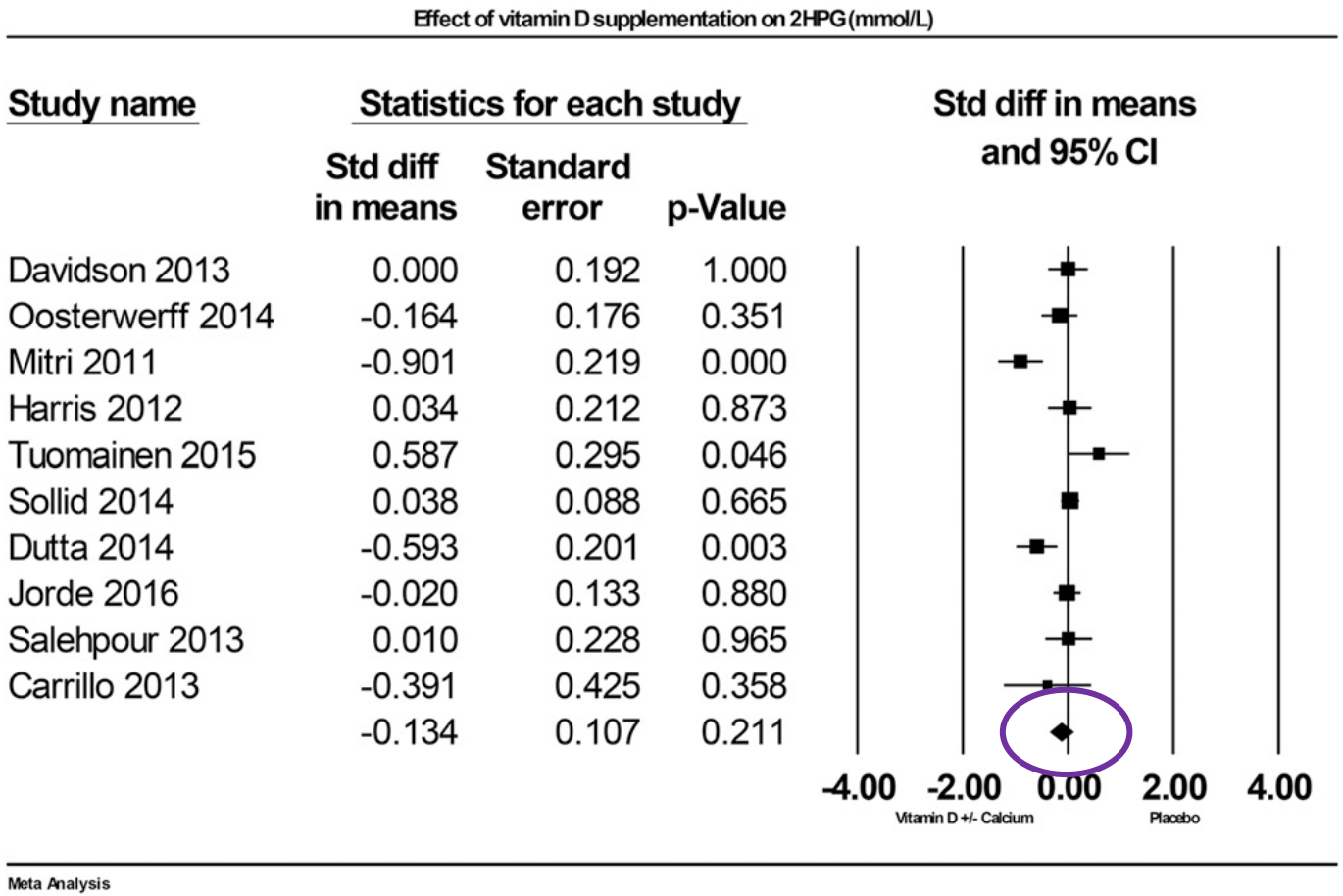


Figure 6. Forest plot of mean change from baseline in plasma glucose after 2HPG (mmol/L) between vitamin D supplementation and control.

Annals of Internal Medicine

REVIEW

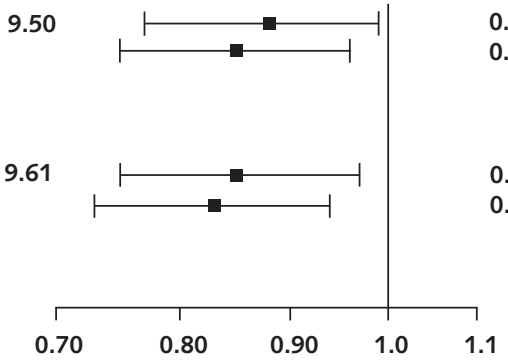
Vitamin D and Risk for Type 2 Diabetes in People With Prediabetes

A Systematic Review and Meta-analysis of Individual Participant Data From 3 Randomized Clinical Trials

Anastassios G. Pittas, MD, MS; Tetsuya Kawahara, MD, PhD; Rolf Jorde, MD, PhD; Bess Dawson-Hughes, MD; Ellen M. Vickery, MS; Edith Angellotti, MD; Jason Nelson, MPH; Thomas A. Trikalinos, MD; and Ethan M. Balk, MD, MPH

Figure 1. Effect of vitamin D on new-onset diabetes among adults with prediabetes.

Population	Vitamin D		Placebo		Hazard Ratio (95% CI)
	Events/ Participants, *n*/*N*	Rate per 100 Person-Years	Events/ Participants, *n*/*N*	Rate per 100 Person-Years	
All participants, intention-to-treat analysis					
Unadjusted	475/2097	8.42	524/2093	9.50	0.88 (0.77–0.99)
Adjusted					0.85 (0.75–0.96)
All participants, secondary analysis					
Unadjusted	447/2097	8.26	505/2093	9.61	0.85 (0.75–0.97)
Adjusted					0.83 (0.73–0.94)



Secondary analyses censored follow-up when a participant stopped taking the trial pills, started using a diabetes or weight loss medication, or took vitamin D supplements at a dose above 1000 IU/d outside the study.

Annals of Internal Medicine

REVIEW

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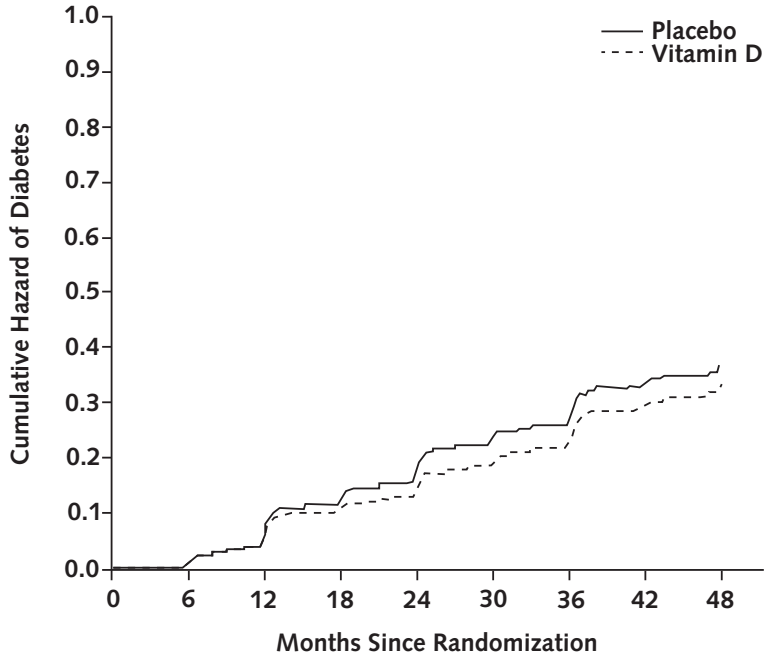
Figure 2. Incidence curves for new-onset diabetes among adults with prediabetes: intention-to-treat analysis.



At risk, *n*

Vitamin D	2097	2040	1908	1745	1527	1298	1105	429	281
Placebo	2093	2032	1900	1714	1488	1239	1050	397	255

Annals of Internal Medicine REVIEW

Vitamin D and Risk for Type 2 Diabetes in People With Prediabetes

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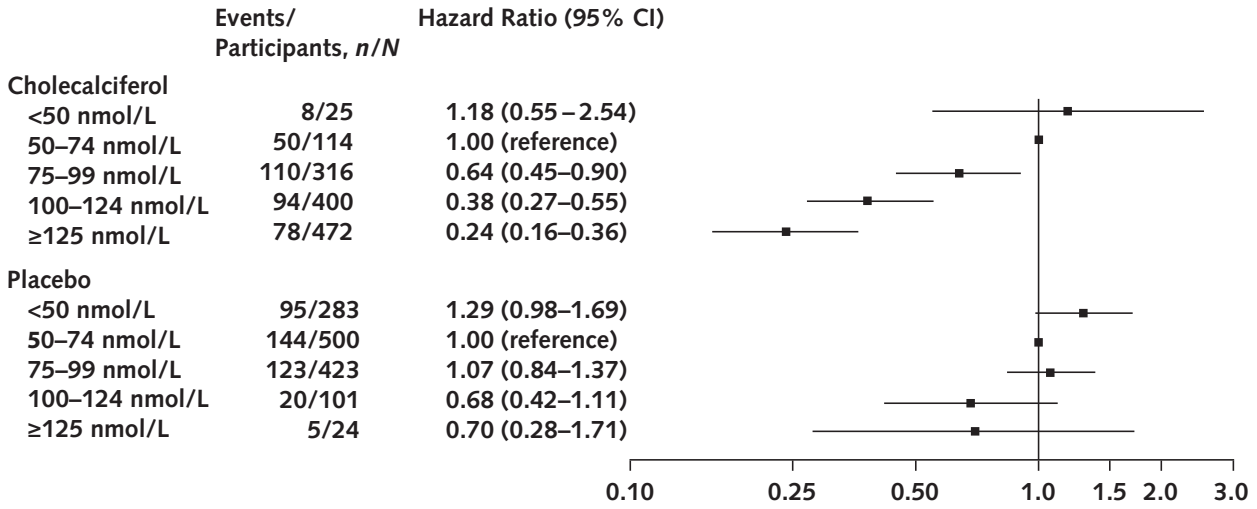
Figure 3. Effect of cholecalciferol on new-onset diabetes among adults with prediabetes according to intratrial cumulative mean serum 25-hydroxyvitamin D level.



Analyses censored follow-up when a participant stopped taking the trial pills, started using a diabetes or weight loss medication, or took vitamin D supplements at a dose above 1000 IU/d outside the study. Details are provided in Supplement Methods 7 (available at Annals.org).

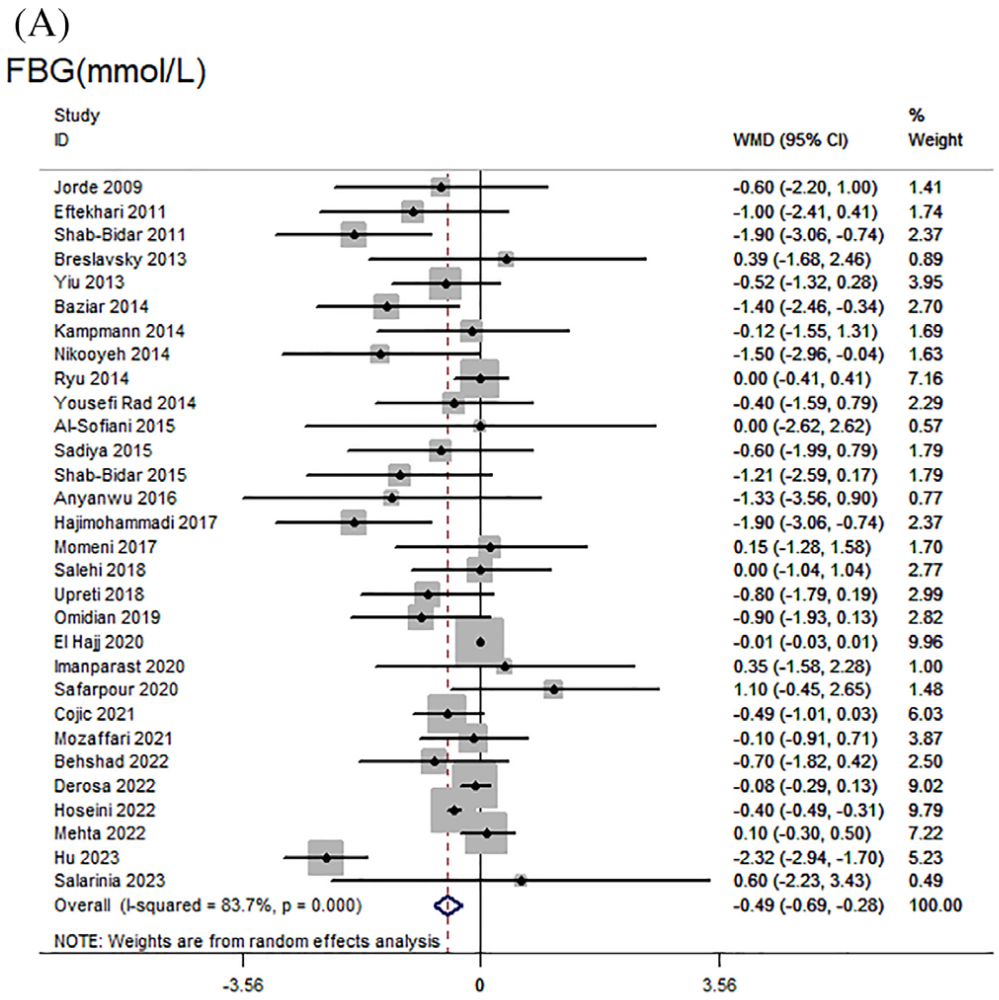
Received: 7 July 2024 | Revised: 15 August 2024 | Accepted: 28 August 2024
DOI: 10.1111/dom.15941

ORIGINAL ARTICLE

WILEY

Efficacy of vitamin D supplementation on glycaemic control in type 2 diabetes: An updated systematic review and meta-analysis of randomized controlled trials

Glucosa ayunas



Diabetes Obes Metab. 2024;26:5713–5726.

Received: 7 July 2024 | Revised: 15 August 2024 | Accepted: 28 August 2024
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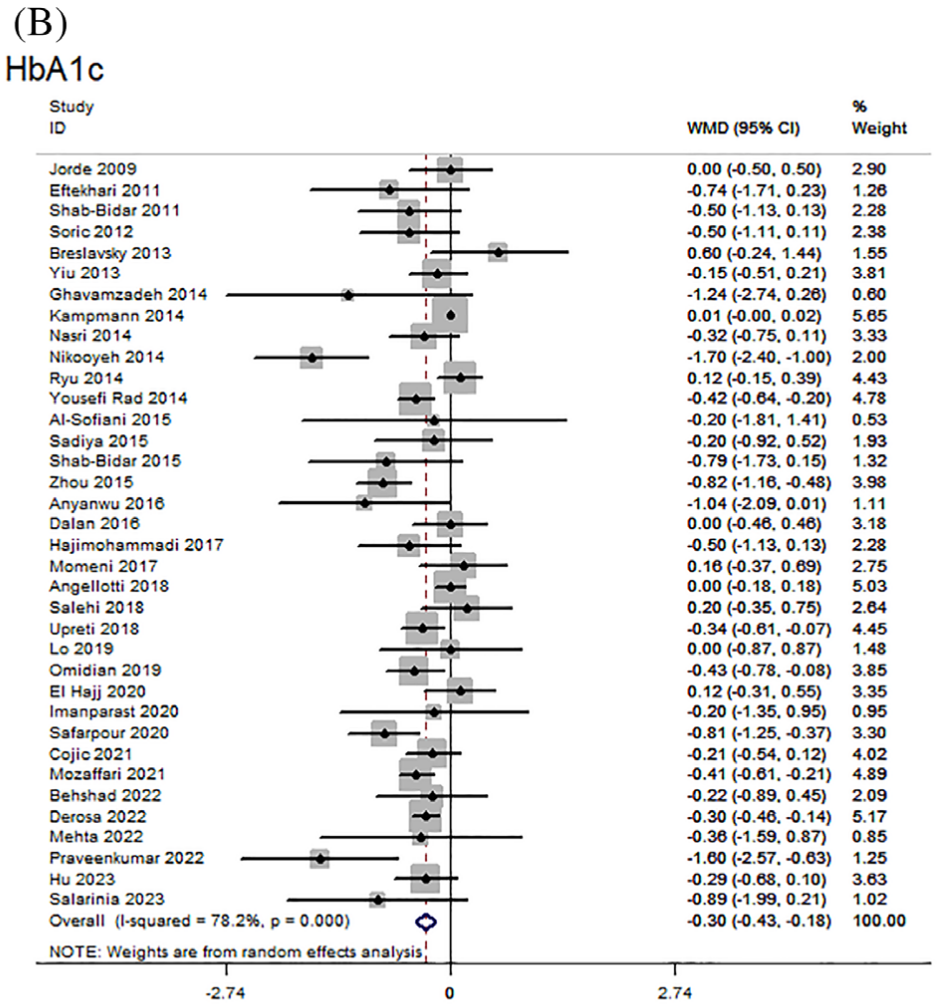
ORIGINAL ARTICLE

WILEY

Efficacy of vitamin D supplementation on glycaemic control in type 2 diabetes: An updated systematic review and meta-analysis of randomized controlled trials

A1c

(B)



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ORIGINAL ARTICLE

WILEY

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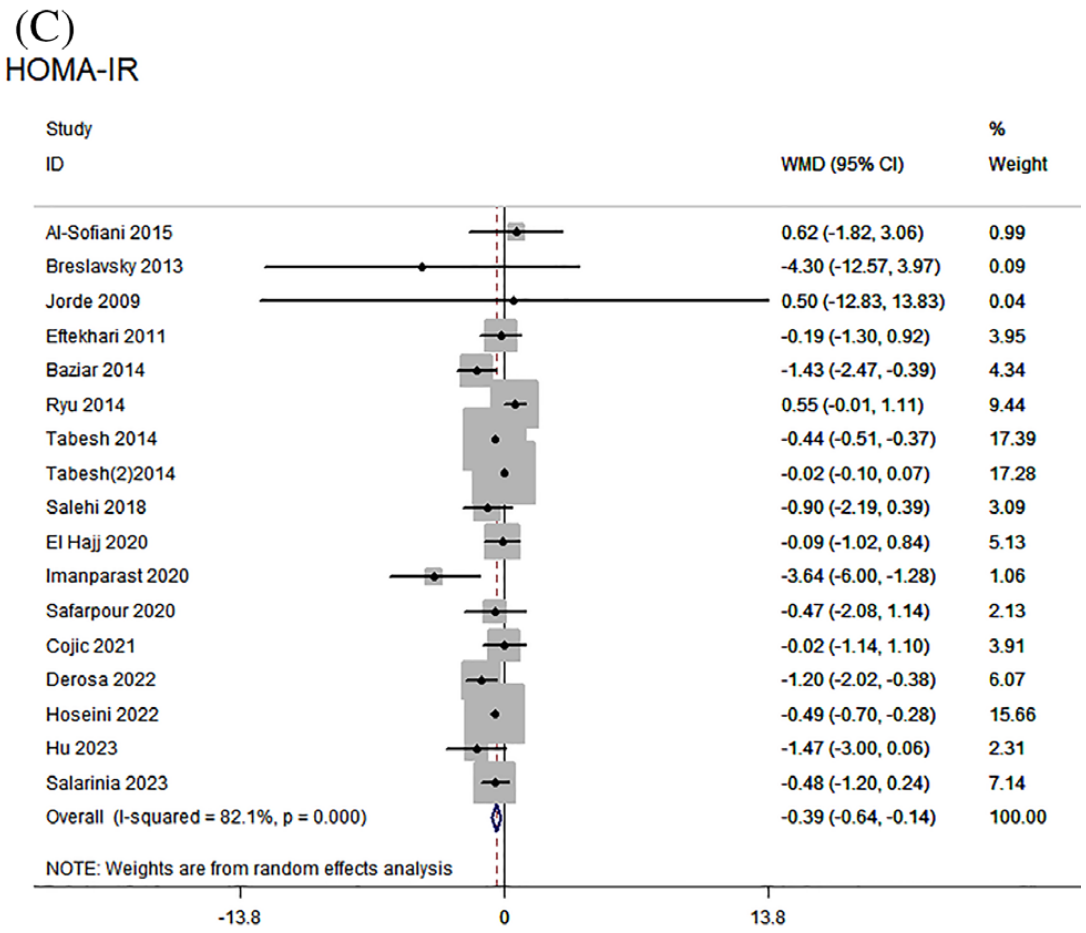
HOMA-IR



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ORIGINAL ARTICLE

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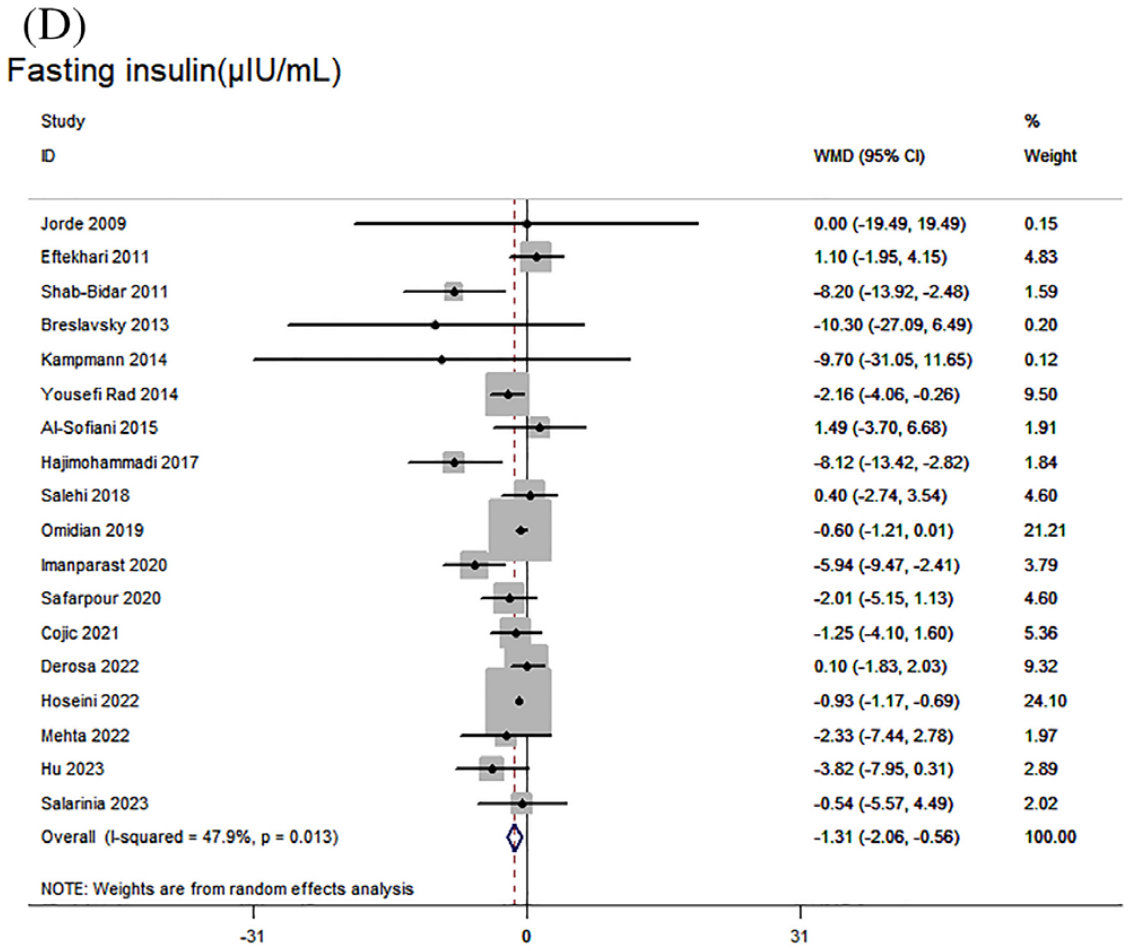
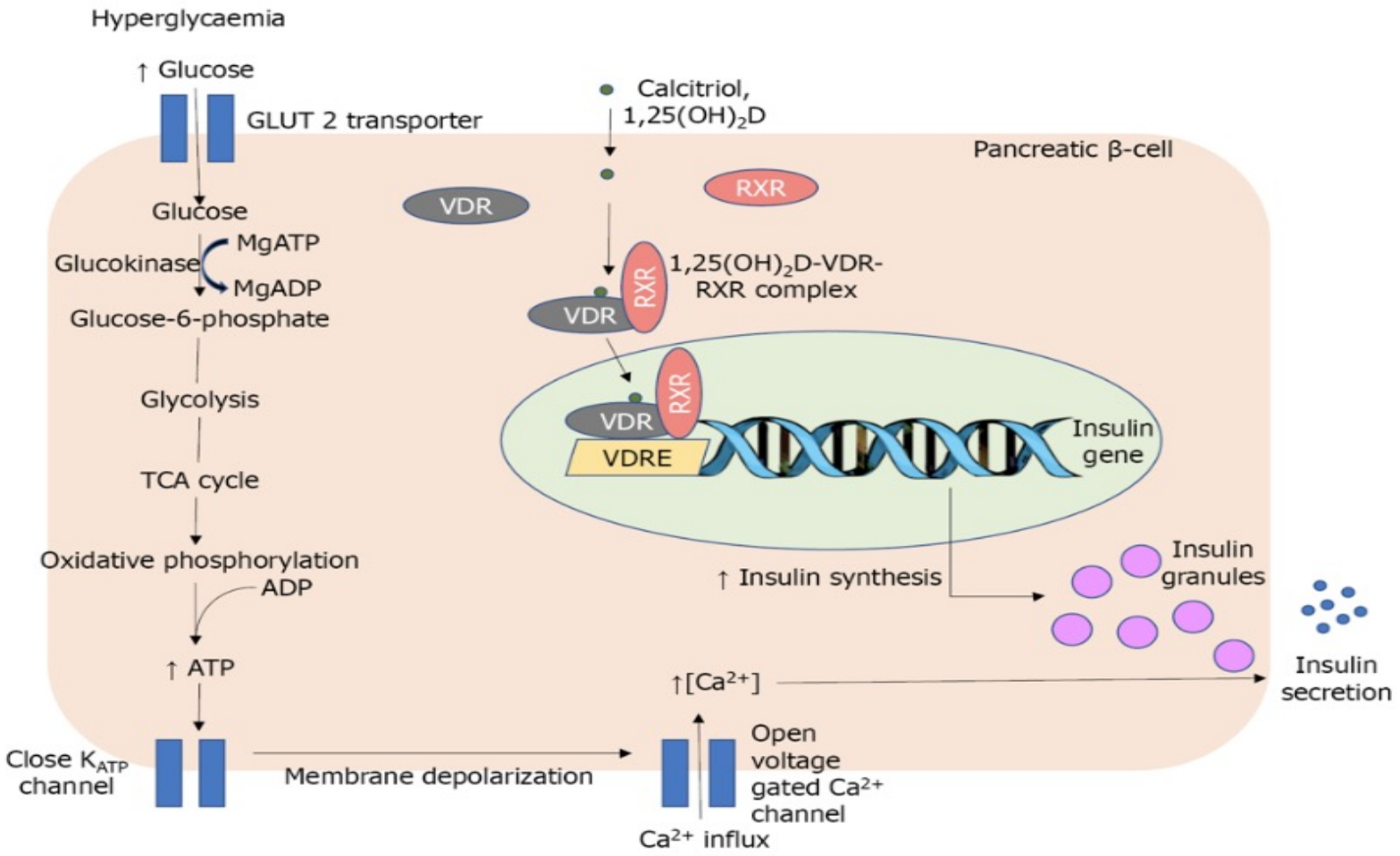
Efficacy of vitamin D supplementation on glycaemic control in type 2 diabetes: An updated systematic review and meta-analysis of randomized controlled trials

Insulina en ayunas

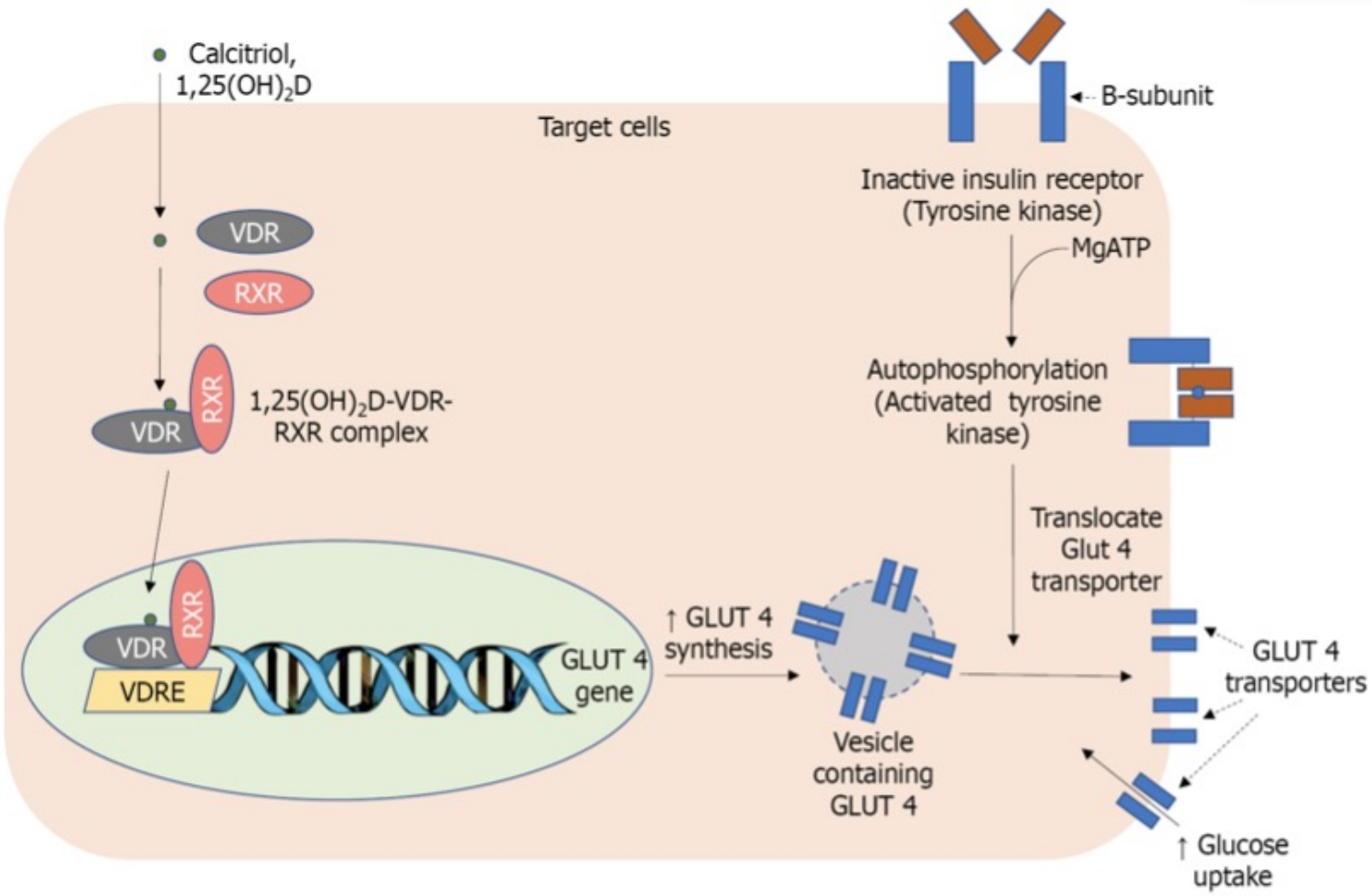


VITAMINA D Y AUMENTO DE LA SECRECION DE INSULINA



World J Diabetes 2023; 14(1): 26-34

VITAMINA D Y AUMENTO DE LA SECRECION DE INSULINA



World J Diabetes 2023; 14(1): 26-34

Contents lists available at ScienceDirect

Archives of Biochemistry and Biophysics

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

Review article

Vitamin D supplementation modulates glycated hemoglobin (HBA1c) in diabetes mellitus

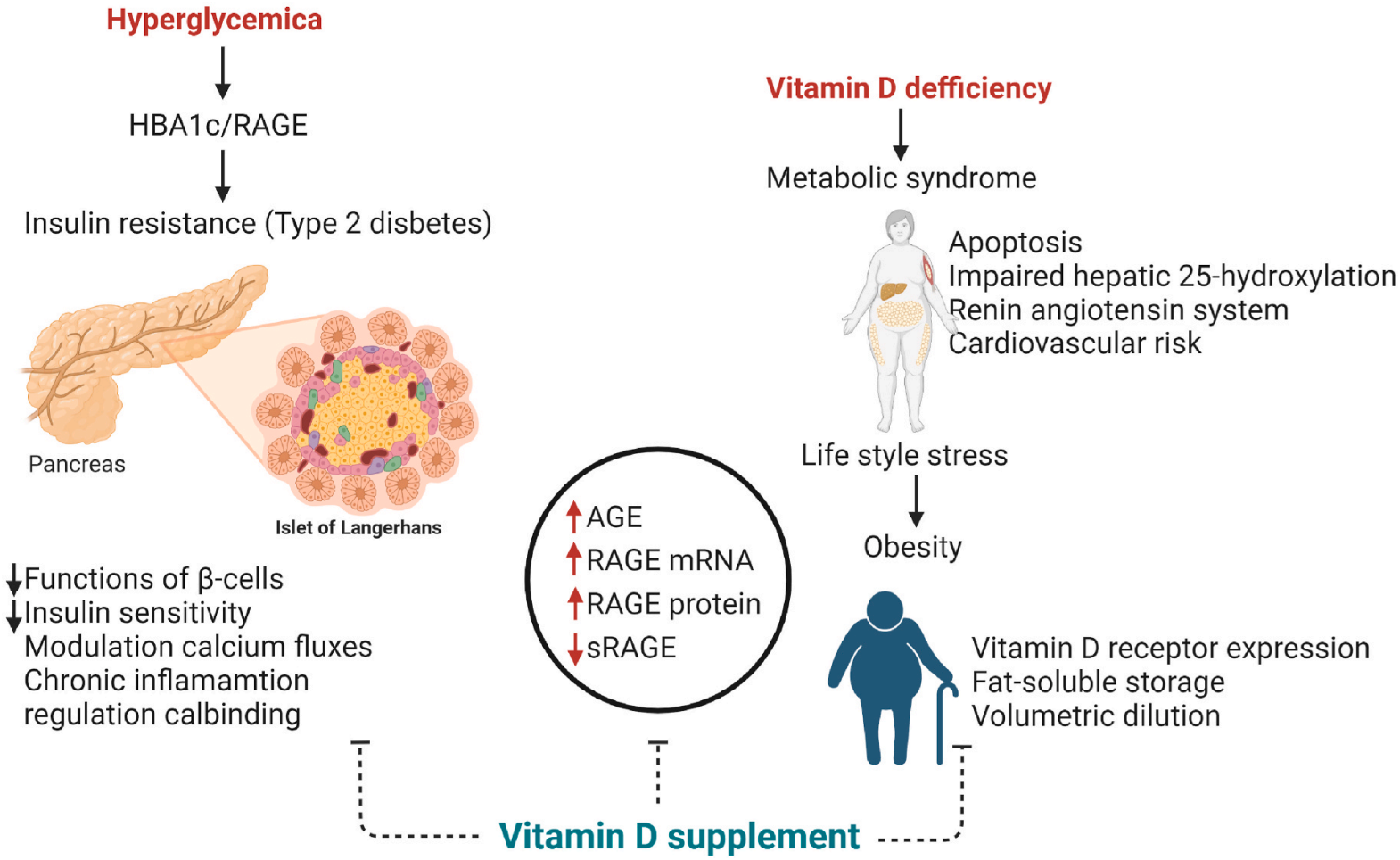


Fig. 3. Mechanisms relating to vitamin D insufficiency that led to dysregulation of glucose homeostasis.

7. Conclusions and future directions

CRediT authorship contribution statement


Contents lists available at ScienceDirect

Archives of Biochemistry and Biophysics

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

Review article

Vitamin D supplementation modulates glycated hemoglobin (HBA1c) in diabetes mellitus

Table 2
25OHD serum levels and risk for Gestational Diabetes and Preeclampsia.

25OHD serum levels and risk for Gestational Diabetes (GD)				
Sample Size (GD/ Controls)	Weeks of Gestation	25OHD	Risk for GD Development [Odds ratio (95 % CI)]	References
54/111	≥24	<37.5 nmol/L	2.66 (1.26–5.6)	[147]
68/1246	≥26	<25 nmol/L	3.6 (1.7–7.8)	[148]
81/226	13–26	<50 nmol/L	1.92 (0.89–4.17)	[149]
57/114	16	<50 nmol/L	3.74 (1.47–9.50)	[150]
116/219	≥15	<73.5 nmol/L	2.21 (1.19–4.13)	[151]
20/40	40	<50 nmol/L	30.78 (4.65–203.90)	[152]
200/200	≥26	<25 nmol/L	1.80 (1.209–2.678)	[153]
25OHD serum levels and risk for Preeclampsia				
Sample Size (Preeclampsia/ Controls)	Weeks of Gestation	25OHD	Risk for Preeclampsia Development [Odds ratio (95 % CI)]	Reference
32/665	≥24	<50 nmol/L	3.24 (1.37–7.69)	[154]
51/204	≥15	<50 nmol/L	3.63 (1.52–8.65)	[155]
55/219	>20	<37.5 nmol/L	5.0 (1.7–14.1)	[156]
100/100	>24	<75 nmol/L	3.26 (1.12–9.54)	[157]
33/76	≥20	<5 nmol/L	3.9 (1.18–12.87)	[158]

Pregunta 10

¿Se deben utilizar suplementos empíricos de vitamina D versus ningún suplemento de vitamina D para adultos con prediabetes (según criterios glucémicos)?

Para los adultos con prediabetes de alto riesgo, además de modificar el estilo de vida, sugerimos la suplementación empírica de vitamina D para reducir el riesgo de progresión a diabetes.

2 | ⊕◯◯◯

The Journal of Clinical Endocrinology & Metabolism, 2024, **00**, 1–41
https://doi.org/10.1210/clinem/dgae290
Advance access publication 3 June 2024
Clinical Practice Guideline

ENDOCRINE SOCIETY | OXFORD

Vitamin D for the Prevention of Disease: An Endocrine Society Clinical Practice Guideline

Marie B. Demay,[1] Anastassios G. Pittas,[2] Daniel D. Bikle,[3] Dima L. Diab,[4] Mairead E. Kiely,[5] Marise Lazaretti-Castro,[6] Paul Lips,[7] Deborah M. Mitchell,[8] M. Hassan Murad,[9] Shelley Powers,[10] Sudhaker D. Rao,[11,12] Robert Scragg,[13] John A. Tayek,[14,15] Amy M. Valent,[16] Judith M. E. Walsh,[17] and Christopher R. McCartney[18,19]

Dosis promedio: 2.000 UI

Conclusiones

Si bien la suplementación con vitamina D muestra beneficios potenciales en el manejo de la diabetes mellitus tipo 2 (DM2), estos efectos son complejos y pueden requerir enfoques individualizados.

Las **tendencias** observadas en la glucosa plasmática en ayunas (GA), los niveles de insulina, HOMA-IR, HOMA-B, HbA1c y PCR-as indican que la vitamina D puede influir en el control glucémico, la sensibilidad a la insulina y la inflamación; sin embargo, estos efectos suelen ser moderados y pueden disminuir con el tiempo.

La variabilidad en los resultados entre los estudios resalta la importancia de considerar factores como los niveles basales de vitamina D, la dosis, la duración del tratamiento y las características individuales de cada paciente.

Los regímenes de vitamina D en **dosis altas** podrían ser necesarios para una corrección rápida en ciertas poblaciones, mientras que las dosis de mantenimiento podrían mantener los beneficios a largo plazo.

Metabolic Syndrome/Insulin Resistance Syndrome/Pre-Diabetes
BRIEF REPORT

Concentrations of Serum Vitamin D and the Metabolic Syndrome Among U.S. Adults

EARL S. FORD, MD, MPH[1]
UMED A. AJANI, MBBS, MPH[1]
LISA C. MCGUIRE, PHD[1]
SIMIN LIU, MD, SCD[2,3]

medical examination clinic sampling weights to produce our weighted estimates and standard errors (17).

Table 1 —*Unadjusted prevalence and adjusted odds ratios and 95% confidence limits of having the metabolic syndrome by quintiles of serum vitamin D concentration among 8,421 U.S. adults aged ≥20 years, NHANES III, 1988–1994*

	Quintiles of vitamin D (nmol/l)					
	1 (≤48.4)	2 (48.5–63.4)	3 (63.5–78.1)	4 (78.2–96.3)	5 (≥96.4)	*P**
	19	19– 25	25 – 31	31 – 38	> 38	
Metabolic syndrome						
Unadjusted prevalence†	27.5 (1.7)	26.6 (1.4)	23.3 (1.5)	18.7 (1.3)	13.5 (1.7)	<0.001
Model 1‡	1.00	0.91 (0.72, 1.17)	0.80 (0.62, 1.03)	0.65 (0.51, 0.83)	0.49 (0.37, 0.66)	<0.001
Model 2§	1.00	0.82 (0.60, 1.10)	0.75 (0.55, 1.02)	0.60 (0.44, 0.83)	0.46 (0.32, 0.67)	<0.001

nutrients

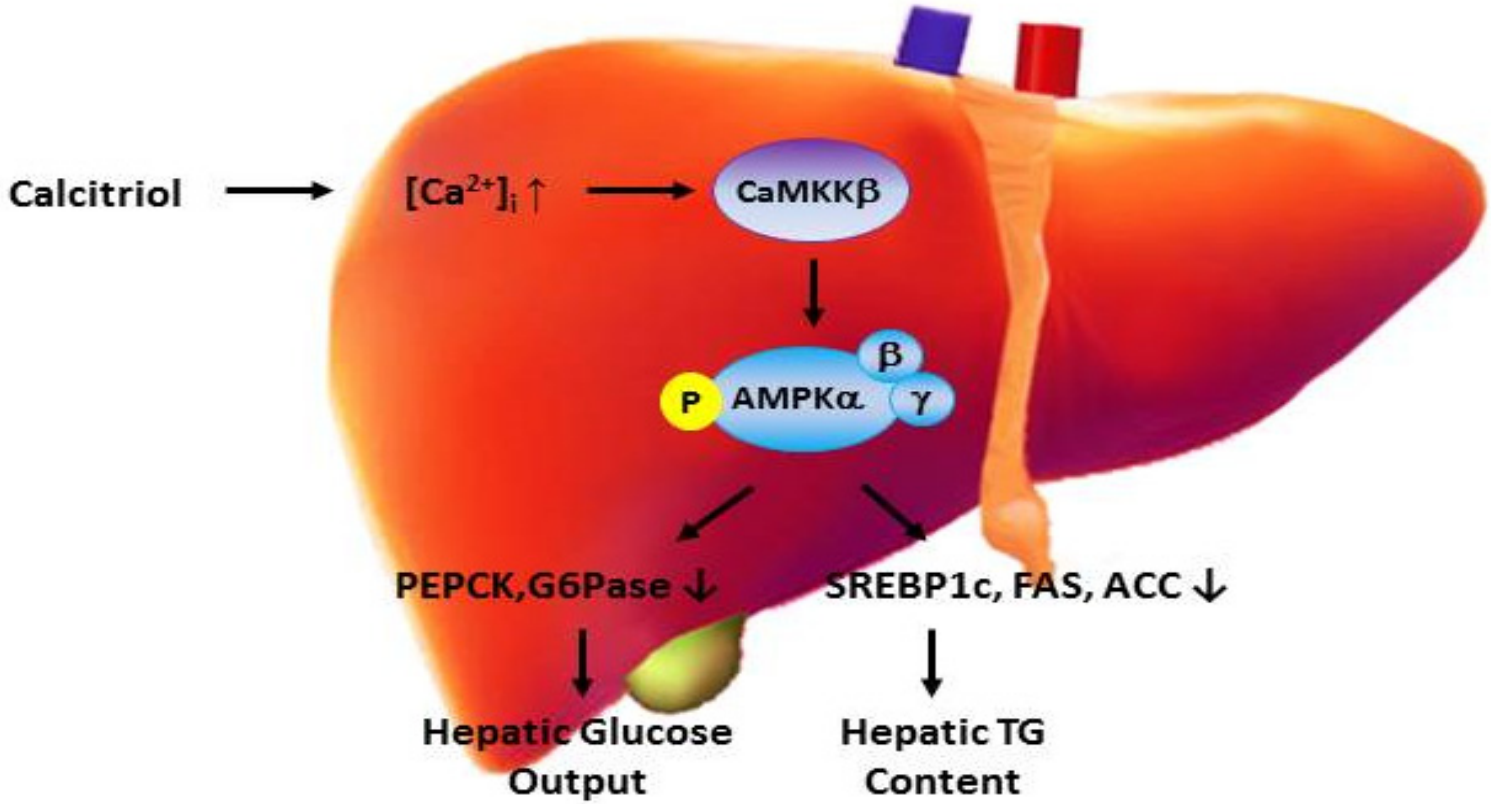
MDPI

Review

The Potential Protective Action of Vitamin D in Hepatic Insulin Resistance and Pancreatic Islet Dysfunction in Type 2 Diabetes Mellitus

Po Sing Leung

CaMKK$\mathcal{B}$ calcium/calmodulin protein kinase kinase beta



Nutrients 2016, 8, 147; doi:10.3390/nu8030147

Y cómo lo hace

RESEARCH ARTICLE

Impact of vitamin D on glycemic control and microvascular complications in type 2 diabetes: A cross-sectional study

Salma Ahi[1]*, Amirreza Reiskarimian[2], Mohammad Aref Bagherzadeh[1,3,4], Zhila Rahmanian[1], Parisa Pilban[2], Saeed Sobhanian[1]

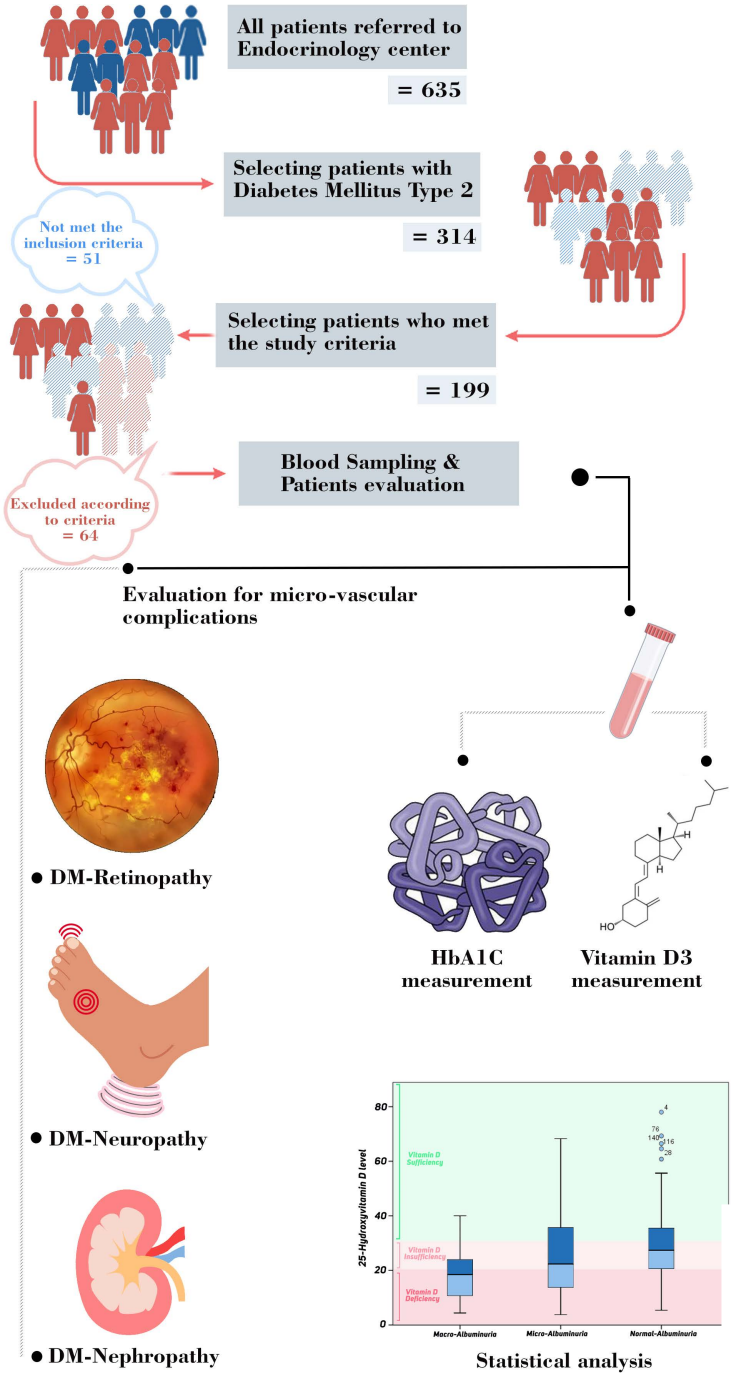


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Table 1. Clinical and laboratory characteristics of patients. Cell contents are expressed as a number, percentage, mean ± s.d., or median (25th – 75th percentile). Normally distributed variables are shown as mean ± s.d. nonparametric variables are shown as median (25th – 75th percentile).

	Parameter	**(N = 199)**
Baseline Characteristics	Sex, F/M	126/73
	Age, years	56.79 ± 10.78
	BMI, kg/m^2	28.91 (26.23–32.75)
	Duration, years	8 (3–15)
	Hypertension, yes%	114, 57.3%
	SBP, mmHg	125 (110–140)
	DBP, mmHg	80 (74–82)
	HbA_1C, %	7.7 (6.5–8.9)
	FBS, mg/dL	134 (111–173)
	2HPP, mg/dL	198 (162–263)
	SCr, mg/dL	1 (0.9–1.2)
	25-OHD, ng/ml	24.3 (18–35.5)
	UACR, mg/g	22 (9.73–78)
Microvascular Complications	**Retinopathy, N(percent)**	51 (25.6%)
	Neuropathy, N(percent)	28 (14.1%)
	Microalbuminuria (UACR* 30–300 mg/g)	64 (32.2%)
	Macroalbuminuria (UACR ≥ 300 mg/g)	16 (8%)
Vitamin D deficiency	**Vitamin D Deficiency (< 20 ng/ml)**	58 (29.1%)
	Vitamin D Insufficiency (20–30 ng/ml)	68 (34.2%)
	Vitamin D Sufficiency (≥ 30 ng/ml)	73 (36.7%)

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Table 2. Distribution of patients based on the presence or absence of microvascular complications and vitamin D level.

Vitamin D status	UACR			Retinopathy		Neuropathy	
	Macroalbuminuria (UACR* ≥ 300 mg/g)	Microalbuminuria (UACR 30–300 mg/g)	Neg.	No	Yes	No	Yes
Vitamin D Deficiency (< 20 ng/ml)	9	24	25	39	19	44	14
Vitamin D Insufficiency (20–30 ng/ml)	5	19	44	50	18	59	9
Vitamin D Sufficiency (≥ 30 ng/ml)	2	21	50	59	14	68	5
Vitamin D level	19.21 ± 9.76 ng/ml	24.66 ± 13.54 ng/ml	29.47 ± 13.6 ng/ml	27.96 ± 13.54 ng/ml	24.59 ± 13.77 ng/ml	27.74 ± 13.22 ng/ml	23.21 ± 15.7 ng/ml

RESEARCH ARTICLE

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Salma Ahi[1]*, Amirreza Reiskarimian[2], Mohammad Aref Bagherzadeh[1,3,4], Zhila Rahmanian[1], Parisa Pilban[2], Saeed Sobhanian[1]

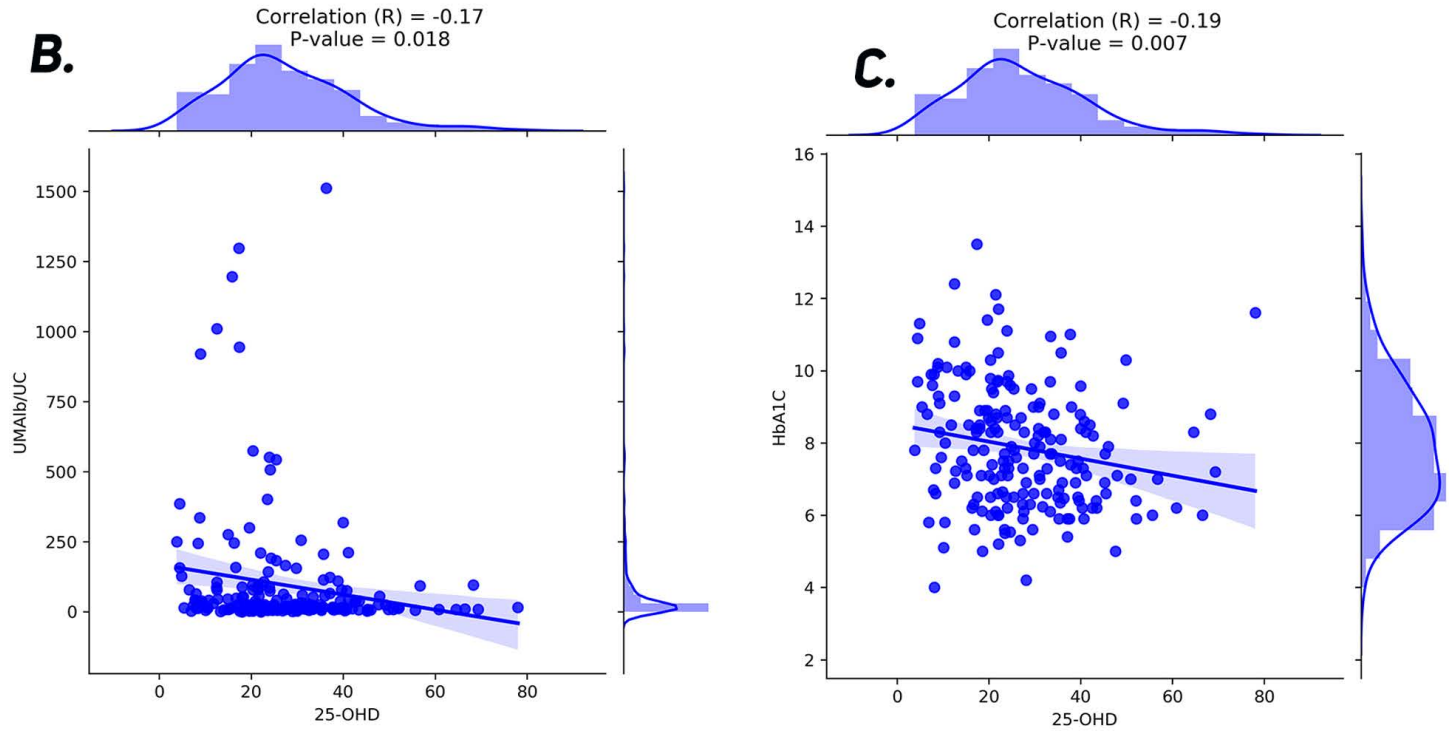


Fig 3. Correlation of clinical and biochemical parameters; (A) Correlation matrix of clinical and biochemical parameters: Pearson correlation coefficients (R) between age, weight, height, BMI, duration of type 2 diabetes (DMT2), fasting blood sugar (FBS), 2-hour postprandial blood sugar (2HPP), HbA1C, urinary albumin/creatinine ratio (UMAlb/UC), serum creatinine (S.Cr), and serum 25-hydroxyvitamin D (25-OHD). Significant

- Entonces…

por qué NO, una corrección rápida?

Review

Vitamin D_3 Distribution and Status in the Body

Robert P. Heaney, MD, FACN, Ronald L. Horst, PhD, Diane M. Cullen, PhD, Laura A. G. Armas, MD

Creighton University, Omaha, Nebraska (R.P.H., D.M.C., L.A.G.A.), Heartland Assays, Inc., Ames, Iowa (R.L.H.)

1 nmol = 15.4 IU and 1 mcg = 40 IU

70 Kg

35% 25 OH Vitamina D

- 20% Músculo
- 30% Sérico
- 35% Grasa
- 15% Otros

65% Colecalciferol

- ¾ Grasa

Conclusions: At total intakes on the order of 2000 IU/day, an adult has very little vitamin D reserve, despite intakes 10 x the current recommendations

- Data presented elsewhere suggest that daily utilization of vitamin D in humans at a serum 25(OH)D concentration of 32 ng/ml, is on the order of 4000 IU.

Journal of the American College of Nutrition, Vol. 28, No. 3, 252–256 (2009)

Annals of Epidemiology 24 (2014) 781–784

Contents lists available at ScienceDirect

Annals of Epidemiology

journal homepage: www.annalsofepidemiology.org

Brief communication

The effect of body mass index on adequacy of serum 25-hydroxyvitamin D levels in US adults: the National Health and Nutrition Examination Survey 2001 to 2006

Table 2
Crude and adjusted prevalence ratios* for serum 25(OH)D levels greater than or equal to 20 ng/mL by BMI categories among adults aged 18 years: NHANES 2001 to 2006

BMI categories (kg/m^2)		Adequate status for vitamin D			
		Crude	Model 1	Model 2	Model 3
<18.5		0.96 (0.87 to 1.05)	0.96 (0.88 to 1.04)	0.96 (0.89 to 1.04)	0.97 (0.90 to 1.05)
18.5 to <25		1.00	1.00	1.00	1.00
25 to <30	26%	0.92 (0.89 to 0.95)	0.93 (0.91 to 0.96)	0.93 (0.90 to 0.96)	0.93 (0.90 to 0.96)
≥30		0.74 (0.71 to 0.78)	0.79 (0.76 to 0.82)	0.78 (0.75 to 0.81)	0.79 (0.75 to 0.82)

Vitamina D 50.000 UI:
Correción rápida y manejo inteligente

THE PRESENT AND FUTURE

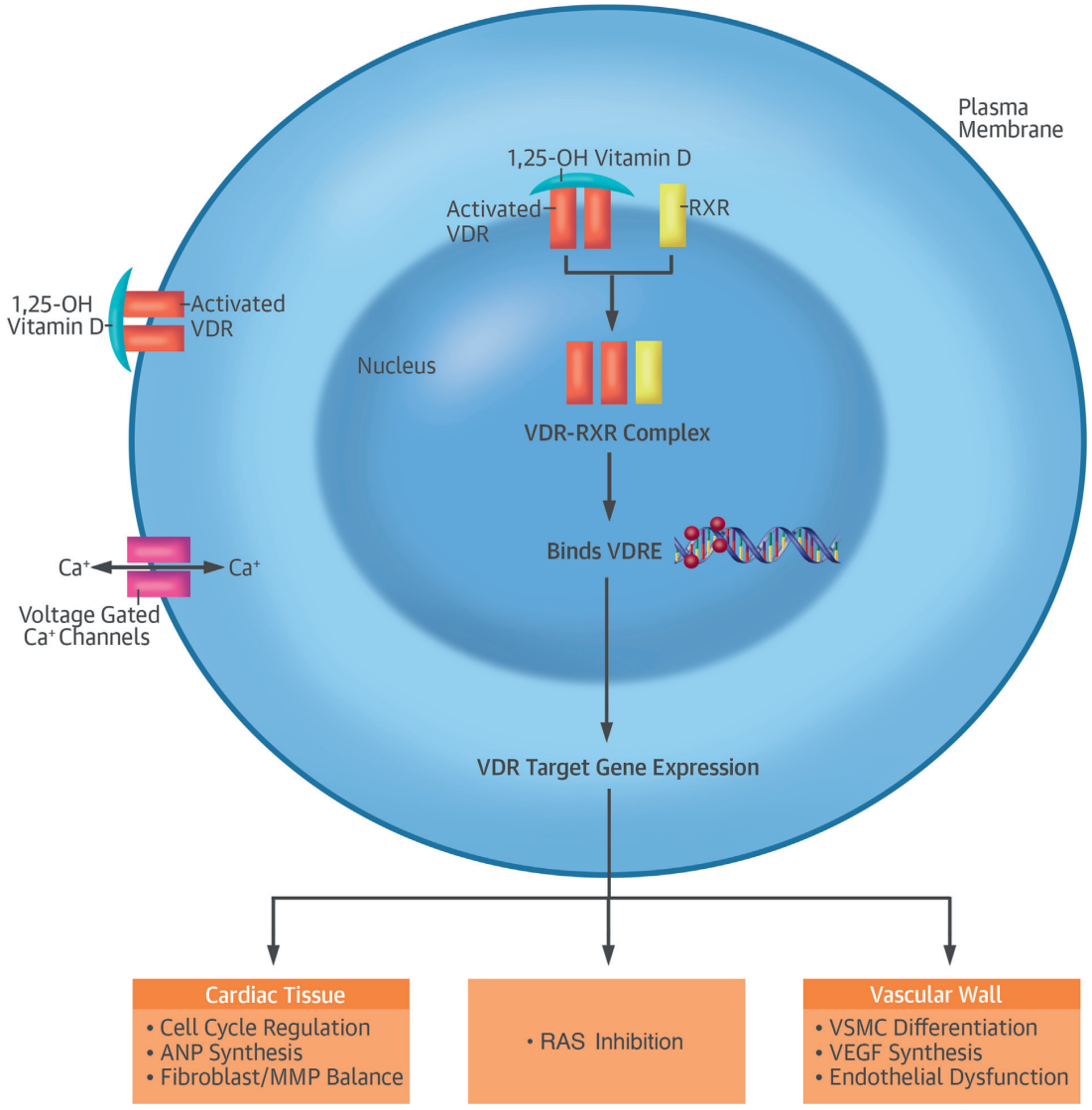
STATE-OF-THE-ART REVIEW

Vitamin D and Cardiovascular Disease

Controversy Unresolved

Ibhar Al Mheid, MD,[a,b] Arshed A. Quyyumi, MD[a,b]

CENTRAL ILLUSTRATION Mechanisms by Which Vitamin D Deficiency May Confer Cardiovascular Risk



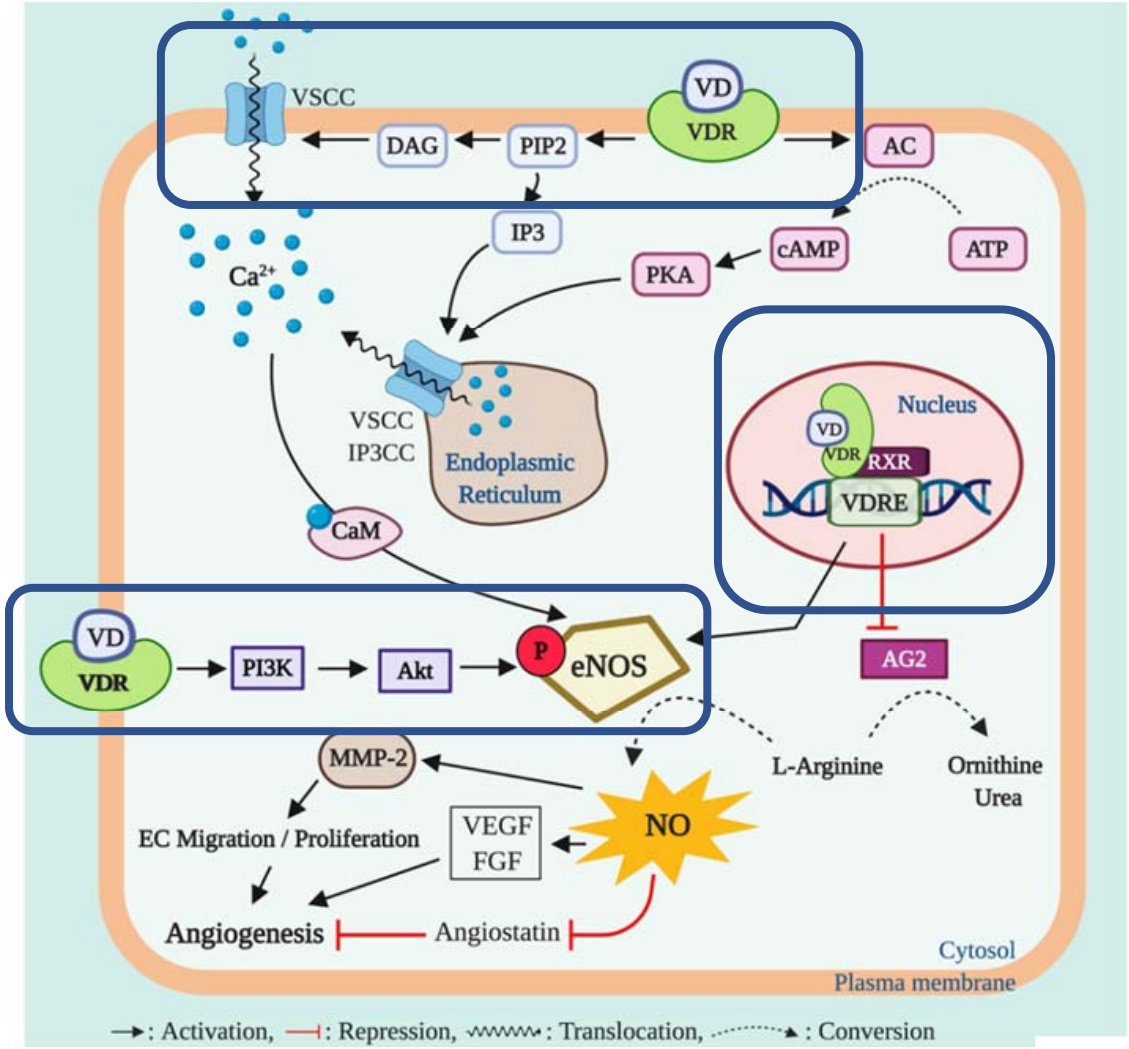
nutrients

MDPI

Review

Vitamin D and Endothelial Function

Do-Houn Kim [1,2], Cesar A. Meza [1], Holly Clarke [1], Jeong-Su Kim [1,2,3] and Robert C. Hickner [1,3,4,*]



Nutrients **2020**, *12*, 575; doi:10.3390/nu12020575

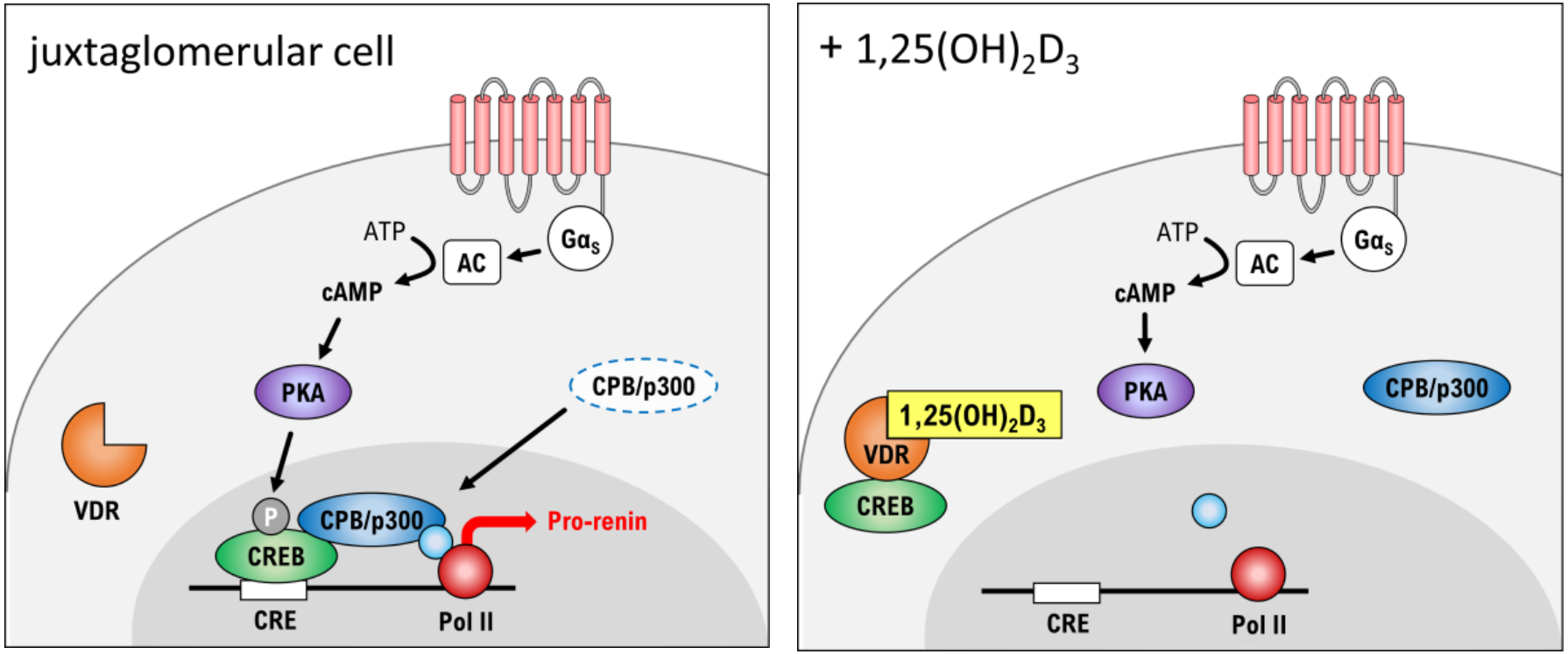
International Journal of Molecular Sciences

MDPI

Review

The Impact of Vitamin D in the Treatment of Essential Hypertension

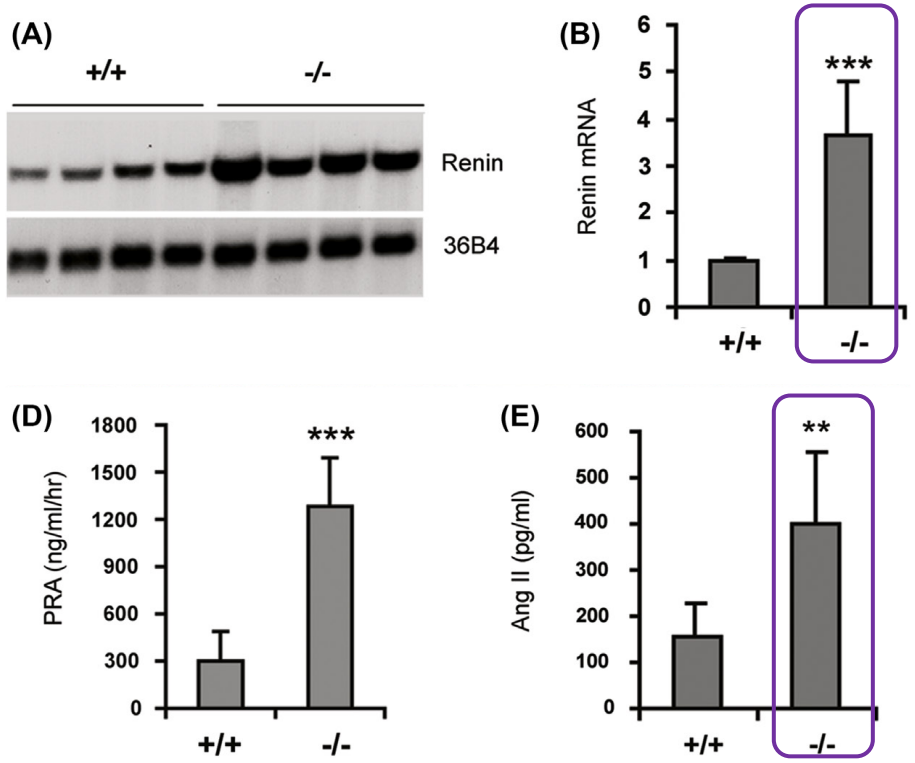
Christian Legarth [1], Daniela Grimm [1,*], Markus Wehland [2], Johann Bauer [3] and Marcus Krüger [2]



JCI The Journal of Clinical Investigation

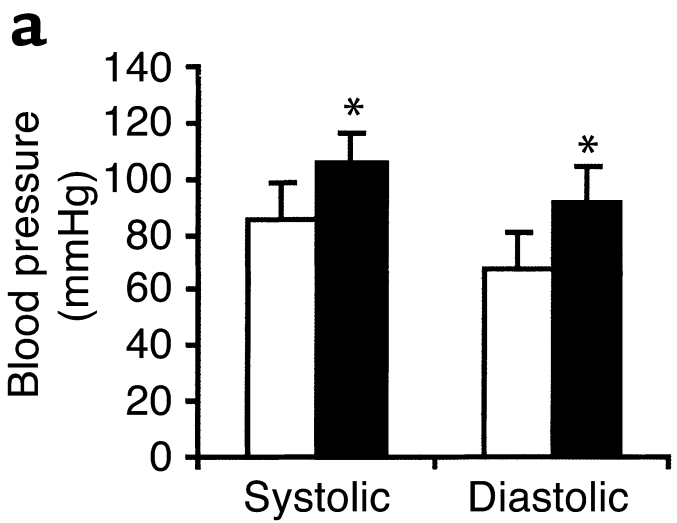
1,25-Dihydroxyvitamin D_3 is a negative endocrine regulator of the renin-angiotensin system

Yan Chun Li, … , Shu Q. Liu, Li-Ping Cao



+/+ Con Receptor Vit D

-/- Sin Receptor Vit D



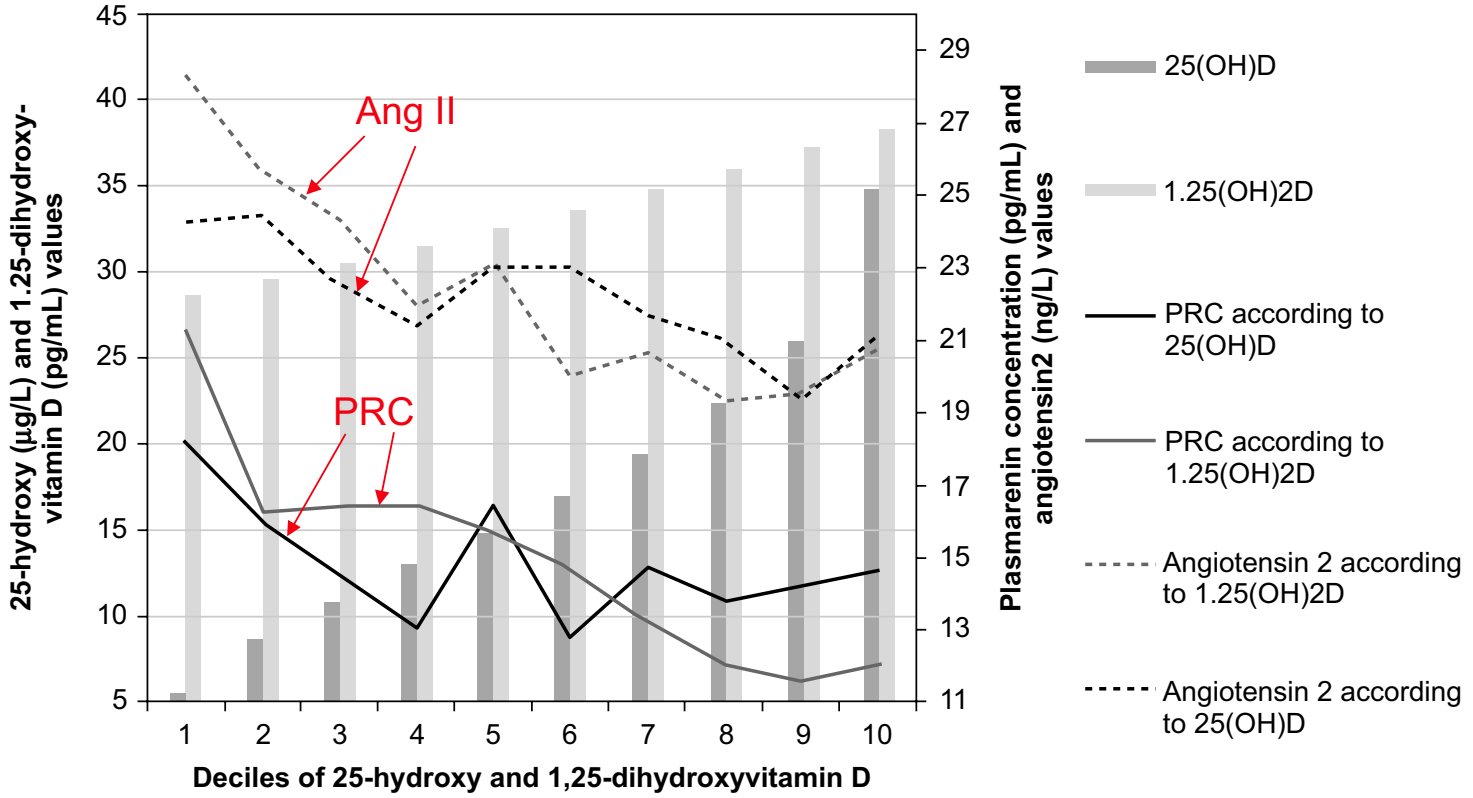
J Clin Invest. 2002;110(2):229-238

CHAPTER

45

Vitamin D and the Renin-Angiotensin System

Yan Chun Li
The University of Chicago, Chicago, IL, United States



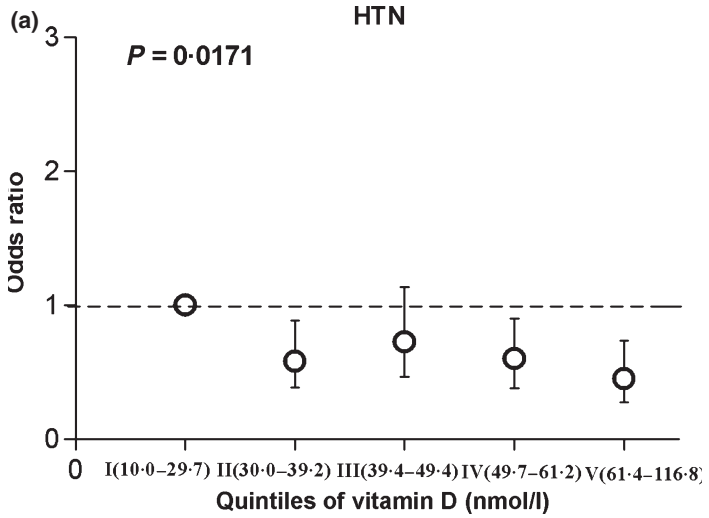
http://dx.doi.org/10.1016/B978-0-12-809965-0.00045-8

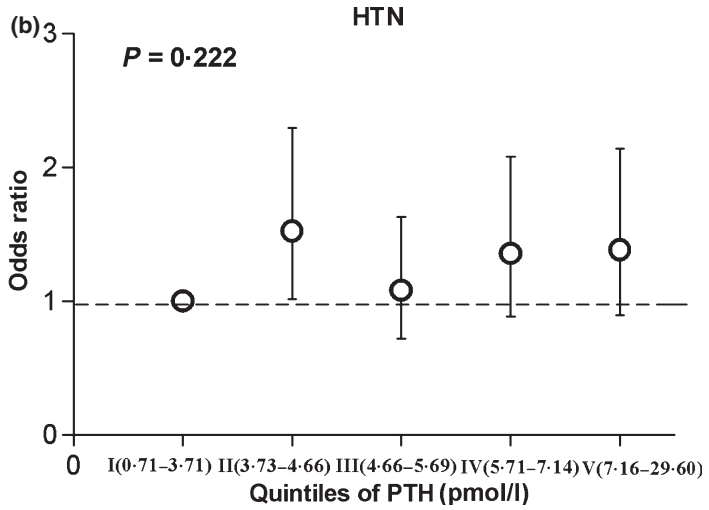
Clinical Endocrinology (2010) **73**, 330–338 doi: 10.1111/j.1365-2265.2010.03798.x

ORIGINAL ARTICLE

The association of serum vitamin D level with presence of metabolic syndrome and hypertension in middle-aged Korean subjects

Mee K. Kim*, Moo Il Kang*, Ki Won Oh†, Hyuk S. Kwon*, Jin H. Lee‡, Won C. Lee‡, Kun-Ho Yoon* and Ho Y. Son*





Clinical Trials

Effect of Vitamin D Supplementation on Blood Pressure in Blacks

John P. Forman, Jamil B. Scott, Kimmie Ng, Bettina F. Drake, Elizabeth Gonzalez Suarez, Douglas L. Hayden, Gary G. Bennett, Paulette D. Chandler, Bruce W. Hollis, Karen M. Emmons, Edward L. Giovannucci, Charles S. Fuchs, Andrew T. Chan

1 ng/ml 25 OH VD

0.2% mm/Hg

Table 2. Effect of Vitamin D Supplementation on Blood Pressure During the Treatment Period (Baseline to 3 mo)

Parameter	Vitamin D Dose, IU/d				3 mo Change in BP per 1000 IU/d	*P* Value
	Placebo	1000	2000	4000		
n (at baseline)	72	68	73	70		
Baseline SBP, mean (SE)	122.2 (2.2)	124.7 (2.1)	122.8 (2.0)	130.4 (2.4)	−1.4 (0.7)	0.04
3 mo SBP, mean (SE)	124.9 (2.4)	122.5 (2.0)	120.0 (2.4)	126.6 (2.6)		
Difference SBP, mean (SE)	1.7 (2.1)	−0.66 (2.1)	−3.4 (2.0)	−4.0 (2.1)		
Baseline DBP, mean (SE)	78.0 (1.3)	79.8 (1.3)	77.6 (1.4)	79.8 (1.6)	−0.5 (0.5)	0.37
3 mo DBP, mean (SE)	78.9 (1.8)	78.0 (1.6)	76.0 (1.8)	78.0 (1.6)		
Difference DBP, mean (SE)	0.7 (1.6)	−2.5 (1.6)	−1.8 (1.4)	−1.8 (1.50)		

BP indicates blood pressure; DBP, diastolic blood pressure; IU, international unit; and SBP, systolic blood pressure.

Hypertension. 2013;61:779-785

INTERNATIONAL JOURNAL OF HEALTH & MEDICAL RESEARCH
ISSN(print): 2833-213X, ISSN(online): 2833-2148
Volume 03 Issue 06 June 2024
DOI : 10.58806/ijhmr.2024.v3i06n17
Page No. 352-360

Effect of Vitamin D3 on Lipids Metabolism and Adipose Tissue Biology

Maha K. Ibrahim[1], Eqbal Abdul-Aziz[2], Zainab J. Abdulridha[3] , Ali A. Al-fahham[4]
[1,2,3] Biology department, College of Science, Basrah University, Basrah, Iraq,
[4] Corresponding Author, Faculty of Nursing, University of Kufa, Iraq

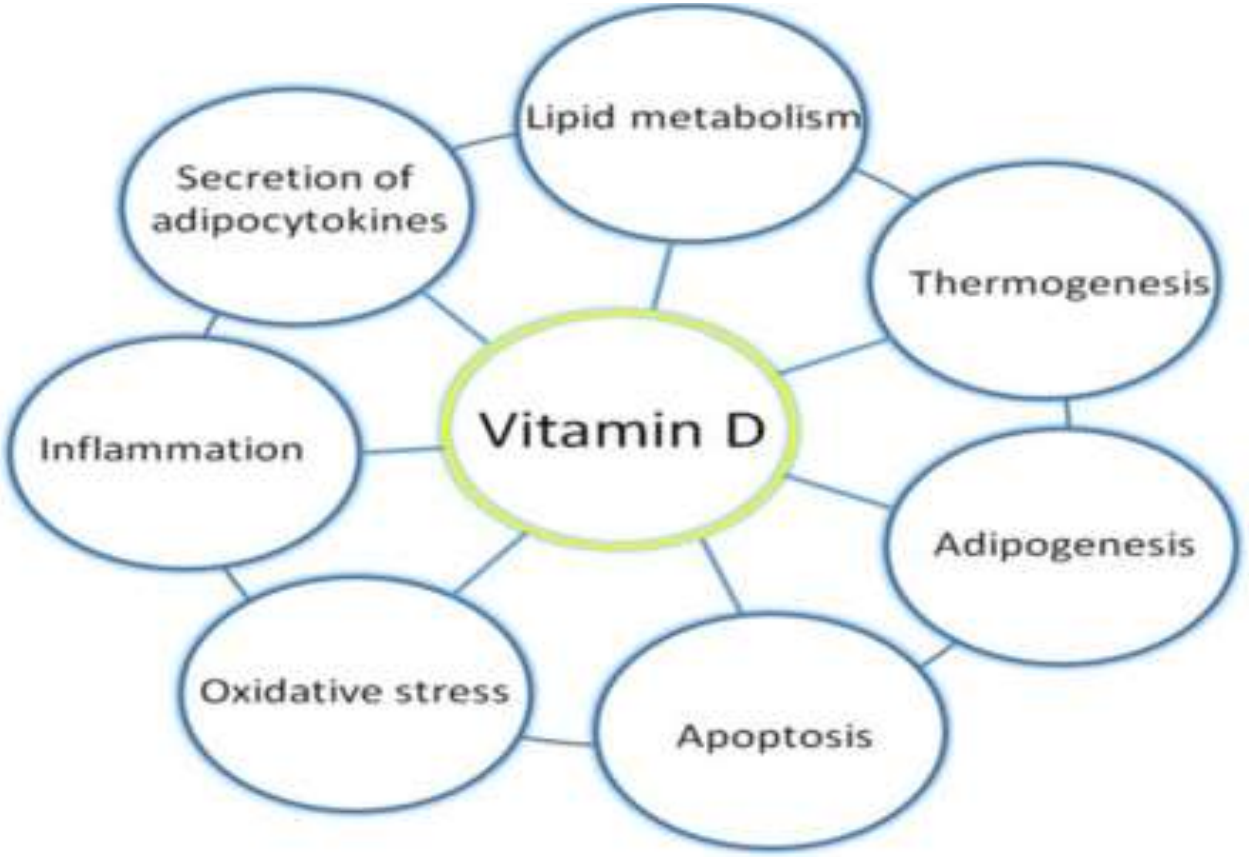


Fig 4: The function of vitamin D in adipose tissue (Xiang et al.,2020).

Osteoporos Int (2013) 24:2955–2959
DOI 10.1007/s00198-013-2427-1

OPINION PAPER

What's in a name revisited: should osteoporosis and sarcopenia be considered components of "dysmobility syndrome?"

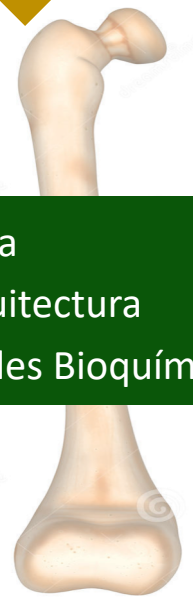
N. Binkley · D. Krueger · B. Buehring

Interacción musculo/hueso

- Varias similaridades entre los dos tejido

FACTORES EXTRISECOS

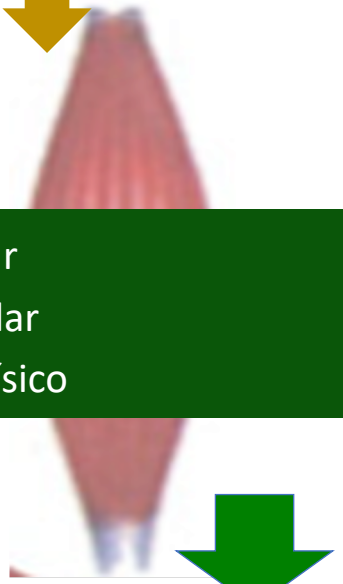
INACTIVIDAD | Factores Nutricionales | Tratamiento Medico | Estilo de vida | Deficiencia de Vitamina D



- Masa Osea
- Microarquitectura
- Propiedades Bioquímicas

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

INFLAMACION



- Masa Muscular
- Fuerza Muscular
- Desempeño Físico

Osteoporosis

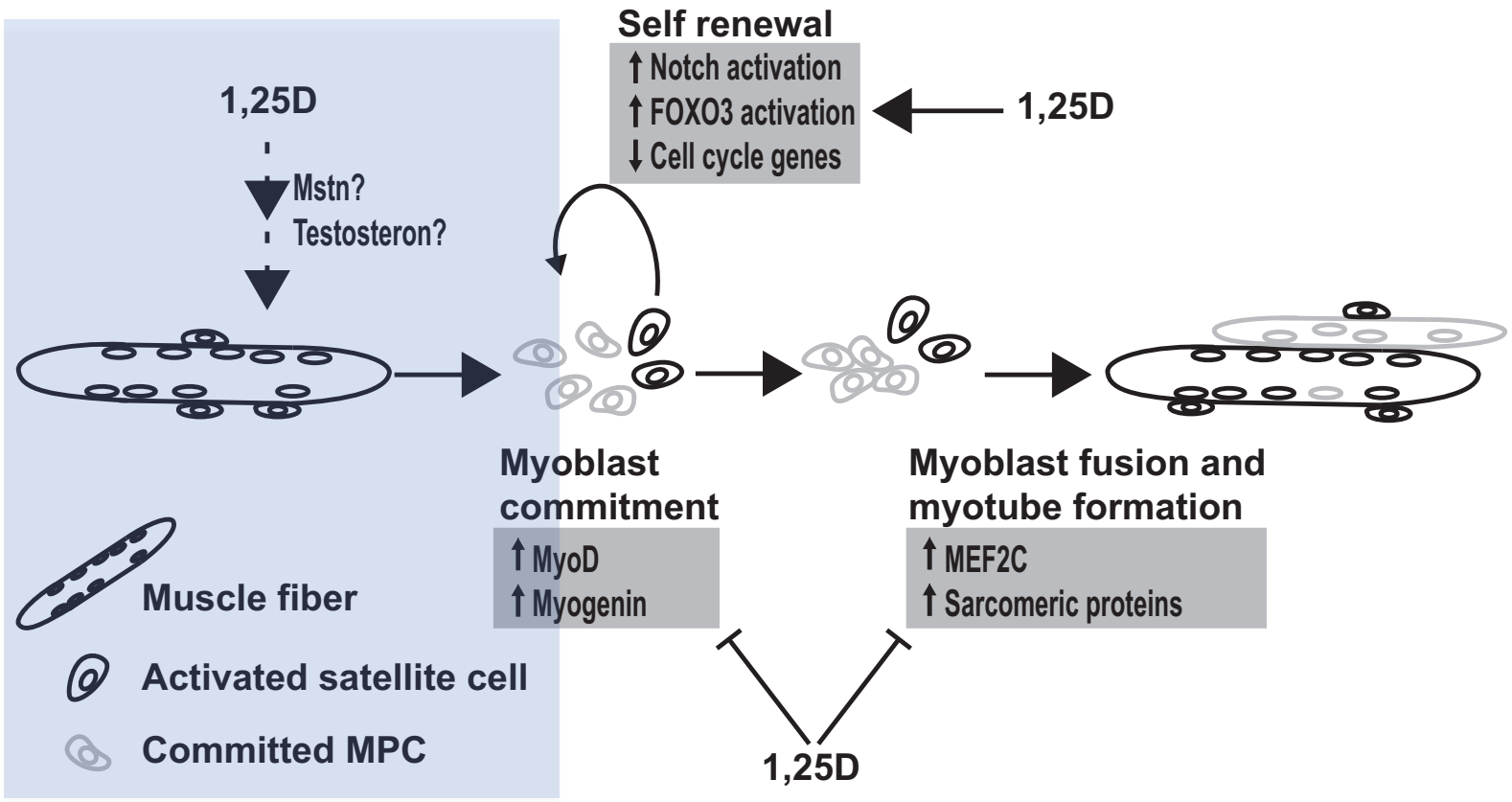
Disregulación Metabólica

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

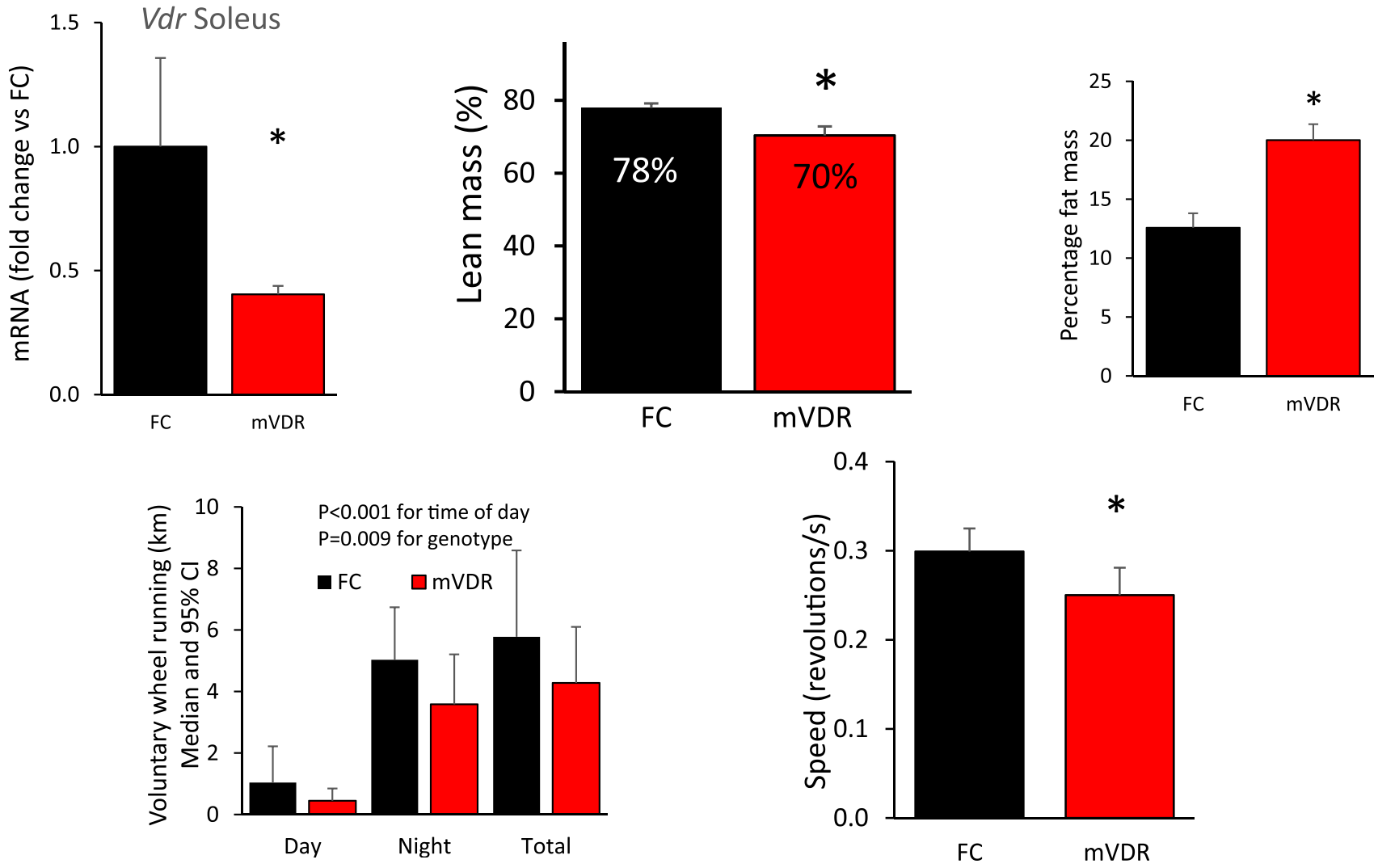
Sarcopenia

Ageing Research Reviews 21 (2015) 55-70

Importancia de las celulas satelitales



- Endocrinology, Volume 157, Issue 1, 1 January 2016, Pages 98–111,



Journal of Cachexia, Sarcopenia and Muscle 2019; 10: 1228–1240

THE GERONTOLOGICAL SOCIETY OF AMERICA®

Journals of Gerontology: Medical Sciences
cite as: *J Gerontol A Biol Sci Med Sci*, 2018, Vol. 73, No. 1, 131–138
doi:10.1093/gerona/glx086
Advance Access publication May 25, 2017

OXFORD

Research Article

Longitudinal Associations Between Vitamin D Metabolites and Sarcopenia in Older Australian men: The Concord Health and Aging in Men Project

Vasant Hirani,[1,2] Robert G. Cumming,[2,3,4] Vasi Naganathan,[2] Fiona Blyth,[2] David G. Le Couteur,[6] Benjumin Hsu,[2,4,7] David J. Handelsman,[5] Louise M. Waite,[2] and Markus J. Seibel[8]

The Concord Health and Aging in Men Project (CHAMP)

SARCOPENIA

Masa magra apendicular

I.M.C.

Baja Masa Muscular ≤ 0.789

- J Gerontol A Biol Sci Med Sci, 2018, Vol. 73, No. 1, 131–138

25 OH VD

Table 2. Longitudinal Unadjusted and Multivariate Adjusted (Odds Ratios and 95% confidence interval) for GEE Analyses: 25D Status at Baseline, and Associations with Incidence of Sarcopenia at 2- and 5-year Follow-up (Reference Category is the Highest Quartile 25D ≥68.9 nmol/L)

N = 709	Serum 25D Lowest Quartile <40.0 nmol/L	Serum 25D Second Quartile 40–52.9 nmol/L	Serum 25D Third Quartile 53–68.9 nmol/L	Serum 25D Fourth Quartile ≥68.9 nmol/L (Referent Category)
Model 1*	2.55 (1.33,4.90) *p* = .005	1.75 (0.91,3.39) *p* = .10	1.33 (0.69,2.58) *p* = .39	1
Model 2*	2.48 (1.27,4.85) *p* = .01	1.90 (0.97,3.73) *p* = .10	1.43 (0.74,2.78) *p* = .29	1
Model 3*	2.53 (1.14,5.64) *p* = .02	1.90 (0.89,4.10) *p* = .10	1.51 (0.73,3.12) *p* = .27	1
Model 4*	2.40 (1.02,5.64) *p* = .04	1.86 (0.83,4.15) *p* = .13	1.47 (0.68,3.16) *p* = .33	1

16	16-21.2	21.2-27.6	≥28 ng/ml

0021-972X/03/$15.00/0
Printed in U.S.A.

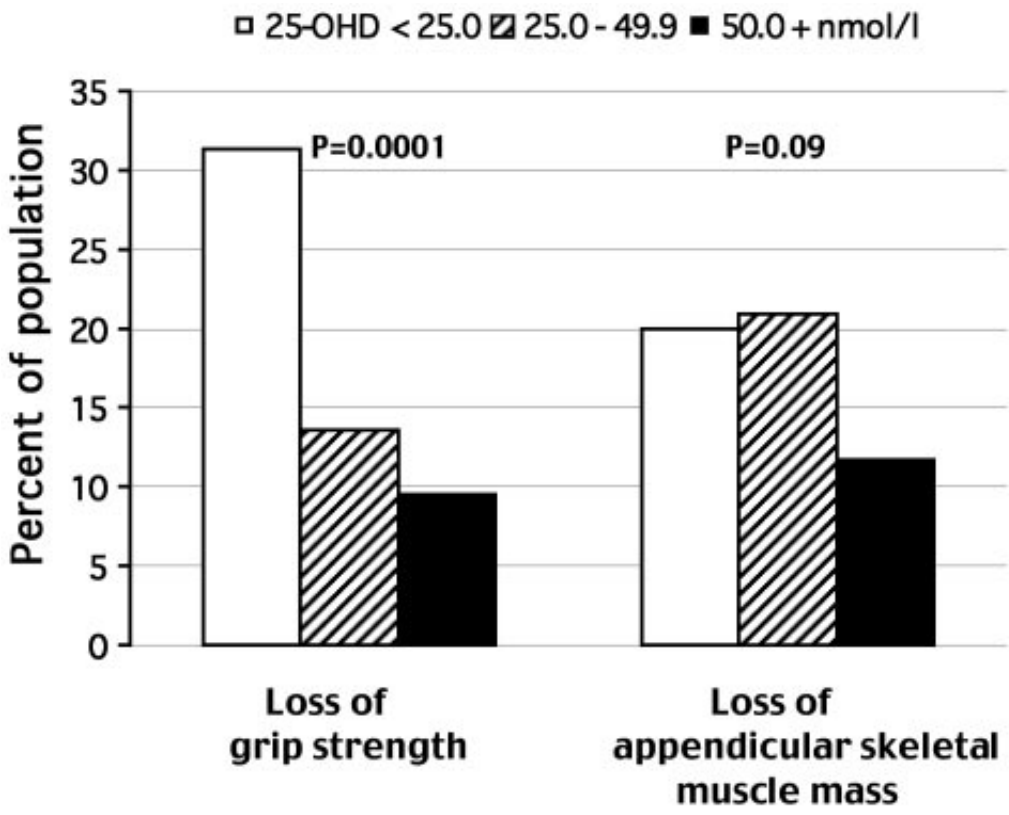
The Journal of Clinical Endocrinology & Metabolism 88(12):5766–5772

doi: 10.1210/jc.2003-030604

Low Vitamin D and High Parathyroid Hormone Levels as Determinants of Loss of Muscle Strength and Muscle Mass (Sarcopenia): The Longitudinal Aging Study Amsterdam

MARJOLEIN VISSER, DORLY J. H. DEEG, AND PAUL LIPS

Bajos niveles de Vit D:
perdida de fuerza más que de masa

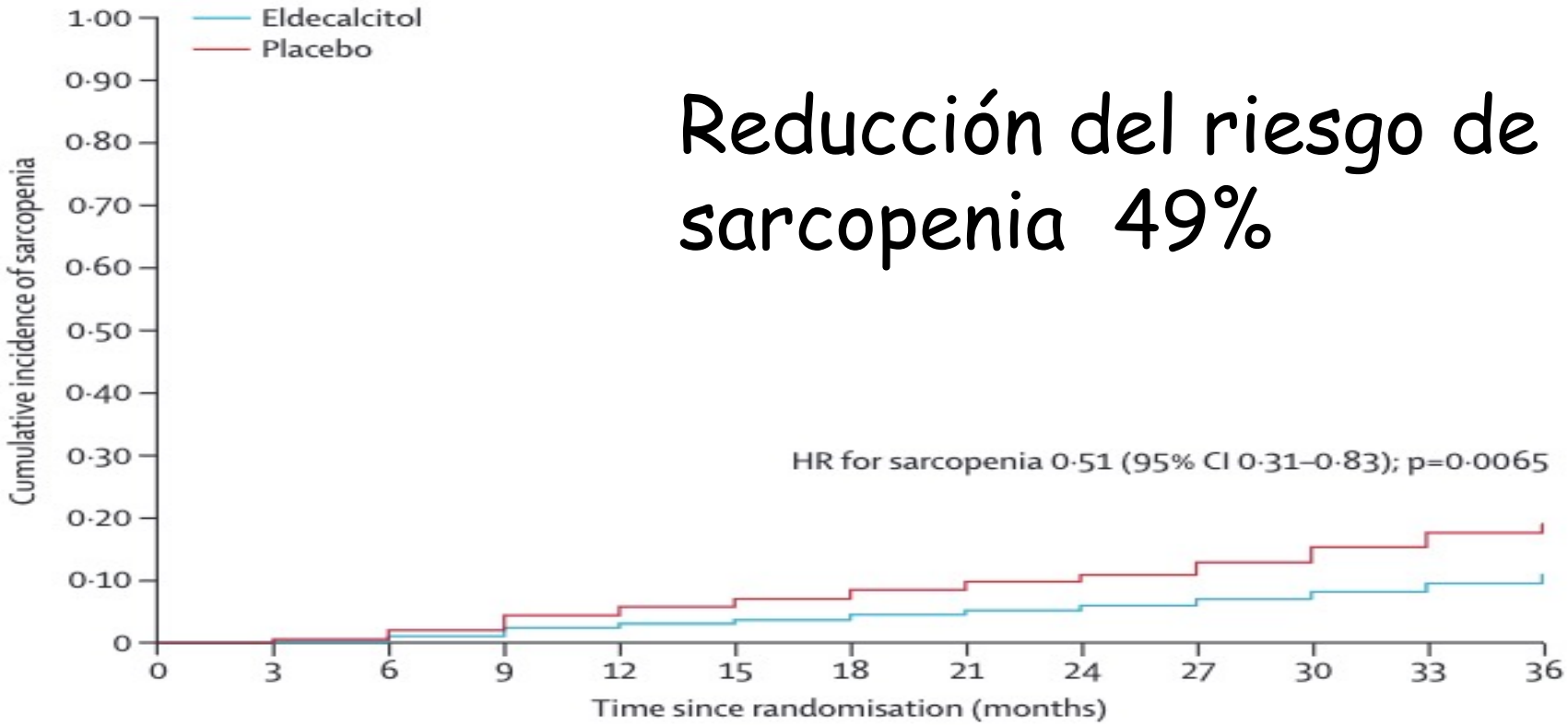


The Journal of Clinical Endocrinology & Metabolism 88(12):5766–5772, 2003

Active vitamin D treatment in the prevention of sarcopenia in adults with prediabetes (DPVD ancillary study): a randomised controlled trial

Tetsuya Kawahara, Gen Suzuki, Shoichi Mizuno, Naoki Tominaga, Mikio Toda, Nagahiro Toyama, Tetsuya Inazu, Chie Kawahara, Yosuke Okada, Yoshiya Tanaka

25 OH VIT D
20± 6 ng/ml



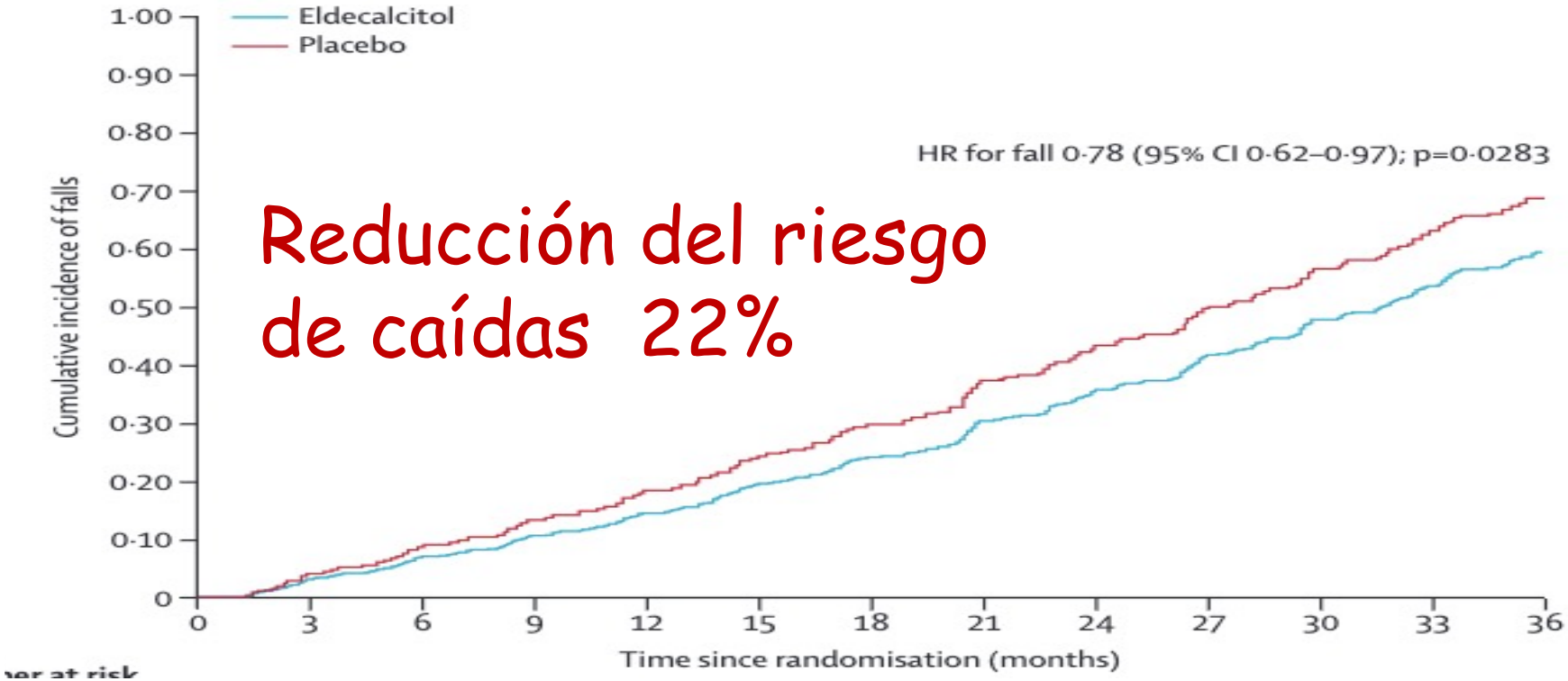
Reducción del riesgo de sarcopenia 49%

Lancet Healthy Longev 2024;5: e255–63

Active vitamin D treatment in the prevention of sarcopenia in adults with prediabetes (DPVD ancillary study): a randomised controlled trial

Tetsuya Kawahara, Gen Suzuki, Shoichi Mizuno, Naoki Tominaga, Mikio Toda, Nagahiro Toyama, Tetsuya Inazu, Chie Kawahara, Yosuke Okada, Yoshiya Tanaka

25 OH VIT D
20± 6 ng/ml



Reducción del riesgo de caídas 22%

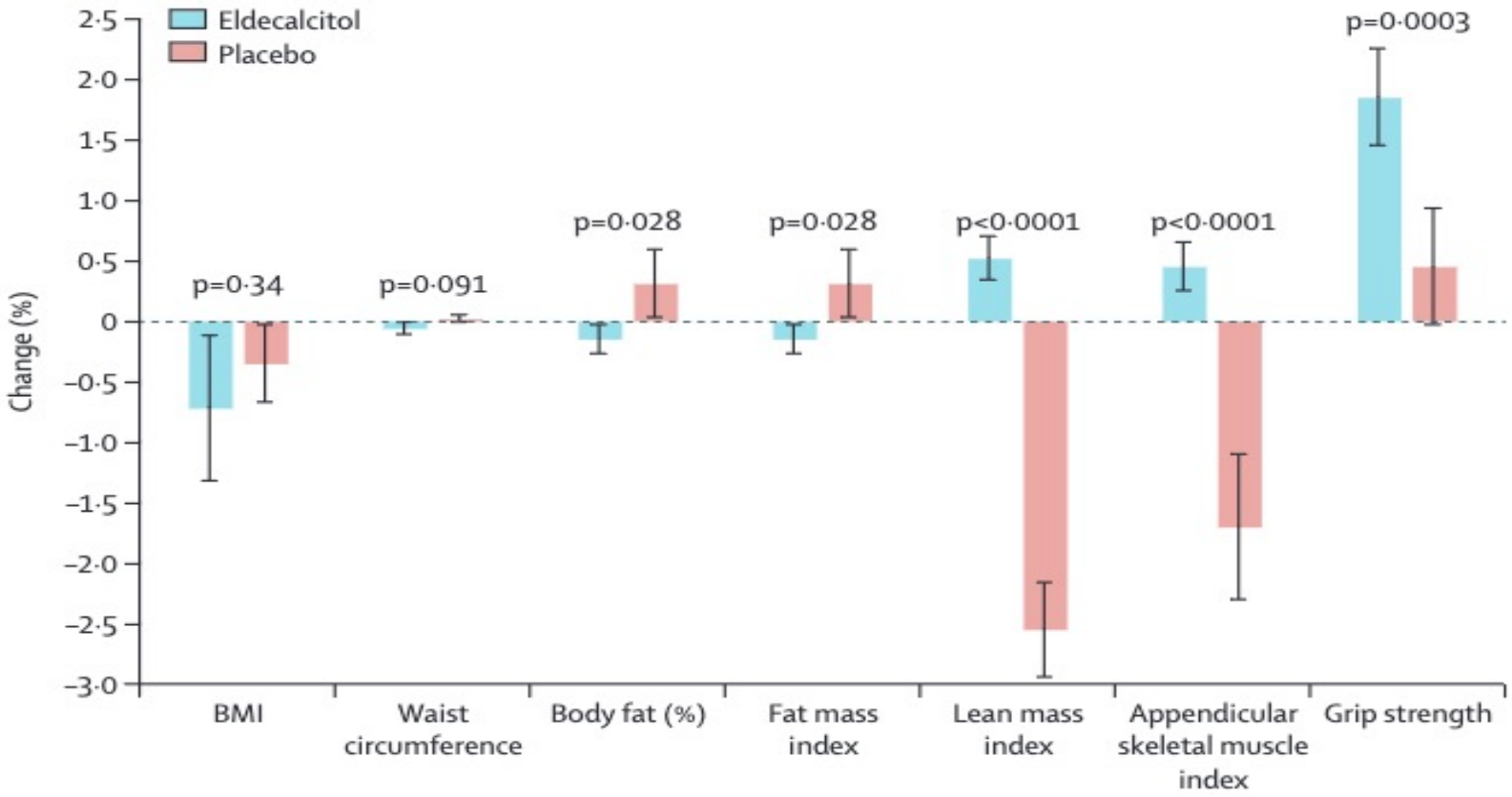
Lancet Healthy Longev 2024;5: e255–63

Active vitamin D treatment in the prevention of sarcopenia in adults with prediabetes (DPVD ancillary study): a randomised controlled trial

Tetsuya Kawahara, Gen Suzuki, Shoichi Mizuno, Naoki Tominaga, Mikio Toda, Nagahiro Toyama, Tetsuya Inazu, Chie Kawahara, Yosuke Okada, Yoshiya Tanaka

25 OH VIT D
20± 6 ng/dl

Cambios en la composición corporal

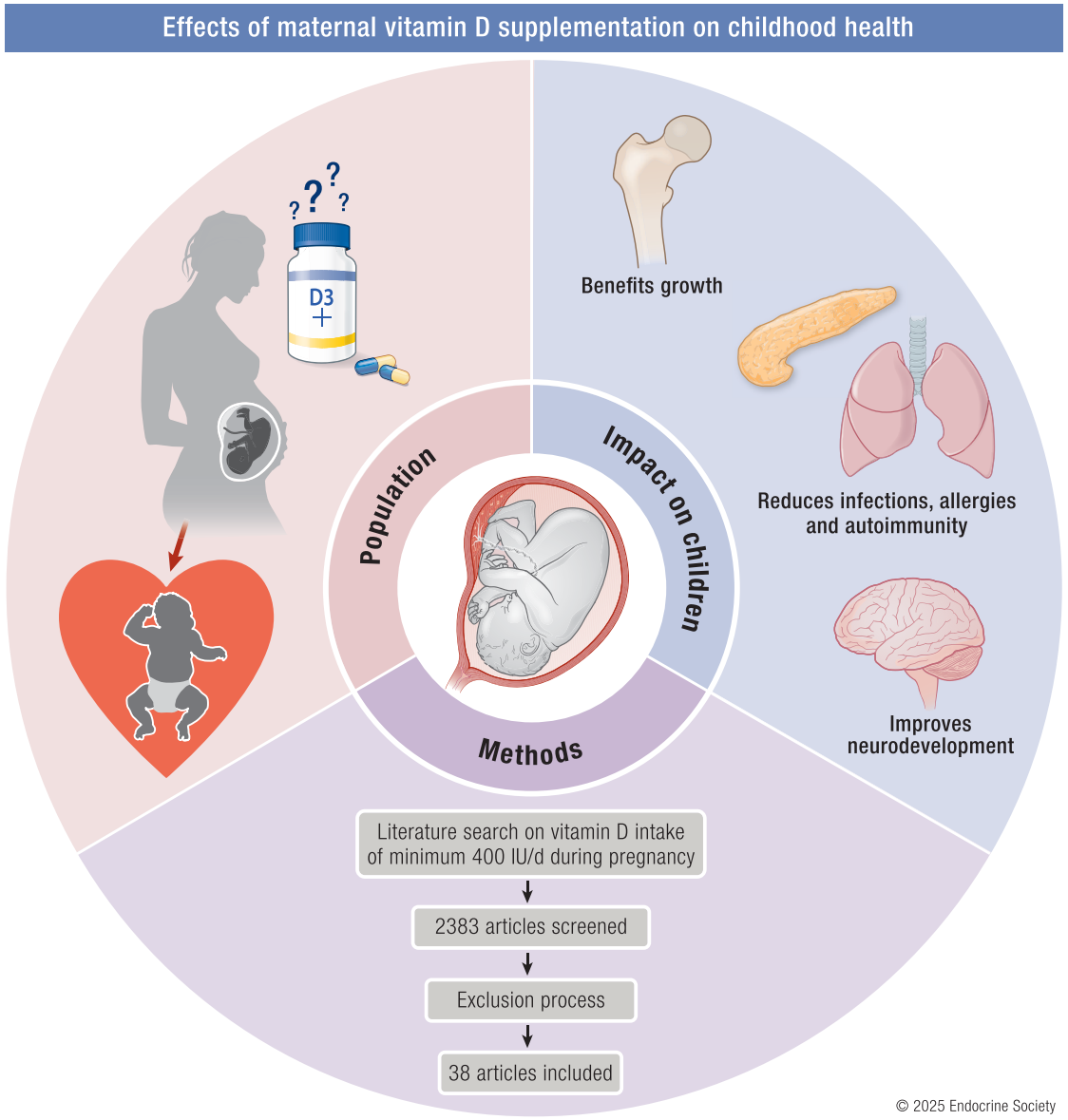


Lancet Healthy Longev 2024;5: e255–63

Endocrine Reviews, 2025, **46**, 922–953
https://doi.org/10.1210/endrev/bnaf034
Advance access publication 23 October 2025
Review

Effects of Maternal Vitamin D Supplementation on Childhood Health

Nanna S. Svensson,[1,2] Tabia Volqvartz,[2] Anna Louise Vestergaard,[1,2] Esben T. Vestergaard,[2,3] Agnete Larsen,[2,4] and Pinar Bor[2,5]



Vitamina D 50.000 UI:
Correción rápida y manejo inteligente

Journal of Steroid Biochemistry & Molecular Biology 165 (2017) 369–381

Contents lists available at ScienceDirect

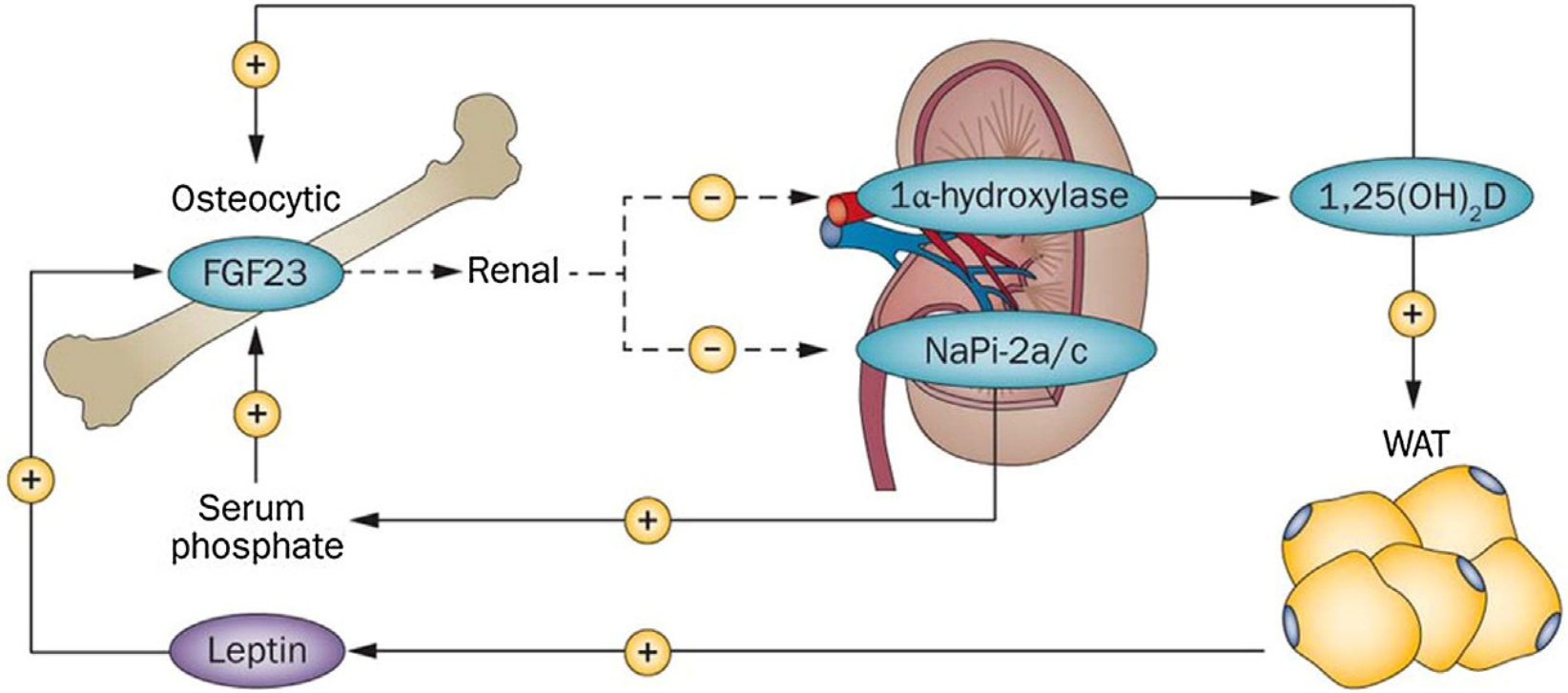
Journal of Steroid Biochemistry & Molecular Biology

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

Review

Physiological functions of Vitamin D in adipose tissue

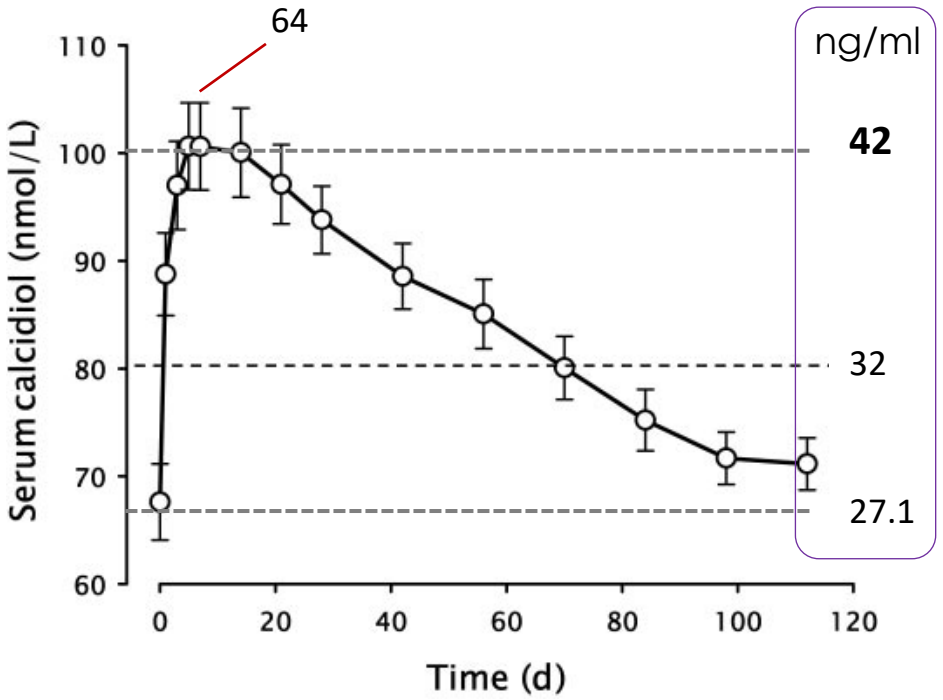
Manal A. Abbas



Pharmacokinetics of a single, large dose of cholecalciferol[1–3]

Marium Ilahi, Laura AG Armas, and Robert P Heaney

100.000 UI Colecalciferol



Serum calcium did not rise at any time point in either age group; in fact, a biologically small but statistically significant fall (−0.30 ± 0.38 mg/dL) occurred in serum calcium by 5 d after dosing. No subject experienced hypercalcemia at any of the measured time points.

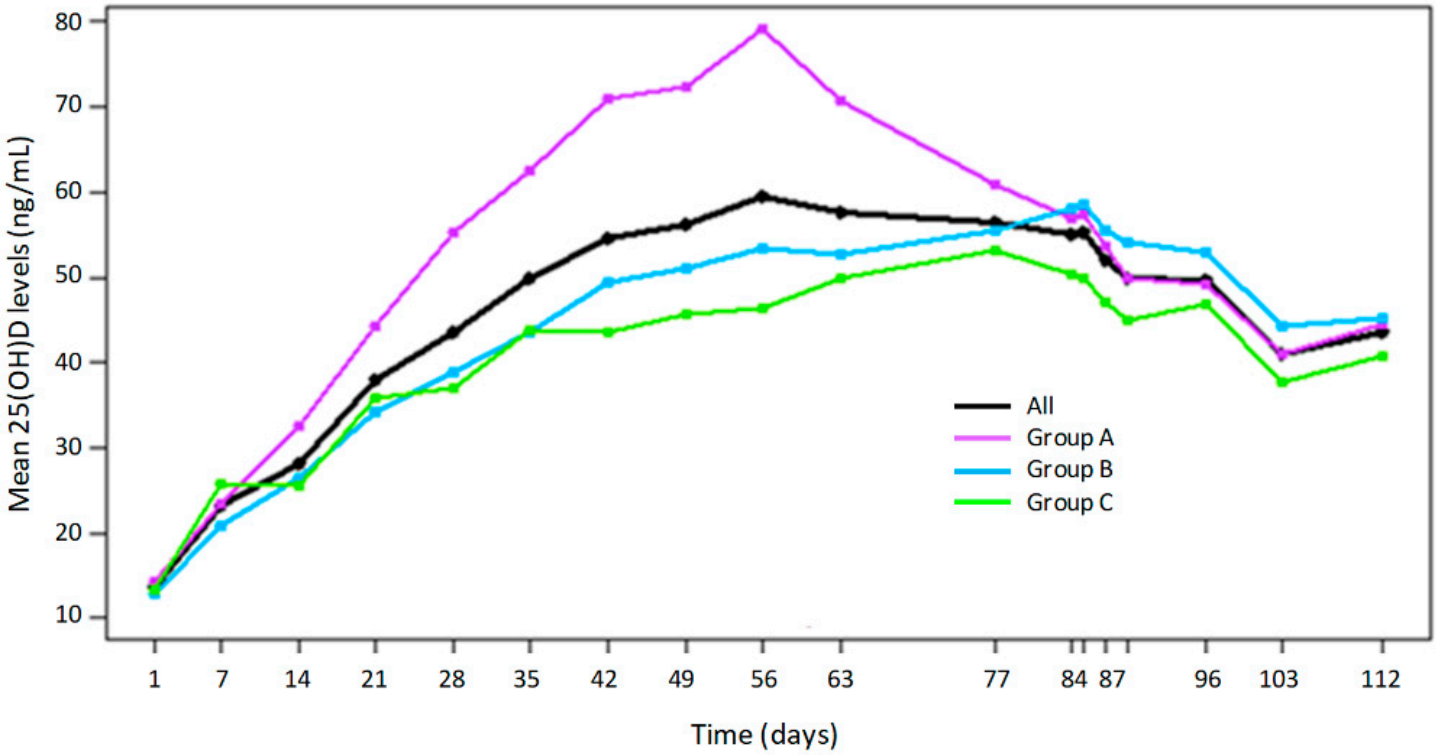
- Am J Clin Nutr 2008;87:688–91

nutrients

MDPI

Article

Pharmacokinetics of Oral Cholecalciferol in Healthy Subjects with Vitamin D Deficiency: A Randomized Open-Label Study



A_ 10.000 UI día
B_ 50.000 /wk
C_ 100.000 C/15D

Pregunta 6

¿Deberían los adultos ≥ 75 años utilizar suplementos empíricos de vitamina D versus no suplementar empíricamente con vitamina D?

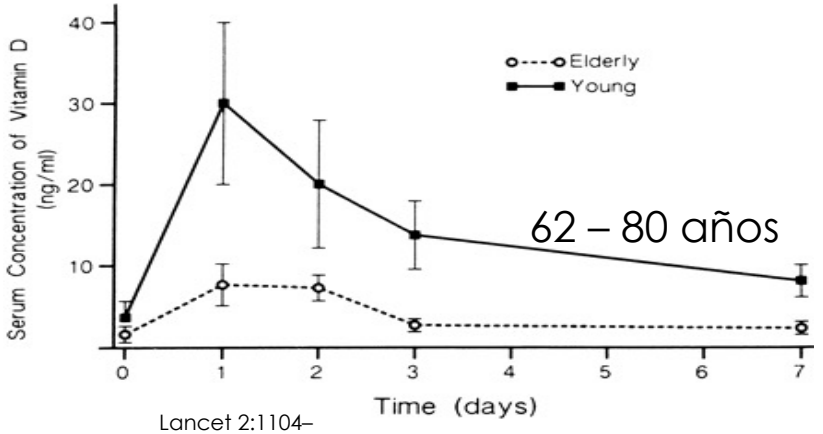
En la población general de 75 años o más, sugerimos la administración empírica de suplementos de vitamina D debido al potencial de reducir el riesgo de mortalidad.

2 | ⊕◯◯◯

The Journal of Clinical Endocrinology & Metabolism, 2024, **00**, 1–41
https://doi.org/10.1210/clinem/dgae290
Advance access publication 3 June 2024
Clinical Practice Guideline

Vitamin D for the Prevention of Disease: An Endocrine Society Clinical Practice Guideline

Marie B. Demay,[1] Anastassios G. Pittas,[2] Daniel D. Bikle,[3] Dima L. Diab,[4] Mairead E. Kiely,[5] Marise Lazaretti-Castro,[6] Paul Lips,[7] Deborah M. Mitchell,[8] M. Hassan Murad,[9] Shelley Powers,[10] Sudhaker D. Rao,[11,12] Robert Scragg,[13] John A. Tayek,[14,15] Amy M. Valent,[16] Judith M. E. Walsh,[17] and Christopher R. McCartney[18,19]



Lancet 2:1104–1105, 1989

> 800 UI día

Recomendaciones

Deficiencia (<20 ng/mL): 50.000 UI/semana × 6–8 semanas

Insuficiencia (20–30 ng/mL): 2.000–4.000 UI/día o esquemas intermedios

Mantenimiento: 1.000–2.000 UI/día (ajustado)

Holick MF et al. JCEM 2011 (Endocrine Society)
StatPearls 2023
Cleveland Clinic Journal of Medicine

Fundamento Fisiológico

Vitamina D liposoluble → secuestro en tejido adiposo

Vida media prolongada (25-OH vitamina D ~2–3 semanas)

Dosis bajas no generan gradiente de repleción

Impacto Clínico

Corrección en 6–8 semanas vs meses con dosis bajas

Reduce riesgo de caídas y fracturas

Mejora función muscular

Seguridad

50.000 UI/semana ≈ 7.000 UI/día

Amplio margen terapéutico

Toxicidad rara (<150 ng/mL)

Gracias

@ eldoctorcastillo

www.eldoctorcastillo.com

jorgecastillomd@hotmail.com