Modulo 7.3.

ALIMENTACIÓN A BASE DE PLANTAS

M.S.C. GIOMAR PAREDES RENGIFO

LICENCIADO EN EDUCACION FISICA

MAGISTER EN CIENCIAS DEL DEPORTE

DIPLOMADO EN GESTION Y GERENCIA DEL DEPORTE - UNE

DIPLOMADO EN NUTRICION Y DIETETICA DEPORTIVA - CNP

ISAK II

Tipos de Vegetarianismo Como Patrones de Alimentación

- **Lacto-Ovo-Vegetarianos (Vegetarianos).**No consumen carnes de ningún tipo (animales), más si consumen derivados animales como lácteos y huevos.
- **Lacto vegetarianos u Ovo-Vegetarianos:** Como los primeros, más solo consumen lácteos o huevos respectivamente
- **Vegetarianos estrictos:** No consumen ningún alimento de origen animal ni derivados. Este es el patrón de alimentación que tienen los Veganos
- **Flexitarianos, pescovegetarianos, Plant Based: ??**

Veganismo: Definición

"Una filosofía y forma de vida que busca excluir, en la medida de lo posible y practicable, todas las formas de explotación y crueldad hacia los animales para alimentación, vestimenta o cualquier otro propósito; y por extensión, promueve el desarrollo y el uso de alternativas libres de animales en beneficio de los humanos, los animales y el medio ambiente. En términos dietéticos, denota la práctica de dispensar todos los productos derivados total o parcialmente de animales"

"The vegan Society"

[redacted]

¿Es Sana una dieta Vegetariana/Vegana?

OJO

Los elementos con puntaje + estan asociados generalmente con dietas no vegetarianas.

Table 2 Food parameters included in the dietary inflammatory index, inflammatory effect scores, and intake values from the global composite data set; Dietary Inflammatory Index Development Study, Columbia, SC, USA, 2011–2012

Food parameter	Weighted number of articles	Raw inflammatory effect score*	Overall inflammatory effect score†	Global daily mean intake‡ (units/d)	SD‡
Alcohol (g)	417	−0·278	−0·278	13·98	3·72
Vitamin B_{12} (μg)	122	0·205	0·106	5·15	2·70
Vitamin B_6 (mg)	227	−0·379	−0·365	1·47	0·74
β-Carotene (μg)	401	−0·584	−0·584	3718	1720
Caffeine (g)	209	−0·124	−0·110	8·05	6·67
Carbohydrate (g)	211	0·109	0·097	272·2	40·0
Cholesterol (mg)	75	0·347	0·110	279·4	51·2
Energy (kcal)	245	0·180	0·180	2056	338
Eugenol (mg)	38	−0·868	−0·140	0·01	0·08
Total fat (g)	443	0·298	0·298	71·4	19·4
Fibre (g)	261	−0·663	−0·663	18·8	4·9
Folic acid (μg)	217	−0·207	−0·190	273·0	70·7
Garlic (g)	277	−0·412	−0·412	4·35	2·90
Ginger (g)	182	−0·588	−0·453	59·0	63·2
Fe (mg)	619	0·032	0·032	13·35	3·71
Mg (mg)	351	−0·484	−0·484	310·1	139·4
MUFA (g)	106	−0·019	−0·009	27·0	6·1
Niacin (mg)	58	−1·000	−0·246	25·90	11·77
n-3 Fatty acids (g)	2588	−0·436	−0·436	1·06	1·06
n-6 Fatty acids (g)	924	−0·159	−0·159	10·80	7·50
Onion (g)	145	−0·490	−0·301	35·9	18·4
Protein (g)	102	0·049	0·021	79·4	13·9
PUFA (g)	4002	−0·337	−0·337	13·88	3·76
Riboflavin (mg)	22	−0·727	−0·068	1·70	0·79
Saffron (g)	33	−1·000	−0·140	0·37	1·78
Saturated fat (g)	205	0·429	0·373	28·6	8·0
Se (μg)	372	−0·191	−0·191	67·0	25·1
Thiamin (mg)	65	−0·354	−0·098	1·70	0·66
Trans fat (g)	125	0·432	0·229	3·15	3·75
Turmeric (mg)	814	−0·785	−0·785	533·6	754·3
Vitamin A (RE)	663	−0·401	−0·401	983·9	518·6
Vitamin C (mg)	733	−0·424	−0·424	118·2	43·46
Vitamin D (μg)	996	−0·446	−0·446	6·26	2·21
Vitamin E (mg)	1495	−0·419	−0·419	8·73	1·49
Zn (mg)	1036	−0·313	−0·313	9·84	2·19
Green/black tea (g)	735	−0·536	−0·536	1·69	1·53
Flavan-3-ol (mg)	521	−0·415	−0·415	95·8	85·9
Flavones (mg)	318	−0·616	−0·616	1·55	0·07
Flavonols (mg)	887	−0·467	−0·467	17·70	6·79
Flavonones (mg)	65	−0·908	−0·250	11·70	3·82
Anthocyanidins (mg)	69	−0·449	−0·131	18·05	21·14
Isoflavones (mg)	484	−0·593	−0·593	1·20	0·20
Pepper (g)	78	−0·397	−0·131	10·00	7·07
Thyme/oregano (mg)	24	−1·000	−0·102	0·33	0·99
Rosemary (mg)	9	−0·333	−0·013	1·00	15·00

Construcción del EII

La puntuación DII no depende de las medias de la población ni de las recomendaciones de ingesta; se basa en los resultados publicados en la literatura científica.

Type of study	Study design	Value
Human	Experimental	10
	Prospective cohort	8
	Case–control	7
	Cross-sectional	6
Animal	Experimental	5
Cell culture	Experimental	3

Effect	Study design	Number of articles	Weighted number of articles	Fraction
Anti-inflammatory	Clinical	0	0	9 ÷ 205 = 0·044
	Cohort	0	0	
	Case–control	0	0	
	Cross-sectional	1 × 6 =	6	
	Animal	0	0	
	Cell	1 × 3 =	3	
	Total	**2**	**9**	
Pro-inflammatory	Clinical	3 × 10 =	30	97 ÷ 205 = 0·473
	Cohort	0	0	
	Case–control	1 × 7 =	7	
	Cross-sectional	4 × 6 =	24	
	Animal	3 × 5 =	15	
	Cell	7 × 3 =	21	
	Total	**18**	**97**	
No effect	Clinical	3 × 10 =	30	
	Cohort	0	0	
	Case–control	0	0	
	Cross-sectional	9 × 6 =	54	
	Animal	3 × 5 =	15	
	Cell	0	0	
	Total	**15**	**99**	
Overall total		**35**	**205**	

STEP 1

Score = 0·473 – 0·044 = **0·429** STEP 2

Healthy plant foods	Unhealthy plant foods	Animal foods
Fruits	Fruit juice	Meat
Vegetables	Refined grains	Fish
Whole grains	Potatoes	Eggs
Nuts	Sugar-sweetened beverages	Dairy
Tea & coffee	Sweets & desserts	Animal fat
Vegetable oils		

https://plantbasedhealthprofessionals.com/

Dietas Vegetarianas y Rendimiento Deportivo

- **Hanne y col. (1986)** compararon el estado físico de atletas vegetarianos y atletas no vegetarianos y **no encontraron diferencias**. Las mujeres vegetarianas tenían un porcentaje de grasa corporal significativamente menor que las mujeres no vegetarianas, y las mujeres vegetarianas también tenían valores de hematocrito más bajos que los controles, aunque la hemoglobina era similar.

- **No diferencias significativas** en la **densidad ósea** entre mujeres vegetarianas y no vegetarianas. Además el vegetarianismo en sí mismo no parece ser un factor de riesgo para la tríada de la atletas femenina **(Benson et al. 1996)**

- Aún así es necesario estar alertas pues la adhesión a una dieta vegetariana, u otra dieta restrictiva, puede usarse como una excusa para patrones alimenticios desordenados, ya que se puede percibir el vegetarianismo como una estrategia para adelgazar.

- Una dieta vegetariana al ser rica en **CHOs** puede tener un efecto ventajoso sobre el rendimiento atlético.

- Una dieta vegetariana mal planificada puede tener un efecto adverso sobre el rendimiento físico y la salud a largo plazo.

British Nutrition Foundation Nutrition Bulletin

Necesidades Nutricionales de Atletas Veganos

• En base a las calorías, las necesidades de carbohidratos para los atletas son similares a las de cualquier otra persona. Las recomendaciones específicas para atletas se basan en el peso y el tipo de actividad.

• En triatletas Ironman se encontró que menos de la mitad alcanzó la ingesta recomendada de carbohidratos para quienes entrenan de 1 a 3 horas por día.

Review

Plant-Based Diets for Cardiovascular Safety and Performance in Endurance Sports

Neal D. Barnard [1,2,3], David M. Goldman [4], James F. Loomis [1,3], Hana Kahleova [2], Susan M. Levin [2,*], Stephen Neabore [1,3] and Travis C. Batts [5]

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Received: 1 November 2018; Accepted: 11 December 2018; Published: 10 January 2019

check for updates

Abstract: Studies suggest that endurance athletes are at higher-than-average risk for atherosclerosis and myocardial damage. The ability of plant-based regimens to reduce risk and affect performance was reviewed. The effect of plant-based diets on cardiovascular risk factors, particularly plasma lipid concentrations, body weight, and blood pressure, and, as part of a healthful lifestyle, reversing existing atherosclerotic lesions, may provide a substantial measure of cardiovascular protection. In addition, plant-based diets may offer performance advantages. They have consistently been shown to reduce body fat, leading to a leaner body composition. Because plants are typically

Beneficios de una Plant Based Diet en el Rendimiento

- El consumo de carne y los niveles altos de colesterol exacerban la inflamación, lo que puede provocar dolor y afectar el rendimiento deportivo y la recuperación. Los estudios demuestran que una dieta basada en plantas puede tener un efecto antiinflamatorio.
- Una dieta basada en plantas, baja en grasas saturadas y libre de colesterol, ayuda a mejorar la viscosidad o el grosor de la sangre, ayudando a que llegue más oxígeno a los músculos, lo que mejora el rendimiento deportivo.
- Las dietas basadas en plantas mejoran la flexibilidad y el diámetro arterial, lo que conduce a un mejor flujo sanguíneo.
- Las personas que tienen una dieta basada en plantas obtienen más antioxidantes, ayudando a neutralizar radicales libres, los cuales conducen a la fatiga muscular, un menor rendimiento y una menor recuperación.
- Los estudios demuestran que los atletas que siguen una dieta basada en plantas aumentan su VO2 máx lo que lleva a una mejor resistencia.

¿Conviene más una dieta Vegetariana para deportes de Resistencia?

Riesgo Cardiovascular en Atletas de Resistencia

Prevalence of Subclinical Coronary Artery Disease in Masters Endurance Athletes With a Low Atherosclerotic Risk Profile

Editorial, see p 149

BACKGROUND: Studies in middle-age and older (masters) athletes with atherosclerotic risk factors for coronary artery disease report higher coronary artery calcium (CAC) scores compared with sedentary individuals. Few studies have assessed the prevalence of coronary artery disease in masters athletes with a low atherosclerotic risk profile.

METHODS: We assessed 152 masters athletes 54.4±8.5 years of age (70% male) and 92 controls of similar age, sex, and low Framingham 10-year coronary artery disease risk scores with an echocardiogram, exercise stress test, computerized tomographic coronary angiogram, and cardiovascular magnetic resonance imaging with late gadolinium enhancement and a 24-hour Holter. Athletes had participated in endurance exercise for an average of 31±12.6 years. The majority (77%) were runners, with a median of 13 marathon runs per athlete.

RESULTS: Most athletes (60%) and controls (63%) had a normal CAC score. Male athletes had a higher prevalence of atherosclerotic plaques of any luminal irregularity (44.3% versus 22.2%; P=0.009) compared with sedentary males, and only male athletes showed a CAC ≥300 Agatston units (11.3%) and a luminal stenosis ≥50% (7.5%). Male athletes demonstrated predominantly calcific plaques (72.7%), whereas sedentary males showed predominantly mixed morphology plaques (61.5%). The number of years of training was the only independent variable associated with increased risk of CAC >70th percentile for age or luminal stenosis ≥50% in male athletes (odds ratio, 1.08; 95% confidence interval, 1.01–1.15; P=0.016); 15 (14%) male athletes but none of the controls revealed late gadolinium enhancement

Ahmed Merghani, MD
Viviana Maestrini, PhD
Stefania Rosmini, MD
Andrew T. Cox, MD
Harshil Dhutia, MD
Rachel Bastiaenan, PhD
Sarojini David, MD
Tee Joo Yeo, MD
Rajay Narain, MD
Aneil Malhotra, MD
Michael Papadakis, MD
Mathew G. Wilson, PhD
Maite Tome, MD
Khaled AlFakih, MD
James C. Moon, MD
Sanjay Sharma, MD

Increased Coronary Artery Plaque Volume Among Male Marathon Runners

by Robert S. Schwartz, MD, Stacia Merkel Kraus, MPH, Jonathan G. Schwartz, MD, Kelly K. Wickstrom, BS, Gretchen Peichel, RN, Ross F. Garberich, MS, John R. Lesser, MD, Stephen N. Oesterle, MD, Thomas Knickelbine, MD, Kevin M. Harris, MD, Sue Duval, PhD, William O. Roberts, MD & James H. O'Keefe, MD

This study found that long-term participation in marathon training/racing is paradoxically associated with increased coronary plaque volume.

Robert S. Schwartz, MD, (left) Kelly K. Wickstrom, BS, Gretchen Peichel, RN, Ross F. Garberich, MS, John R. Lesser, MD, Thomas Knickelbine, MD, Kevin M. Harris, MD, are with the Minneapolis Heart Institute and Foundation at Abbott Northwestern Hospital, Minneapolis, MN. Stacia Merkel Kraus, MPH, is with the Integra Group, Brooklyn Park, MN. Jonathan G. Schwartz, MD, is with the Department of Internal Medicine, University of Colorado Medical Center, Denver, CO. Stephen N. Oesterle, MD is with Medtronic Inc., Minneapolis, MN. Sue Duval, PhD, is with the School of Public Health, University of Minnesota, Minneapolis, MN. William O. Roberts, MD, MS, is with the Department of Family Medicine and Community Health, University of Minnesota, St. Paul, MN. James H. O'Keefe, MD, (right), MSMA member since 2003, is with the Saint Luke's Mid America Heart Institute, Kansas City, MO, and the *Missouri Medicine* Preventive Medicine Editorial Board Member.
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Abstract

Background

Long-term marathon running improves many cardiovascular risk factors, and is presumed to protect against coronary artery plaque formation. This hypothesis, that long-term marathon running is protective against coronary atherosclerosis, was tested by quantitatively assessing coronary artery plaque using high resolution coronary computed tomographic angiography (CCTA) in veteran marathon runners compared to sedentary control subjects.

Methods

Men in the study completed at least one marathon yearly for 25 consecutive years. All study subjects underwent CCTA, 12-lead electrocardiogram, measurement of blood pressure, heart rate, and lipid panel. A sedentary matched group was derived from a contemporaneous CCTA database of asymptomatic healthy individuals. CCTAs were analyzed using validated plaque characterization software.

Results

Male marathon runners (n = 50) as compared with sedentary male controls (n = 23) had increased total plaque volume (200 vs. 126 mm3, p < 0.01), calcified plaque volume (84 vs. 44 mm3, p < 0.0001), and non-calcified plaque volume (116 vs. 82 mm3, p = 0.04). Lesion area and length, number of lesions per subject, and diameter stenosis did not reach statistical significance.

Conclusion

Long-term male marathon runners may have paradoxically increased coronary artery plaque volume.

Dietas Vegetarianas una opción para la salud cardiovascular en atletas

nutrients

MDPI

Review

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Received: 1 November 2018; Accepted: 11 December 2018; Published: 10 January 2019

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Abstract: Studies suggest that endurance athletes are at higher-than-average risk for atherosclerosis and myocardial damage. The ability of plant-based regimens to reduce risk and affect performance was reviewed. The effect of plant-based diets on cardiovascular risk factors, particularly plasma lipid concentrations, body weight, and blood pressure, and, as part of a healthful lifestyle, reversing existing atherosclerotic lesions, may provide a substantial measure of cardiovascular protection. In addition, plant-based diets may offer performance advantages. They have consistently been shown to reduce body fat, leading to a leaner body composition. Because plants are typically high in carbohydrate, they foster effective glycogen storage. By reducing blood viscosity and improving arterial flexibility and endothelial function, they may be expected to improve vascular flow and tissue oxygenation. Because many vegetables, fruits, and other plant-based foods are rich in antioxidants, they help reduce oxidative stress. Diets emphasizing plant foods have also been shown to reduce indicators of inflammation. These features of plant-based diets may present safety and performance advantages for endurance athletes. The purpose of this review was to explore the role of nutrition in providing cardioprotection, with a focus on plant-based diets previously shown to provide cardiac benefits.

Dietas vegetarianas seguras para deportistas

International Journal of Sport Nutrition and Exercise Metabolism, 2016, 26, 212-220
http://dx.doi.org/10.1123/ijsnem.2015-0231

Human Kinetics
ORIGINAL RESEARCH

Vegetarian and Omnivorous Nutrition— Comparing Physical Performance

Joel C. Craddock, Yasmine C. Probst, and Gregory E. Peoples

Humans consuming vegetarian-based diets are observed to have reduced relative risk for many chronic diseases. Similarly, regular physical activity has also been shown to assist in preventing, and reducing the severity of these conditions. Many people, including athletes, acknowledge these findings and are adopting a vegetarian-based diet to improve their health status. Furthermore, athletes are incorporating this approach with the specific aim of optimizing physical performance. To examine the evidence for the relationship between consuming a predominately vegetarian-based diet and improved physical performance, a systematic literature review was performed using the SCOPUS database. No date parameters were set. The keywords *vegetarian* OR *vegan* AND *sport* OR *athlete* OR *training* OR *performance* OR *endurance* were used to identify relevant literature. Included studies (i) directly compared a vegetarian-based diet to an omnivorous/mixed diet, (ii) directly assessed physical performance, not biomarkers of physical performance, and (iii) did not use supplementation emulating a vegetarian diet. Reference lists were hand searched for additional studies. Seven randomized controlled trials and one cross-sectional study met the inclusion criteria. No distinguished differences between vegetarian-based diets and omnivorous mixed diets were identified when physical performance was compared. Consuming a predominately vegetarian-based diet did not improve nor hinder performance in athletes. However, with only 8 studies identified, with substantial variability among the studies' experimental designs, aims and outcomes, further research is warranted.

Keywords: vegan, veganism, vegetarianism

European Journal of Clinical Nutrition (2020) 74:1550–1555
https://doi.org/10.1038/s41430-020-0639-y

ARTICLE

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Body composition, energy expenditure and physical activity

Is a vegan diet detrimental to endurance and muscle strength?

Guy Hajj Boutros[1] · Marie-Anne Landry-Duval[1] · Mauricio Garzon[1] · Antony D. Karelis[1]

Received: 24 February 2020 / Revised: 3 April 2020 / Accepted: 7 April 2020 / Published online: 24 April 2020

Abstract

Background/objectives In the general population, there is a popular belief that a vegan diet may be associated with a lower exercise performance due to the lack of certain nutrients in vegan individuals. Thus, the purpose of the present study was to examine endurance and muscle strength differences between vegan and omnivore participants.

Subjects/methods We studied 56 healthy young lean physically active women (age: 25.6 ± 4.1 years; body mass index: 22 ± 1.9 kg/m^2). Participants were classified as vegan ($n = 28$) or omnivore ($n = 28$) based on their eating habits. All volunteers followed either a vegan or an omnivore diet for at least 2 years. Anthropometric measurements, body composition, estimated maximal oxygen consumption (VO_2 max), a submaximal endurance test (70% of VO_2 max), muscle strength (leg and chest press), and dietary factors were measured.

Results Both groups were comparable for physical activity levels, body mass index, percent body fat, lean body mass, and muscle strength. However, vegans had a significantly higher estimated VO_2 max (44.5 ± 5.2 vs. 41.6 ± 4.6 ml/kg/min; $p = 0.03$, respectively) and submaximal endurance time to exhaustion (12.2 ± 5.7 vs. 8.8 ± 3.0 min; $p = 0.007$, respectively) compared with omnivores.

Conclusions The results suggest that a vegan diet does not seem to be detrimental to endurance and muscle strength in healthy young lean women. In fact, our study showed that submaximal endurance might be better in vegans compared with omnivores. Therefore, these findings contradict the popular belief of the general population.

Article

Cardiorespiratory Fitness and Peak Torque Differences between Vegetarian and Omnivore Endurance Athletes: A Cross-Sectional Study

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Received: 1 September 2016; Accepted: 10 November 2016; Published: 15 November 2016

Abstract: In spite of well-documented health benefits of vegetarian diets, less is known regarding the effects of these diets on athletic performance. In this cross-sectional study, we compared elite vegetarian and omnivore adult endurance athletes for maximal oxygen uptake (VO2 max) and strength. Twenty-seven vegetarian (VEG) and 43 omnivore (OMN) athletes were evaluated using VO2 max testing on the treadmill, and strength assessment using a dynamometer to determine peak torque for leg extensions. Dietary data were assessed using detailed seven-day food logs. Although total protein intake was lower among vegetarians in comparison to omnivores, protein intake as a function of body mass did not differ ... nd 1.4 ± 0.5 g/kg body mass for VEG and OMN respectively, $p = 0.220$). V ... emales by diet group (53.0 ± 6.9 and 47.1 ± 8.6 mL/kg/min for VEG and O ... .05) but not for males (62.6 ± 15.4 and 55.7 ± 8.4 mL/kg/min respectively). Peak torque did not differ significantly between diet groups. Results from this study indicate that vegetarian endurance athletes' cardiorespiratory fitness was greater than that for their omnivorous counterparts, but that peak torque did not differ between diet groups. These data suggest that vegetarian diets do not compromise performance outcomes and may facilitate aerobic capacity in athletes.

Beneficios derivados de una Dieta

Vegetariana saludable para Atletas

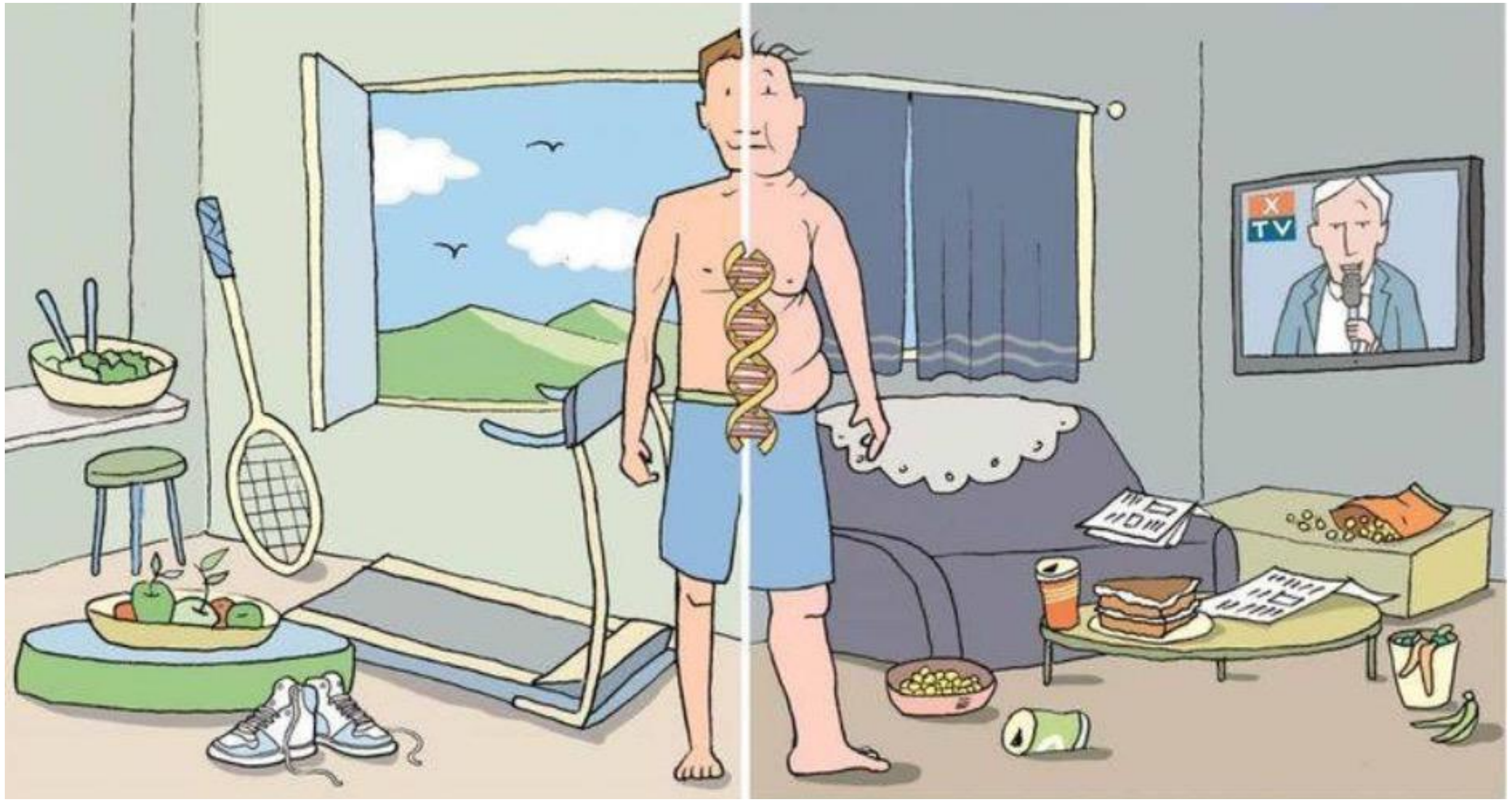
- Mayor consumo de antioxidantes y polifenoles
- Mayor facilidad para llevar una dieta alta en carbohidratos
- Mayor ingesta de nitratos
- Perfil de Microbiota más saludable
- Mejora flujo sanguíneo
- Promueve peso saludable

Planificación Dietética para rendimiento y cambios en composición corporal

M.S.C. Giomar Paredes Rengifo

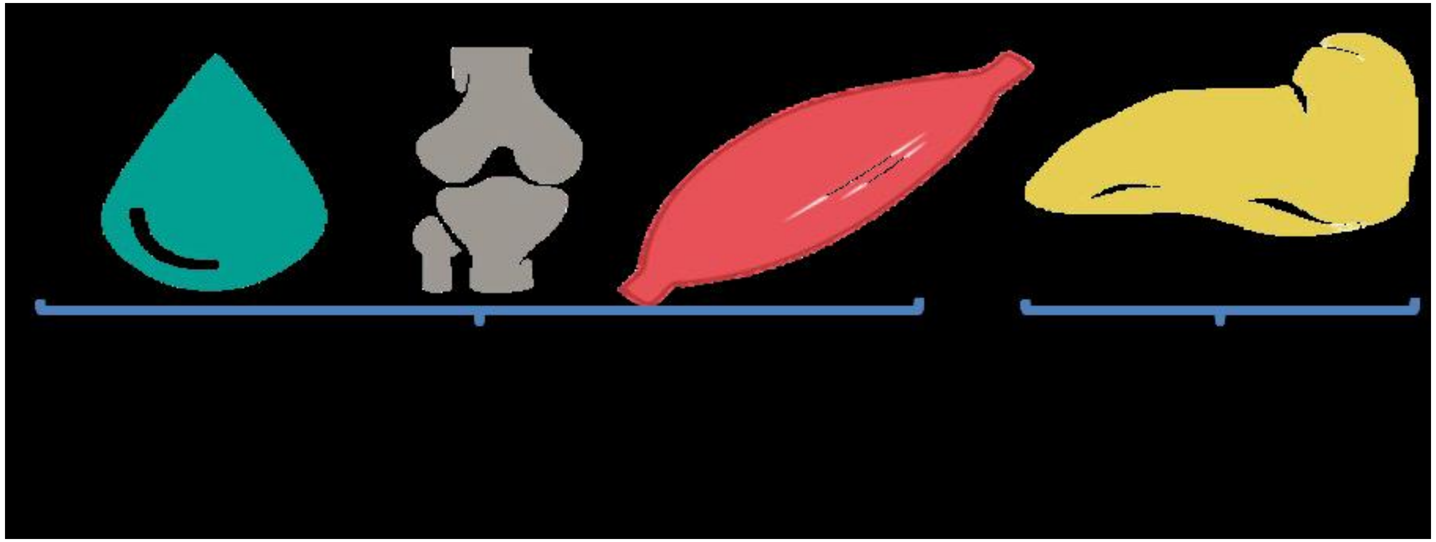
La Composición corporal es clave en los objetivos estéticos y uno de los factores más importantes para el rendimiento en muchos deportes

Influencia del Medio Ambiente en la Composición Corporal



M.S.C. Giomar Paredes Rengifo

pero…¿Qué medir? ¿Cómo cuantificar los cambios en la composición corporal?



IMC ¿Es suficiente?

- IMC 18.5 y 24.9….hasta unos 15 Kg de diferencia.
- Mujer de 1.6m , entre 48 y 63 Kg
- Hombre de 1.7m, entre 57-72 Kg

Factores que influyen en el Somatotipo

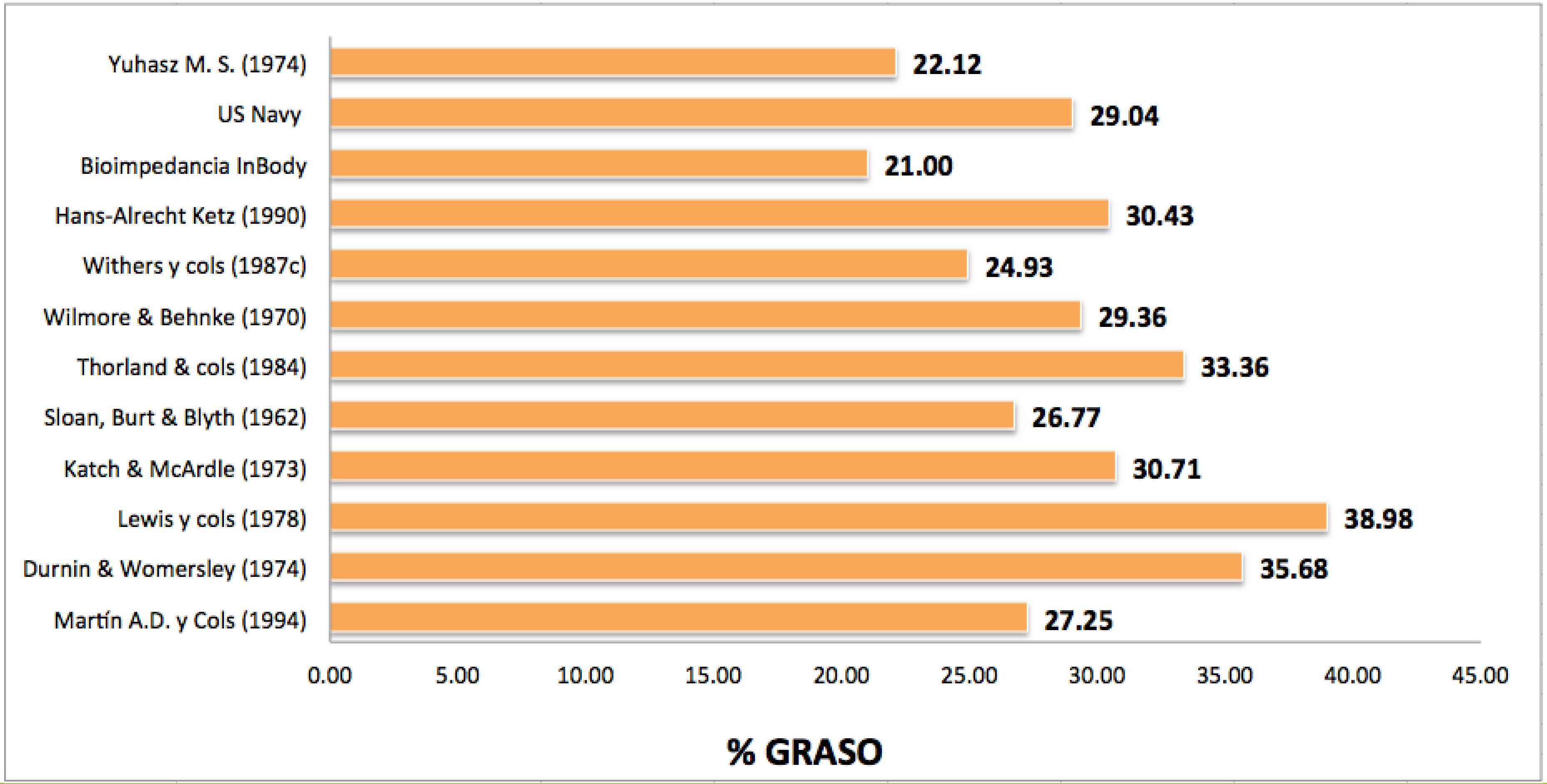
- GenéTca (dimensiones óseas, niveles de miostaTna, etc)
- Edad
- Sexo
- Crecimiento
- AcTvidad Física
- Alimentación
- Factores Ambientales
- Medio sociocultural

NOTA: ES UN CONCEPTO **VISUAL**

Escala del Somatotipo

- Rating de 3 números:
  - endo – meso – ecto
  - Fondista: 1 – 3 – 4
  - Gimnasta: 1 – 6 – 1
  - Ambos tienen un 6% de grasa corporal

% de Grasa



Yuhasz M. S. (1974)
22.12
US Navy
29.04
Bioimpedancia InBody
21.00
Hans-Alrecht Ketz (1990)
30.43
Withers y cols (1987c)
24.93
Wilmore & Behnke (1970)
29.36
Thorland & cols (1984)
33.36
Sloan, Burt & Blyth (1962)
26.77
Katch & McArdle (1973)
30.71
Lewis y cols (1978)
38.98
Durnin & Womersley (1974)
35.68
Martín A.D. y Cols (1994)
27.25
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
% GRASO

Más allá del % de Grasa y Peso

SUMATORIA DE PLIEGUES

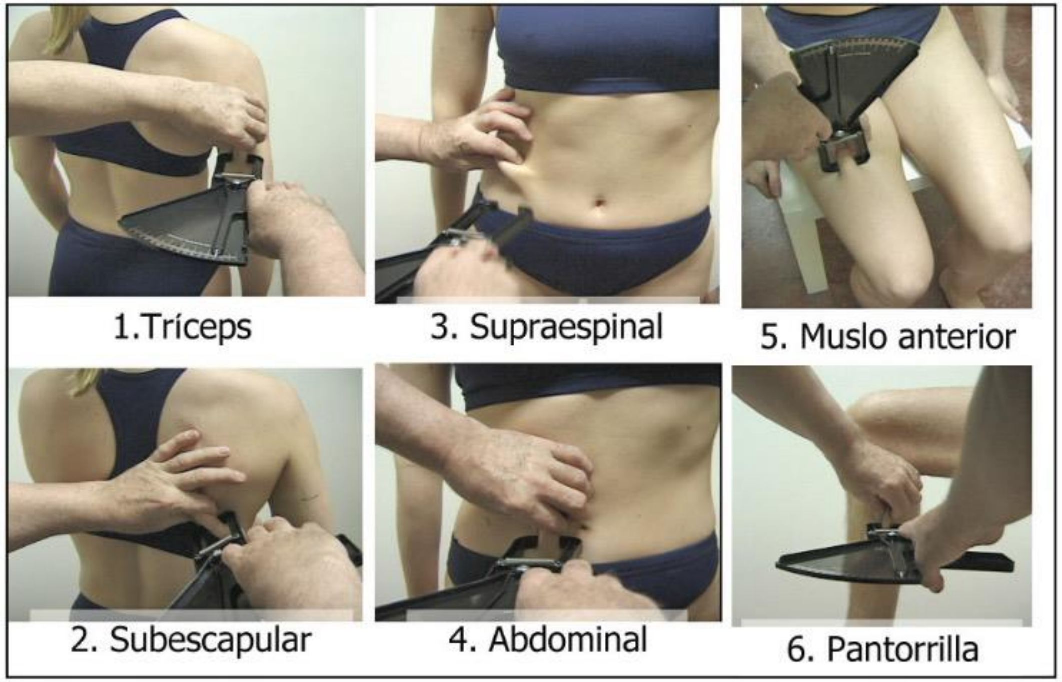
SUMATORIA DE PLIEGUES

- Mujer 28 años, 58.1 Kg, 1.55 m.
- % de Grasa según Bioimpedancia = 22%
- Sumatoria de 6 Pliegues: 119.7 mm

Percentiles

	5%	15%	25%	50%	75%	85%	95%
♀	61,9	69,5	76,4	91,5	112,4	121,6	145,2
♂	33,6	47,1	52,6	65,6	84,2	94,3	115,9

Atletas



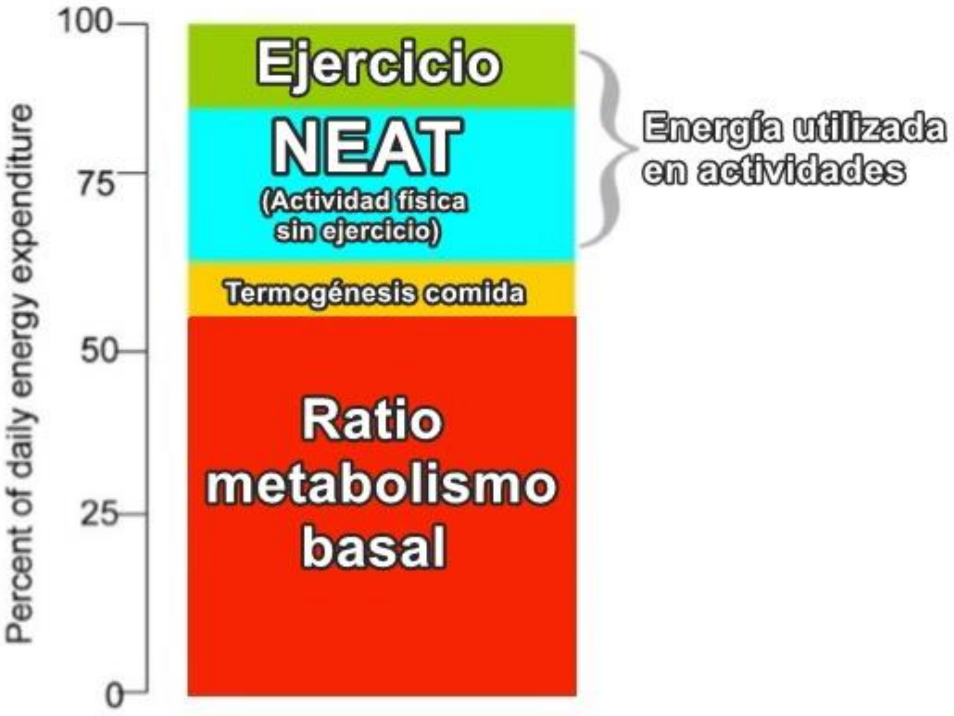
Según ello decidiremos si necesitamos:

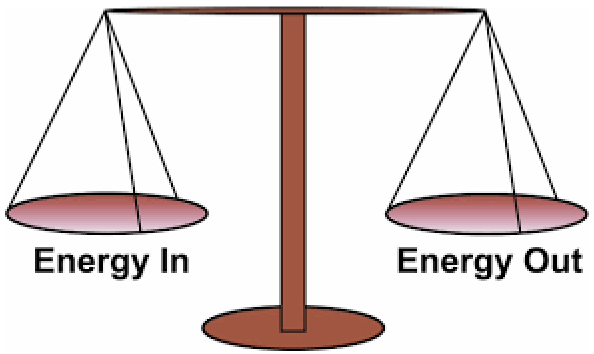
- Mantener la composición actual
- Perder grasa y masa muscular

pero…¿Existen más opciones?

- Ganar masa muscular
- Perder grasa
- Ganar masa muscular y grasa

Y para lograr esto…¿que es lo primordial?





¿UNA CALORIA ES UNA CALORIA?
¿Se cumple la ley de la termodinámica?

Muchos piensan la ecuación del gasto energético es algo asi

GE= X+Y+Z

Donde:

X= GEB

y= Gasto energético en actividad física (METS)

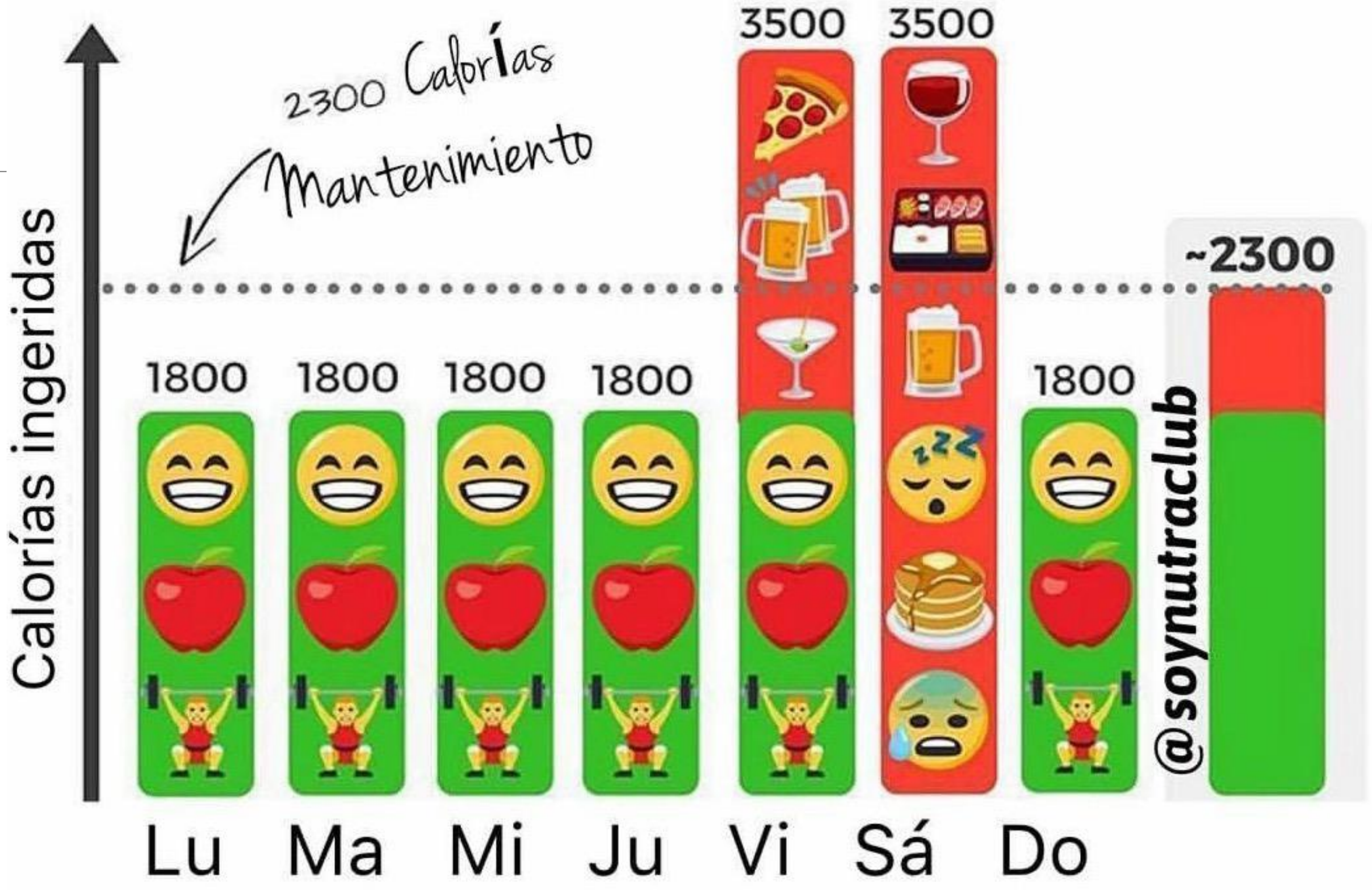
Z= Gasto termógenico de los alimentos

Pero en realidad es algo asi como:

GE= X1+X2+X3+Y1+Y2+Y3+Z1+Z2+Z3…

Donde otras variables a considerar son:

X1: Horas de descanso
X2: Sistema endocrino (Tiroideo, GH, testosterona, estrógenos, etc)
X3: Estado de las mitocondrias
Y1: Lanzadera y cadena de electrones (UCP1)
Y2: Microbiota (producción de AGCC)
Y3: Flexibilidad metabólica
Z1: Absorción de macronutrientes - Fibra
Z2: Número y eficiencia de enzimas lipolíticas y liposintéticas
Z3: Tamaño de organos y masa muscular.
etc



2300 Calorías
Mantenimiento
Calorías ingeridas
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3500
~2300
1800
1800
1800
1800
1800
@soynutraclub
Lu
Ma
Mi
Ju
Vi
Sá
Do

Cálculo Requerimiento Calórico de una Persona

Primero se Calcula el GEB o GER…pero…

¿Cómo hacerlo? ¿Qué Fórmula usar?

GASTO o TASA METABOLICA BASAL (GMB o TMB)

Es la mínima cantidad de Energía que requiere el cuerpo en reposo y en estado de ayuno. Esta tasa metabólica representa la cantidad de energía necesaria para los procesos vitales, como respiración , metabolismo celular, circulación actividad glandular y para el Mantenimiento de la Temperatura Corporal.

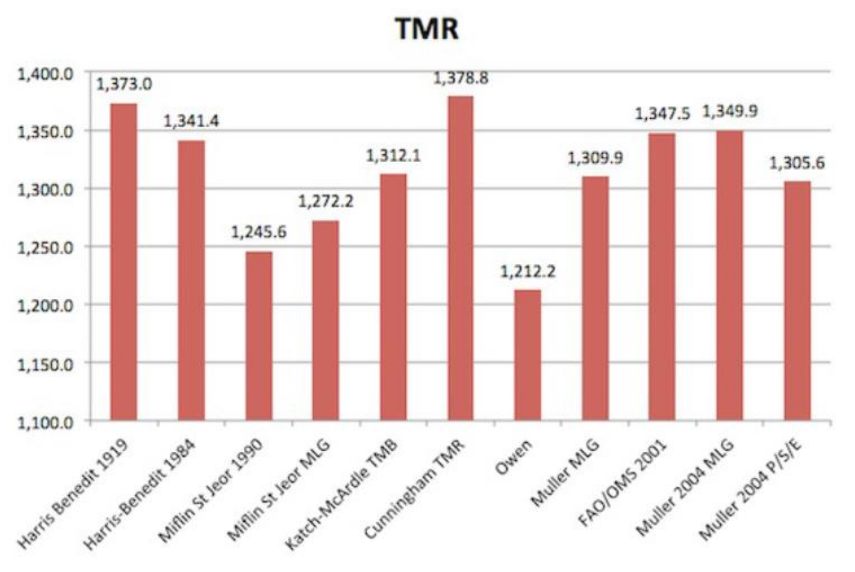
TASA METABÓLICA BASAL SEGÚN HARRIS BENEDICT

Hombres:
TMB = 66 + [13.7 x P (kg)] + [5 x T (cm)] - [6.8 x edad (años)]

Mujeres:
TMB = 655 + [9.6 x P (kg)] + [1.8 x T (cm)] - [4.7 x edad (años)]

FACTOR DE ACTIVIDAD FÍSICA (TRADICIONAL)

COMPARACIÓN CON OTRAS FÓRMULAS



CONSEJO PRÁCTICO

• Lo primero sería buscar el balance Normocalórico, antes de aplicar cualquier déficit o superávit.

• Para hallar este se pueden usar diversas fórmulas y criterios. Sea cual fuere hay que ponerlo a prueba por unas 2 semanas, y según ello valorar y ajustar.

• También podría llevarse un registro de las calorías y macronutrientes que se consumen usualmente por una

semana, y con el cual estamos en nuestro peso actual. Ello sería nuestro normocalórica. Sin embargo tiene el riesgo de que pueda que sea muy bajo y que nuestro organismo se haya adaptado, razón por la cual más bien habría que restablecer el metabolismo. Para ello compararlo con el resultado de alguna fórmula. Si la ingesta esta por debajo de la TMB, es probable que la el gasto energético sea subóptimo.

CONTEXTO DE LAS EXIGENCIAS NUTRICIONALES EN LOS DEPORTES

GASTO DE ENERGÍA KCAL

NATACIÓN REMO	CICLISMO DE RUTA	DEPORTE DE EQUIPO	DEPORTES DE COMBATE	DEPORTES CON PUNTUACIÓN ESTÉTICA
10 000 – 6 000	6000 - 3000	4000 - 2500	2 500 A 1 500	2 500 – 1 500

Nutrición deportiva. Francisco Holway, 2016

CARBOHIDRATOS

REQUERIMIENTOS CARBOHIDRATOS (g/Kg de peso)		Consideraciones
Ligero	3 – 5	Act. Normal, Halterofilia, Deportes fosfagénicos
Moderado	5-7	Deportes de fuerza y potencia
Intenso	6 - 10	FIFA
Super Intenso	8 -12	Resistencia, Gasto extremo. Ironman, triatlón, Ciclismo de ruta extrema

Distribución de Macronutrientes

Macronutrientes	Deportes de fuerza o velocidad	Deportes de resistencia
Carbohidratos (%)	50-55	60-70
Proteínas (%)	15-20	10-15
Grasas (%)	25-30	30-35

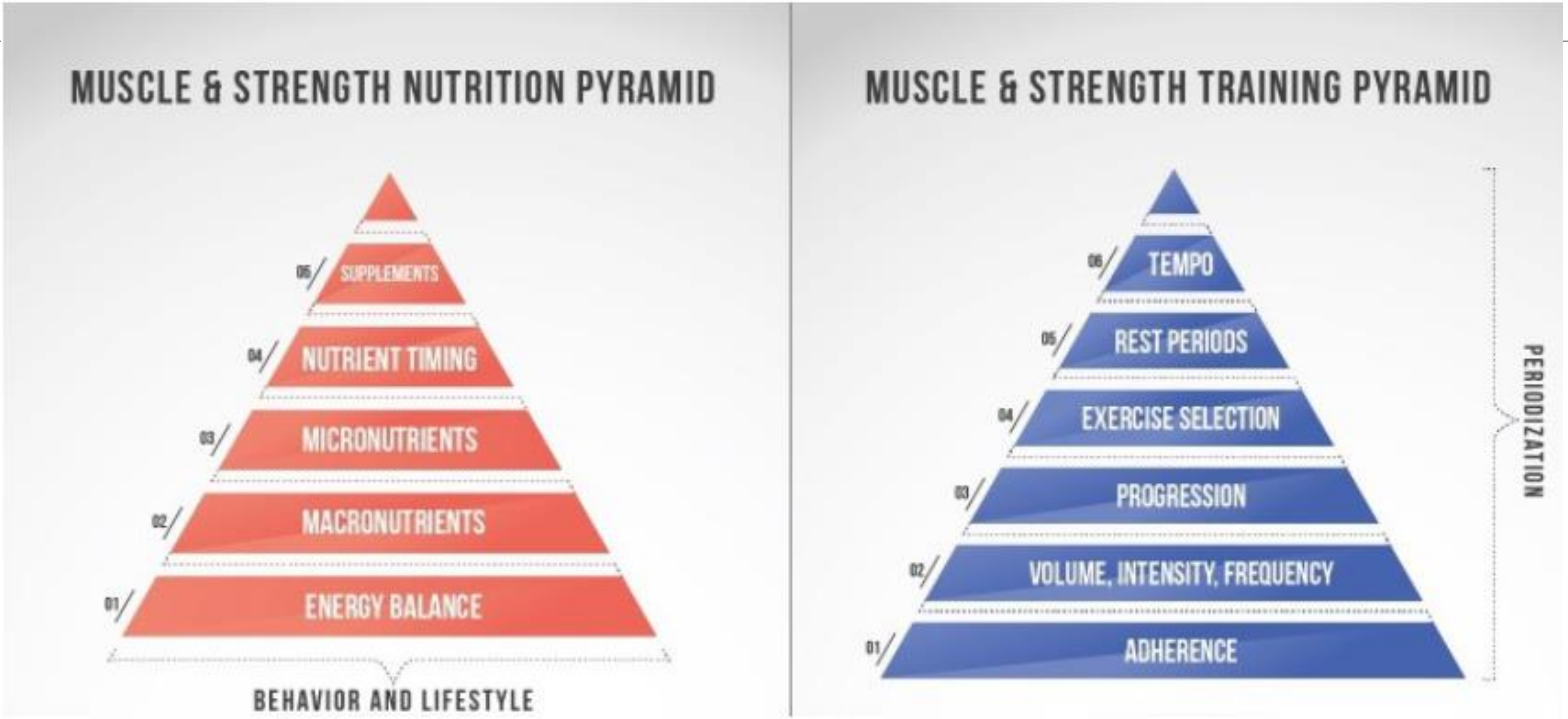
Resumen de necesidades de carbohidratos según la intensidad y situación de la actividad

Situación aguda (antes, durante, post ejercicio)	Recomendaciones
Ingesta diaria para un óptimo depósito de glucógeno muscular (pre y/o post ejercicio)	7 a 12 g/kg peso
Recuperación rápida post-ejercicio	1 – 1.2 g/kg peso
Ingesta anterior a un ejercicio, prolongada	1 – 1.4 g/kg peso de 1 a 4 horas antes del ejercicio *2g/kg peso 1-4 horas antes del ejercicio
Ingesta durante un ejercicio de moderada intensidad	0.5 – 1.0 g/kg peso 30 a 60 g/ hora de ejercicio
Ingesta durante un ejercicio de alta intensidad	1 – 1.5 g/kg peso 60 a 90 g/ por hora de ejercicio

Fuente: Adaptado de (Olivos, C., Cuevas, M., Álvarez, V., Jorquera, C., 2012). Nutrición para el entrenamiento y la competencia

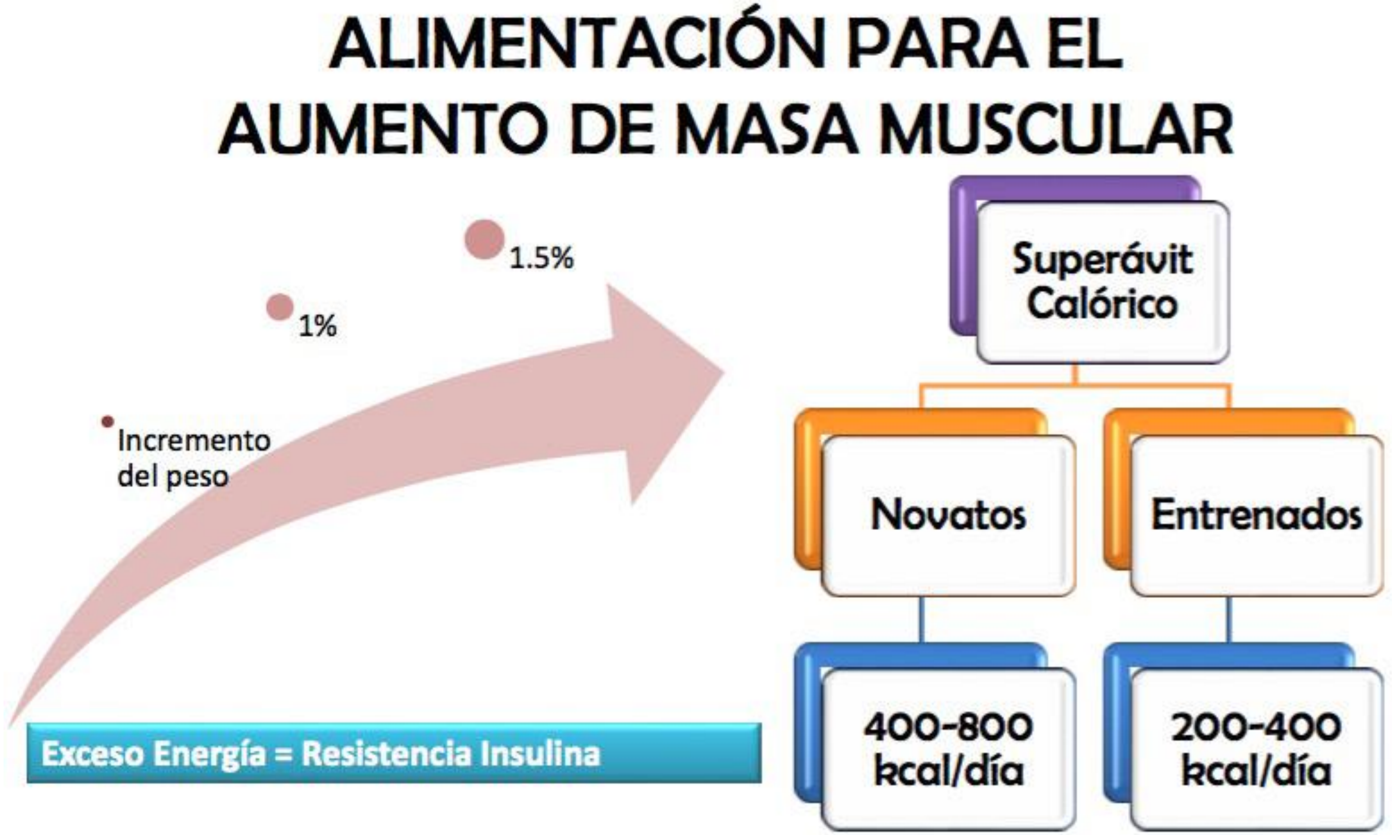
**Nota:* Manejo en deportistas de triatlón por Francisco Holway

Pirámides de Eric Helms



ESTRATEGIAS BÁSICAS

- Aumento de Peso = Superavit calórico sostenido
- Disminución de Peso = Deficit Calórico sostenido



OTROS FACTORES IMPORTANTES
PARA EL ANABOLISMO

Alcohol
- Suprime respuesta anabólica
- Impide recuperación y adaptaciones al entrenamiento

Sueño
- 5 noches privación del sueño: aumento cortisol 21%
- Disminución sensibilidad insulina 29%
- Disminución lipólisis (aumento lipoproteinlipasa)

Estrés
- Cortisol elevado inhibe la síntesis de proteína

Estatus Hormonal
- IGF-1, Testosterora, GH: respuesta al trabajo con cargas.
- Hormonas reducidas: caída en hipertrofia

Genética
- Variabilidad de individuos
- Sujetos con respuetas: bajas, moderadas, altas

Weekly Weight Loss	Total Calories	Calories From BF	Calories From LBM	Daily Calorie Deficit
1.2kg	7113	6699	413	1016
1.1kg	6520	6141	379	931
1.0kg	5927	5583	344	847
0.9kg	5334	5025	310	762
0.8kg	4742	4466	276	677
0.7kg	4149	3908	241	593
0.6kg	3556	3350	207	508
0.5kg	2964	2791	172	423
0.4kg	2371	2233	138	339
0.3kg	1778	1675	103	254
0.2kg	1185	1117	69	169
0.1kg	593	558	34	85

RECOMENDACIÓN DE AUMENTOS CALÓRICOS

Nivel de Experiencia	Calorías por encima de Mantenimiento
Principiante	~300 kcal/d
Intermedio	~200 kcal/d
Avanzado	~100 kcal/d

Evitar hacer incrementos de forma acelerada para evitar la ganancia de grasa corporal

PROTEINAS: Entre 1.5 a 2.2g x Kg/Peso corporal
% de Grasas y Carbohidratos: Indiferente, siempre y cuando se alcancen las Kcal Totales
Nota: Para un mayor rendimiento deportivo y en entrenamiento, es fundamental un buen aporte de carbohidratos.

Consejos para aumentar calorías **(aumento de masa muscular).**

- Alimentos “plant based” son generalmente menos densos en calorías y más voluminosos que los alimentos de origen animal/alimentos ultraprocesados. Aumenta las porciones de alimentos (sobre todo los ricos en Carbohidratos como pasta o papas) y alimentos ricos en proteínas (como frijoles y tofu).
- Prefiere alimentos de mayor densidad energética: Frutos secos, semillas, palta, aceitunas, legumbres, cereales y tubérculos.
- Prueba batidos con leche de soya enriquecida, nueces, dátiles, plátano, etc
- Estimula tu apetito (visualmente). Mira recetas.
- No es necesario que todo sea Integral.
- Agrega aceite de oliva a tus comidas

INGESTA CALÓRICA

- Ajustarse a las modificaciones en masa corporal (peso) atleta
- Reducción calórica: 15%
- Progresión de restricción: 5-10%

EVITAR PÉRDIDA DE MASA MUSCULAR

↓

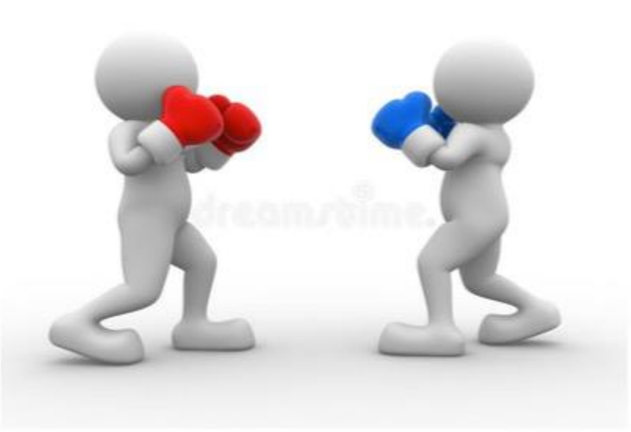
Pérdida 0.7% de peso por semana
(Garthe I, et al. 2011)

Porcentaje de grasa menor = mayor riesgo de pérdida de masa muscular (Mettler et al., 2010)

RECOMEDACIONES DE INGESTA CARBOHIDRATOS Y GRASAS

GRASAS	15-25%	Mínimo 0.5g/kg/d
CARBS	Restante	Mínimo 1g/kg/d

AHORA: ¿uso más “carbs” que grasa o viceversa?



Cuando las calorías totales y la cantidad de proteína están controladas, no existe diferencia entre uno o el otro en la pérdida de peso y grasa corporal

ERRORES COMUNES

- Ingesta calórica muy baja
- Eliminar uno o varios macronutrientes
- Objetivos a muy corto plazo
- Proteína insuficiente
- Reducción brusca de calorías
- Sobre entrenamiento / Infra entrenamiento

MÉTODO SIMPLE

Multiplique la cantidad de masa corporal semanal que desea perder x 847

Desea perder 0.6kg / semana

0.6 x 847 = 508 kcal de déficit

ADAPATACIONES METABÓLICAS

TMB
- Se adapta y baja
- Reducción 15%
- Se pierde masa corporal
- Menos tejido
- Menor necesidad energética

TEF
- Se consume menos alimentos
- Calorías quemada de TEF se reducen
- No tiene un impacto tan grande

NEAT
- 400 kcal/d en personas que perdieron al menos un 10% de su masa corporal

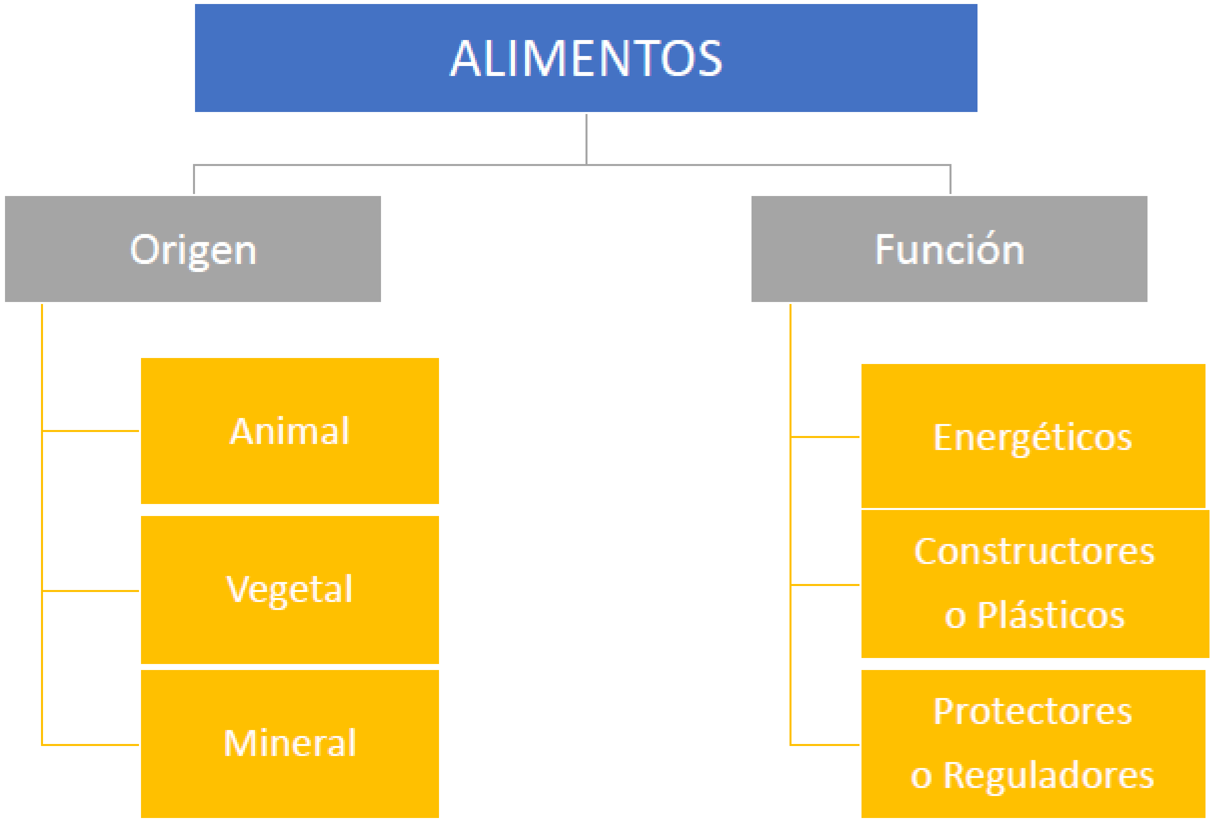
ACTIVIDAD FÍSICA
- Déficit calórico reduce la cantidad de energía que se utiliza durante el ejercicio (termogénesis reducida)

TIPO DE DÍA	Nº DE DÍAS	CALORÍAS	DISTRIBUCIÓN DE MACRONUTRIENTES
A	4	Déficit: *350-400Kcal*	• 30-35% Proteínas • 25-30% Carbohidratos • 40% Grasas
B	2	Superávit: *300Kcal*	• 30% Proteínas • 60% Carbohidratos • 10% Grasas
C	1	Muy bajo en calorías (VLCD): *900/600kcals*(mujeres)	• 35% Proteínas • 15% Carbohidratos • 50% Grasas

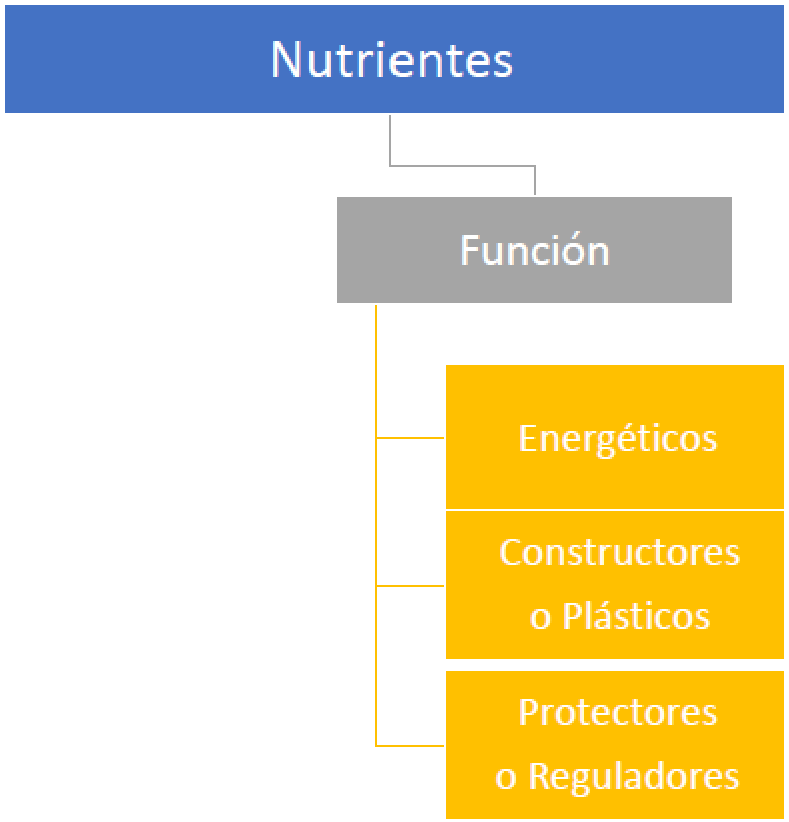
Lunes	Martes	Miercoles	Jueves	Viernes	Sabado	Domingo
B	A	A	B	A	A	C

Reevaluación de Conceptos de Nutrición

CLASIFICACIÓN ANTIGUA /ORTODOXA DE LOS ALIMENTOS



CLASIFICACION REAL



¿Que se sabe de las Proteínas Vegetales?

RDA e IDR

• En 2010, un grupo de investigadores del The Hospital for Sick Children de Toronto sugería que los métodos para determinar la IDR de la proteína subestimaba las necesidades de proteínas. Uno de los autores, el Dr. Paul B. Pencharz, fue miembro del Panel sobre DRI para macronutrientes y miembro de la Consulta Conjunta de Expertos OMS / FAO / Universidad de las Naciones Unidas (UNU) sobre los requisitos de proteínas y aminoácidos en la nutrición humana

• Este grupo de investigadores considera que el requerimiento promedio de proteína es de 0.91 a 0.93 g/kg/día y que la cantidad para cubrir el **97% a 98%** de la población (equivalente a la RDA) es de 1.0 a 1.2 g/kg/día., es decir un 30% más. (para no deportistas).

• El Colegio Americano de Medicina del Deporte (ACSM), la Academia de Nutrición y Dietética (AND) y los Dietistas de Canadá recomiendan que una ingesta de proteínas necesaria para apoyar la adaptación metabólica, la reparación, la remodelación y el recambio de proteínas generalmente varía de 1.2 a 2.0 g / kg / día.

Estudio EPIC-Oxford: % de RDA de ingestas de A.A. esenciales en hombres veganos adultos

Aminoácidos	Ingesta (g / día)	RDA (g / día)	% de RDA
Isoleucina	2,47	1,29	191
Leucina	4.33	2,85	152
Valina	2,95	1,63	181
Histidina	1,52	0,95	160
Lisina	2,82	2,58	109
Metionina + Cisteína	1,72	1,29	133
Fenilalanina + Tirosina	4.79	2,24	214
Teronina	2,19	1,36	161
Triptófano	0,77	0,34	226

¿Y la Calidad de la proteina?

Factores a tener en cuenta

Cantidad	Calidad
Absorción	Utilización

Criterios usados para evaluar la Calidad de las Proteínas

- Calidad de Proteinas= Digestibilidad (BN fecal) y Cantidad de aa esenciales
- Puntuación de aminoácidos
- Balance de Nitrogeno.
- Valor Biológico: Cantidad de N retenido (consumido-excretado en orina)
- NPU (Utilización neta de proteina). = que el Valor Biológico pero considerando tbm N en Heces
- PER (Protein efficiency ratio). Ganancia de peso/g prot consumida en ratas
- DCAA (aa esenciales y no esenciales corregidos x Digestibilidad vs requerimientos diarios)
- PDCAAS (aa esenciales corregidos x Digestibilidad vs Patron FAO). Valor Máximo:1. Se usa aa limitante. Requerimientos de niño de 2-5 años. Ejem. Gelatina (no tiene Trp) PDCAAS =0. Suplemento deTriptófano PDCAAS=0 (le faltan los demás).
- DIAAS (aa esenciales y no esenciales y otro criterio de Digestibilidad: Digestibilidad Ileal. Se evita así interacción con microbiota.

Proteína Vegetal y Balance Nitrogenado. Una revisión

- Con toda la conmoción con respecto a los veganos y las proteínas durante los últimos 40 años, uno pensaría que se realizarían muchos estudios de equilibrio de nitrógeno en **vegetarianos REALES**. Sin embargo no existe NINGUNO a la fecha.
- Por ejemplo un estudio de 1965 tuvo dos partes. En la primera parte, 8 hombres fueron alimentados con una dieta vegana de 0.50 g /, con un perfil de aminoácidos similar al de la leche. Como se esperaba estuvieron en un balance de nitrógeno negativo.
- En la segunda parte del estudio, aumentaron la proteína a .75 g / kg usando .25 g / kg de proteína de soya y los sujetos alcanzaron el equilibrio de nitrógeno. Esto indica que .75 g / kg podría ser suficiente proteína para veganos, especialmente hombres jóvenes, pero podría requerir que .25 g / kg sea proteína de soya (o al menos legumbres).
- Como conclusión de los estudios de la siguiente tabla, podríamos estimar que los veganos no deportistas podrían beneficiarse de 1.0-1.1 g/kg (30% más de la recomendación 0.8) para tener un balance de nitrógeno positivo.

Estudio	Proteína de leguminosas (g/kg de peso Saludable)	Proteína mg/Kg	Resultado
1965 Doyle	Aminoácidos Similares a Leche	0.5	Sujetos que no están en balance de nitrógeno
1965 Doyle	Aminoácidos Similares a Leche	0.75	100% en balance de nitrógeno
1967 Register	0,55	0.91	75% en balance de nitrógeno
1986 Yáñez	Pequeña cantidad	1	7 de 8 en balance de nitrógeno
2000 Caso	Poco claro	1.09	Síntesis de albúmina 12% más baja que control
2000 Caso	Al menos 0.25	1,34	Síntesis normal de albúmina
1999 Haddad	0.36	1.04	Niveles normales de albúmina
2011 Andrich	Ingesta de lisina 79% RDA	1	Masa muscular similar a los omnívoros.

True ileal amino acid digestibility and digestible indispensable amino acid scores (DIAASs) of plant-based protein foods

Yohan Reynaud [1, 2] , Caroline Buffière [3] , Benoît Cohade [3] , Mélissa Vauris [3] , Kevin Liebermann [3] , Noureddine Hafnaoui [3] , Michel Lopez [1] , Isabelle Souchon [4] , Didier Dupont [2] , Didier Rémond [3]

Afficher plus de détails

Table 6 Digestible indispensable amino acid scores (DIAAS, %), and limiting amino acid for seitan, tofu, soya milk and pea emulsion.

	Seitan	Tofu	Soya milk	Pea emulsion
Infant (birth to 6 months)	19	68	78	42
	(Lys)	(SAAs)	(Leu)	(SAAs)
Child (6 months to 3 years)	24	83	99	51
	(Lys)	(SAAs)	(Lys)	(SAAs)
Older child, adolescent, adult	28	97	117	60
	(Lys)	(SAAs)	(Val)	(SAAs)

Scores were calculated using the recommended amino acid scoring patterns for three age groups

Table 4 True ileal digestibility (TID) of amino acids in seitan, tofu, soya milk and pea emulsion in minipigs. Values are means ± SEM, n = 6. [a]

	Seitan	Tofu	Soya milk	Pea emulsion	*P*
$Leu_{endo}/Leut_{otal}$ ileum (%)[b]	$71.6^{a} \pm 7.7$	$67.0^{a} \pm 7.0$	$46.1^{c} \pm 4.8$	$62.4^{a,b} \pm 5.3$	0.025
Leu_{endo}/Leu_{intake} (%)[c]	11.7 ± 3.4	12.8 ± 2.0	9.0 ± 0.8	9.7 ± 1.8	NS
TID, %					
Indispensable amino acids, %					
Histidine	95.6 ± 1.1	95.7 ± 2.1	92.2 ± 3.2	91.8 ± 1.2	NS
Isoleucine	$96.1^{a} \pm 1.3$	$92.9^{a,b} \pm 1.7$	$89.1^{b} \pm 2.9$	$94.6^{a} \pm 1.0$	0.035
Leucine	$96.4^{a} \pm 1.0$	$93.3^{a} \pm 1.9$	$88.3^{b} \pm 2.6$	$94.5^{a} \pm 0.9$	0.009
Lysine	90.1 ± 5.3	93.9 ± 2.1	92.5 ± 2.4	93.9 ± 1.2	NS
Methionine	$97.8^{a} \pm 1.1$	$85.6^{b} \pm 6.0$	$99.3^{a} \pm 2.5$	$80.3^{b} \pm 7.7$	0.034
Phenylalanine	99.9 ± 2.0	98.6 ± 2.2	94.7 ± 2.3	98.3 ± 1.3	NS
Threonine	94.1 ± 5.3	93.0 ± 4.5	90.6 ± 3.9	92.4 ± 2.7	NS
Tryptophan	92.2 ± 4.6	102.6 ± 2.4	99.8 ± 2.1	99.6 ± 3.5	NS
Valine	96.8 ± 1.9	93.3 ± 2.2	90.4 ± 2.9	94.8 ± 1.4	NS

Contents lists available at ScienceDirect

Food Research International

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Comparison of *in vitro* digestibility and DIAAR between vegan and meat burgers before and after grilling

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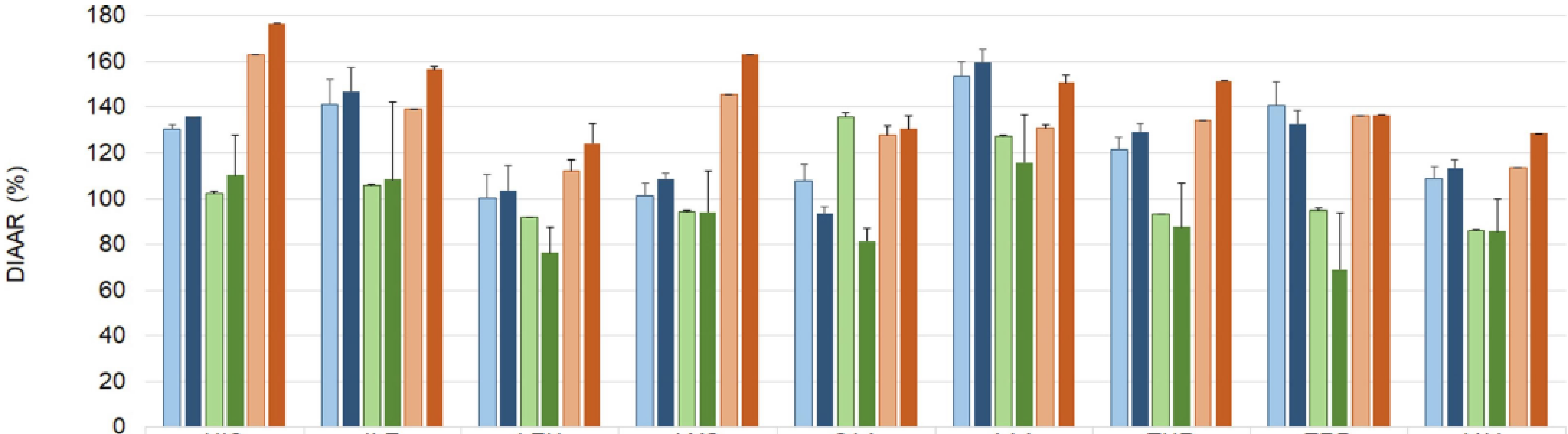
ARTICLE INFO

Keywords:
Digestibility
In vitro DIAAS
Total amino acids
In vitro digestion
Liquid chromatography
Protein hydrolysis
Plant-based protein
Meat alternatives

ABSTRACT

Plant-based meat alternatives of high quality and digestibility could be a way to reduce meat consumption and, consequently, the environmental impact. However, little is known about their nutritional characteristics and digestion behaviour. Therefore, in the present study, the protein quality of beef burgers, known as excellent source of protein, was compared with the protein quality of two highly transformed veggie burgers, based on soy or pea-faba proteins, respectively. The different burgers were digested according to the INFOGEST in vitro digestion protocol. After digestion, total protein digestibility was determined, either based on total nitrogen (Kjeldahl) analysis, or after acid hydrolysis based on total amino groups (o-phthalaldehyde method) or total amino acids (TAA; by HPLC). The digestibility of individual amino acids was also determined, and the digestible indispensable amino acid score (DIAAS) was calculated based on in vitro digestibility. The impact of texturising and grilling on in vitro protein digestibility and the digestible indispensable amino acid ratio (DIAAR) was evaluated at the level of the ingredients and the finished products. As expected, the grilled beef burger had the highest in vitro DIAAS values (Leu 124 %), and grilled soy protein-based burger reached in vitro DIAAS values that could be rated as good (soy burger, *SAA 94 %)* protein source, according to the Food and Agriculture Organization. The texturing process did not significantly affect the total protein digestibility of the ingredients. However, grilling led to a decrease in digestibility and DIAAR of the pea-faba burger ($P < 0.05$), which was not observed in the soy burger, but led to an increase in DIAAR in the beef burger ($P < 0.005$).

M.S.C. Giomar Paredes Rengifo



	HIS	ILE	LEU	LYS	SAA	AAA	THR	TRP	VAL
soy (raw)	130	141	100	101	108	153	121	141	109
soy (grilled)	136	147	104	108	94	160	129	133	113
pea-faba (raw)	102	106	92	94	136	127	93	95	86
pea-fabe (grilled)	110	108	76	94	81	116	88	69	86
beef (raw)	163	139	112	146	128	131	134	136	114
beef (grilled)	177	157	124	163	130	151	151	137	129

Sousa R et al. Comparison of in vitro digestibility and DIAAR between vegan and meat burgers before and after grilling. Food Res Int. 2023 Apr

Limitantes - No toma en cuenta:

- Naturaleza de población de estudios de Balance de nitrógeno
- Naturaleza de población de estudios de digestibilidad de proteina tanto a nivel de todo el tracto intestinal como del ileon. (**PDCAAS, DIAAS)**
- Naturaleza de microbiota y adaptaciones metabólicas en vegetarianos
- Nadie consume un solo tipo de proteina.
- Absorción y uso son cosas diferentes (biodisponibilidad)
- Respuesta metabólica puede ser diferente que la absorción de aa indispensables
- Actualmente se plantea usar marcadores de propiedades anabólicas de Proteina. Es importante medir:Sintesis de proteina,Fuerza, y tamaño del músculo **(biopsia muscular, ecografia musculo, pruebas de fuerza como 1RM,)**
- No mide el impacto en la salud o microbiota de las proteinas.

Sports Medicine (2021) 51:1317–1330
https://doi.org/10.1007/s40279-021-01434-9

ORIGINAL RESEARCH ARTICLE

Check for updates

High-Protein Plant-Based Diet Versus a Protein-Matched Omnivorous Diet to Support Resistance Training Adaptations: A Comparison Between Habitual Vegans and Omnivores

Victoria Hevia-Larraín[1] · Bruno Gualano[1,2] · Igor Longobardi[1] · Saulo Gil[1] · Alan L. Fernandes[1] · Luiz A. R. Costa[1] · Rosa M. R. Pereira[3] · Guilherme G. Artioli[1] · Stuart M. Phillips[4] · Hamilton Roschel[1]

Accepted: 1 February 2021 / Published online: 18 February 2021

Abstract

Background Acute protein turnover studies suggest lower anabolic response after ingestion of plant vs. animal proteins. However, the effects of an exclusively plant-based protein diet on resistance training-induced adaptations are under investigation.
Objective To investigate the effects of dietary protein source [exclusively plant-based vs. mixed diet] on changes in muscle mass and strength in healthy young men undertaking resistance training.
Methods Nineteen young men who were habitual vegans (VEG 26 ± 5 years; 72.7 ± 7.1 kg, 22.9 ± 2.3 kg/m^2) and nineteen young men who were omnivores (OMN 26 ± 4 years; 73.3 ± 7.8 kg, 23.6 ± 2.3 kg/m^2) undertook a 12-week, twice weekly, supervised resistance training program. Habitual protein intake was assessed at baseline and adjusted to 1.6 g kg^{-1} day^{-1} via supplemental protein (soy for VEG or whey for OMN). Dietary intake was monitored every four weeks during the intervention. Leg lean mass, whole muscle, and muscle fiber cross-sectional area (CSA), as well as leg-press 1RM were assessed before (PRE) and after the intervention (POST).
Results Both groups showed significant (all $p < 0.05$) PRE-to-POST increases in leg lean mass (VEG: 1.2 ± 1.0 kg; OMN: 1.2 ± 0.8 kg), rectus femoris CSA (VEG: 1.0 ± 0.6 cm^2; OMN: 0.9 ± 0.5 cm^2), vastus lateralis CSA (VEG: 2.2 ± 1.1 cm^2; OMN: 2.8 ± 1.0 cm^2), vastus lateralis muscle fiber type I (VEG: 741 ± 323 μm^2; OMN: 677 ± 617 μm^2) and type II CSA (VEG: 921 ± 458 μm^2; OMN: 844 ± 638 μm^2), and leg-press 1RM (VEG: 97 ± 38 kg; OMN: 117 ± 35 kg), with no between-group differences for any of the variables (all $p > 0.05$).
Conclusion A high-protein (~ 1.6 g kg^{-1} day^{-1}), exclusively plant-based diet (plant-based whole foods + soy protein isolate supplementation) is not different than a protein-matched mixed diet (mixed whole foods + whey protein supplementation) in supporting muscle strength and mass accrual, suggesting that protein source does not affect resistance training-induced adaptations in untrained young men consuming adequate amounts of protein.

Applied Physiology, Nutrition, and Metabolism

OPEN ACCESS | Review

Plant-based food patterns to stimulate muscle protein synthesis and support muscle mass in humans: a narrative review

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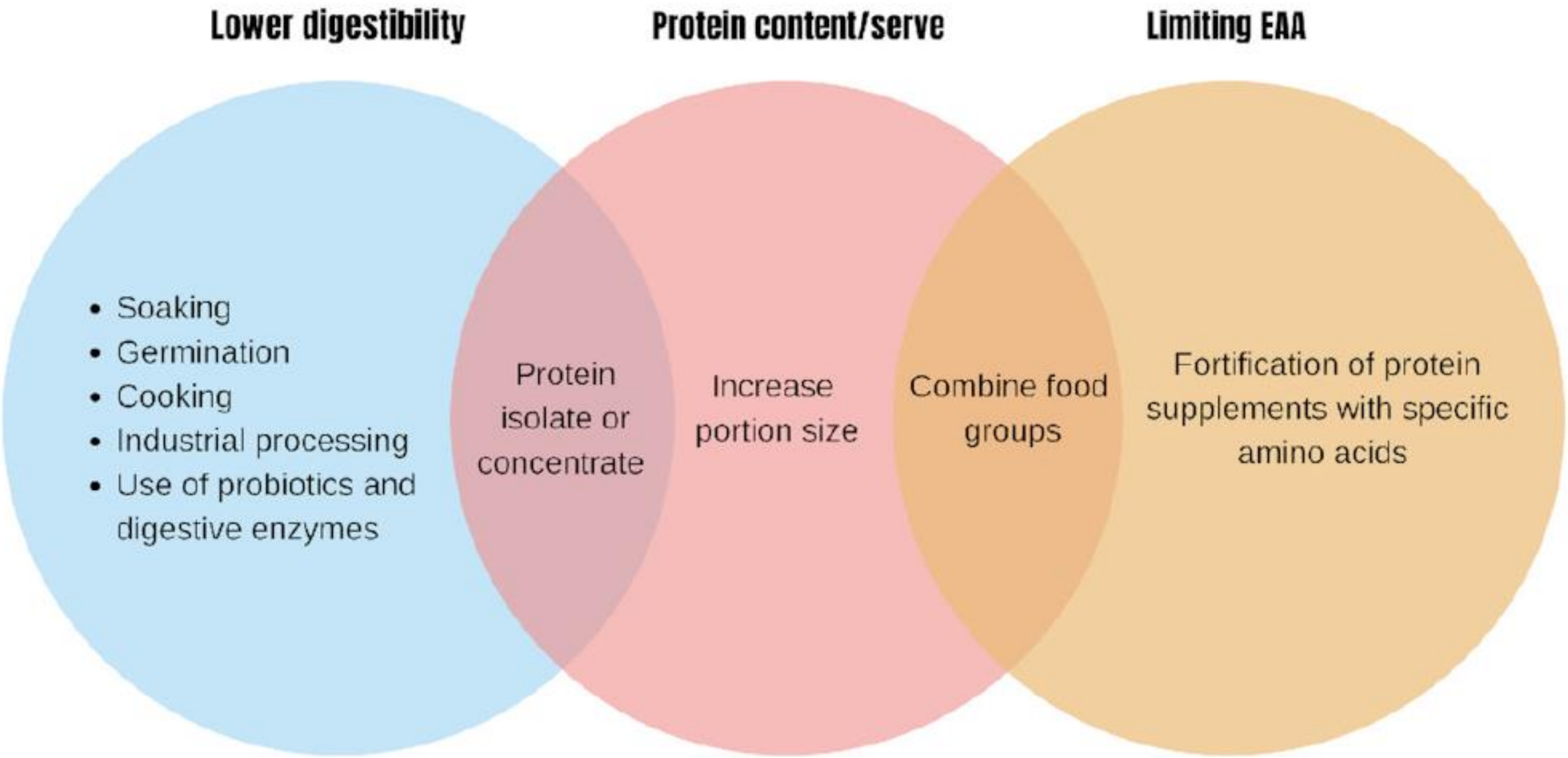
Abstract

The interest in a diet with a higher proportion of plant-based foods to animal-based foods is a global food pattern trend. However, there are concerns regarding adopting plants as the main dietary protein source to support muscle protein synthesis (MPS) and muscle mass. These concerns are centered on three issues: lower protein bioavailability due to antinutritional compounds in plants, lower per-serve scores of protein at similar energy intake, and amino acid scores of plants being lower than optimal. We aimed here to synthesize and discuss evidence around plant protein in human nutrition focusing on the capacity of these proteins to stimulate MPS as a key part of gaining or maintaining muscle mass. In this review, we addressed the issues of plant protein quality and provided evidence for how plant proteins can be made more effective to stimulate MPS and support muscle mass in partial or total replacement of consumption of products of animal origin.

Novelty:

- Plant proteins are known, in general, to have lower protein quality scores than animal proteins, and this may have important implications, especially for those aiming to increase their skeletal muscle mass through exercise.
- A plant-based diet has been postulated to have lower protein quality limiting MPS responses and potentially compromising exercise-induced gains in muscle mass.
- Current evidence shows that plant proteins can stimulate MPS, as can whole foods, especially when combining food groups, increasing portion sizes, and optimizing amino acid bioavailability through processing or common preparation methods.

Soluciones para mejorar la calidad proteina vegetal



Nichele S et al. Plant-based food patterns to stimulate muscle protein synthesis and support muscle mass in humans: a narrative review. Appl Physiol Nutr Metab. 2022 Jul

¿Tiene algún beneficio o perjuicio usar proteína vegetal sobre la animal?

Reemplazar proteína animal por vegetal da disminuye riesgo de mortalidad por todas las causas

JAMA Internal Medicine | Original Investigation

Association of Animal and Plant Protein Intake With All-Cause and Cause-Specific Mortality

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IMPORTANCE Defining what represents a macronutritionally balanced diet remains an open question and a high priority in nutrition research. Although the amount of protein may have specific effects, from a broader dietary perspective, the choice of protein sources will inevitably influence other components of diet and may be a critical determinant for the health outcome.

OBJECTIVE To examine the associations of animal and plant protein intake with the risk for mortality.

DESIGN, SETTING, AND PARTICIPANTS This prospective cohort study of US health care professionals included 131 342 participants from the Nurses' Health Study (1980 to end of follow-up on June 1, 2012) and Health Professionals Follow-up Study (1986 to end of follow-up on January 31, 2012). Animal and plant protein intake was assessed by regularly updated validated food frequency questionnaires. Data were analyzed from June 20, 2014, to January 18, 2016.

MAIN OUTCOMES AND MEASURES Hazard ratios (HRs) for all-cause and cause-specific mortality.

RESULTS Of the 131 342 participants, 85 013 were women (64.7%) and 46 329 were men (35.3%) (mean [SD] age, 49 [9] years). The median protein intake, as assessed by percentage of energy, was 14% for animal protein (5th-95th percentile, 9%-22%) and 4% for plant protein (5th-95th percentile, 2%-6%). After adjusting for major lifestyle and dietary risk factors, animal protein intake was not associated with all-cause mortality (HR, 1.02 per 10% energy increment; 95% CI, 0.98-1.05; *P* for trend = .33) but was associated with higher cardiovascular mortality (HR, 1.08 per 10% energy increment; 95% CI, 1.01-1.16; *P* for trend = .04). Plant protein was associated with lower all-cause mortality (HR, 0.90 per 3% energy increment; 95% CI, 0.86-0.95; *P* for trend < .001) and cardiovascular mortality (HR, 0.88 per 3% energy increment; 95% CI, 0.80-0.97; *P* for trend = .007). These associations were confined to participants with at least 1 unhealthy lifestyle factor based on smoking, heavy alcohol intake, overweight or obesity, and physical inactivity, but not evident among those without any of these risk factors. Replacing animal protein of various origins with plant protein was associated with lower mortality. In particular, the HRs for all-cause mortality were 0.66 (95% CI, 0.59-0.75) when 3% of energy from plant protein was substituted for an equivalent amount of protein from processed red meat, 0.88 (95% CI, 0.84-0.92) from unprocessed red meat, and 0.81 (95% CI, 0.75-0.88) from egg.

Associations of dietary protein intake with all-cause, cardiovascular disease, and cancer mortality: A systematic review and meta-analysis of cohort studies

Check for updates

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Received 7 December 2019; received in revised form 5 March 2020; accepted 6 March 2020
Handling Editor: A. Siani
Available online 17 March 2020

KEYWORDS
Dietary protein;
Cardiovascular disease;
Cancer;
Mortality;
Meta-analysis

Abstract *Background and aims:* The relationships between dietary protein intake and risk of all-cause, cardiovascular disease (CVD), and cancer mortality are still unclear. We conducted a systematic review with meta-analysis of cohort studies to summarize the evidence.
Methods and results: We searched PubMed and Web of Science for relevant studies through February 2020. The associations of total, animal, and plant proteins with all-cause, CVD, and cancer mortality were evaluated. Study-specific relative risks (RR) were pooled using the fixed effect model when no significant heterogeneity was detected; otherwise the random effect model was employed. Twelve cohort studies were eligible for the study. Increased total protein showed no clear association with risk of all-cause, CVD, and cancer mortality. In the stratified analysis by protein sources, higher plant protein intake was associated with a reduced risk of all-cause mortality (highest vs lowest intake: RR = 0.92; 95% CI: 0.88, 0.96; each 3% increment of intake: RR = 0.97; 95% CI: 0.94, 0.99), and may be associated with a reduced risk of CVD mortality (highest vs lowest intake: RR = 0.90; 95% CI: 0.80, 1.01; each 3% increment of intake: RR = 0.95; 95% CI: 0.91, 0.99). Moreover, higher intake of animal protein may be associated with an increased risk of CVD mortality (highest vs lowest intake: RR = 1.11; 95% CI: 1.01, 1.22; each 3% increment of intake: RR = 1.02; 95% CI: 0.98, 1.06).
Conclusion: This study demonstrates that higher plant protein intake is associated with a reduced risk of all-cause and CVD-related mortality. Persons should be encouraged to increase their plant protein intake to potentially decrease their risk of death.

Reemplazar proteína animal por vegetal da disminuye riesgo de mortalidad Diabetes

Article

Effect of Replacing Animal Protein with Plant Protein on Glycemic Control in Diabetes: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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Received: 29 August 2015; Accepted: 17 November 2015; Published: 1 December 2015

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Abstract: Previous research on the effect of replacing sources of animal protein with plant protein on glycemic control has been inconsistent. We therefore conducted a systematic review and meta-analysis of randomized controlled trials (RCTs) to assess the effect of this replacement on glycemic control in individuals with diabetes. We searched MEDLINE, EMBASE, and Cochrane databases through 26 August 2015. We included RCTs $\geqslant$ 3-weeks comparing the effect of replacing animal with plant protein on HbA_{1c}, fasting glucose (FG), and fasting insulin (FI). Two independent reviewers extracted relevant data, assessed study quality and risk of bias. Data were pooled by the generic inverse variance method and expressed as mean differences (MD) with 95% confidence intervals (CIs). Heterogeneity was assessed (Cochran Q-statistic) and quantified (I^2-statistic). Thirteen RCTs (n = 280) met the eligibility criteria. Diets emphasizing a replacement of animal with plant protein at a median level of ~35% of total protein per day significantly lowered HbA_{1c} (MD = −0.15%; 95%-CI: −0.26, −0.05%), FG (MD = −0.53 mmol/L; 95%-CI: −0.92, −0.13 mmol/L) and FI (MD = −10.09 pmol/L; 95%-CI: −17.31, −2.86 pmol/L) compared with control arms. Overall, the results indicate that replacing sources of animal with plant protein leads to modest improvements in glycemic control in individuals with diabetes. Owing to uncertainties in our

Effect of Plant Protein on Blood Lipids: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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Background—There is a heightened interest in plant-based diets for cardiovascular disease prevention. Although plant protein is thought to mediate such prevention through modifying blood lipids, the effect of plant protein in specific substitution for animal protein on blood lipids remains unclear. To assess the effect of this substitution on established lipid targets for cardiovascular risk reduction, we conducted a systematic review and meta-analysis of randomized controlled trials using the Grading of Recommendations Assessment, Development, and Evaluation system.

Methods and Results—MEDLINE, EMBASE, and the Cochrane Registry were searched through September 9, 2017. We included randomized controlled trials of ≥3 weeks comparing the effect of plant protein in substitution for animal protein on low-density lipoprotein cholesterol, non–high-density lipoprotein cholesterol, and apolipoprotein B. Two independent reviewers extracted relevant data and assessed risk of bias. Data were pooled by the generic inverse variance method and expressed as mean differences with 95% confidence intervals. Heterogeneity was assessed (Cochran Q statistic) and quantified (I^2 statistic). The overall quality (certainty) of the evidence was assessed using the Grading of Recommendations Assessment, Development, and Evaluation system. One-hundred twelve randomized controlled trials met the eligibility criteria. Plant protein in substitution for animal protein decreased low-density lipoprotein cho[illegible]L (95% confidence interval, −0.20 to −0.12 mmol/L; P<0.00001; I^2=55%; moderate-quality evidence), n[illegible]tein cholesterol by 0.18 mmol/L (95% confidence interval, −0.22 to −0.14 mmol/L; P<0.00001; I^2=[illegible] evidence), and apolipoprotein B by 0.05 g/L (95% confidence interval, −0.06 to −0.03 g/L; P<0.0000[illegible]quality evidence).

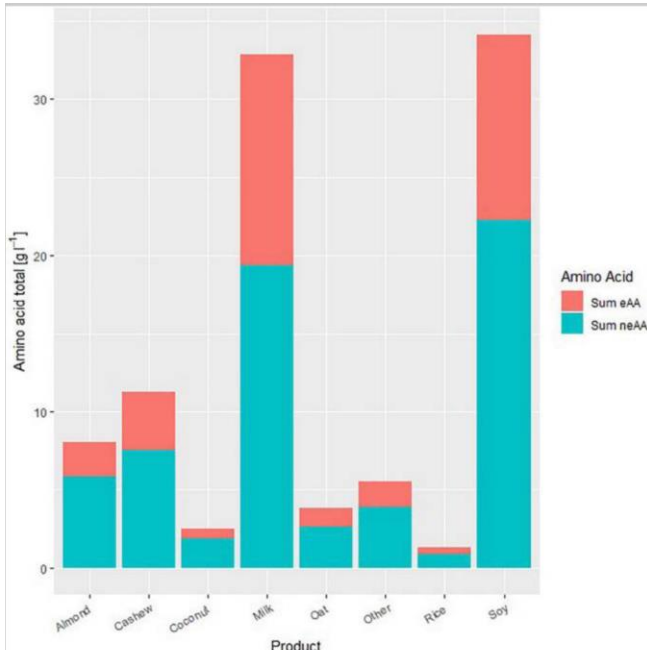
Conclusions—Substitution of plant protein for animal protein decreases the established lipid targets low-density lipoprotein cholesterol, non–high-density lipoprotein cholesterol, and apolipoprotein B. More high-quality randomized trials are needed to improve our estimates.

Reemplazar proteína animal por vegetal disminuye dislipidemias

Algunas fuentes de Proteínas Vegetales

Soya texturizada

- 50% de Proteína (peso seco en crudo)
- En 74g de soya cocida (30g cruda) hay 15g de Proteína



Tempeh

- 17.7% Proteína
- En 120g de Tempeh hay 21g de Proteína

Tofu

- 12.3% de Proteína
- En 125g de Tofu (la 1/8 parte de un molde) hay 15g de Proteína

Seitan

- 22% Proteína
- En 1 filete de 100g = 22g de proteína

Yogurt de Soya

- 6% de Proteína
- 10g de Proteína por ración de 150g

Falafel

- 6.25% de Proteina
- 1 Unid Pesa entre 15 a 25g (1 a 1.5g de Proteina por unid)

Quorn

- 14% de Proteína

Levadura Nutricional

- 53% de Proteína
- 1 cdta Pesa 5g.

Lentejas, Garbanzos y resto de legumbres

- 22.6% y 19% de proteína aprox (en crudo)
- 6-9% de Proteína en lentejas cocidas y 9% en garbanzos cocidos

Quinua

- 14 a 20% de Proteína…pero en Quinua Cruda
- 5% en proteína cocida
- 1 Taza de quinua cocida pesa 180g aprox = 9g Por taza

Tarhui

- 44% en Crudo
- En Tarhui cocido hay 11.6%
- En 60g de Tarhui cocido hay 7g de Proteína

Harina de Tarhui

- 49%
- En 15g de Harina de Tarhui hay 7.4 de Proteína

Champiñones

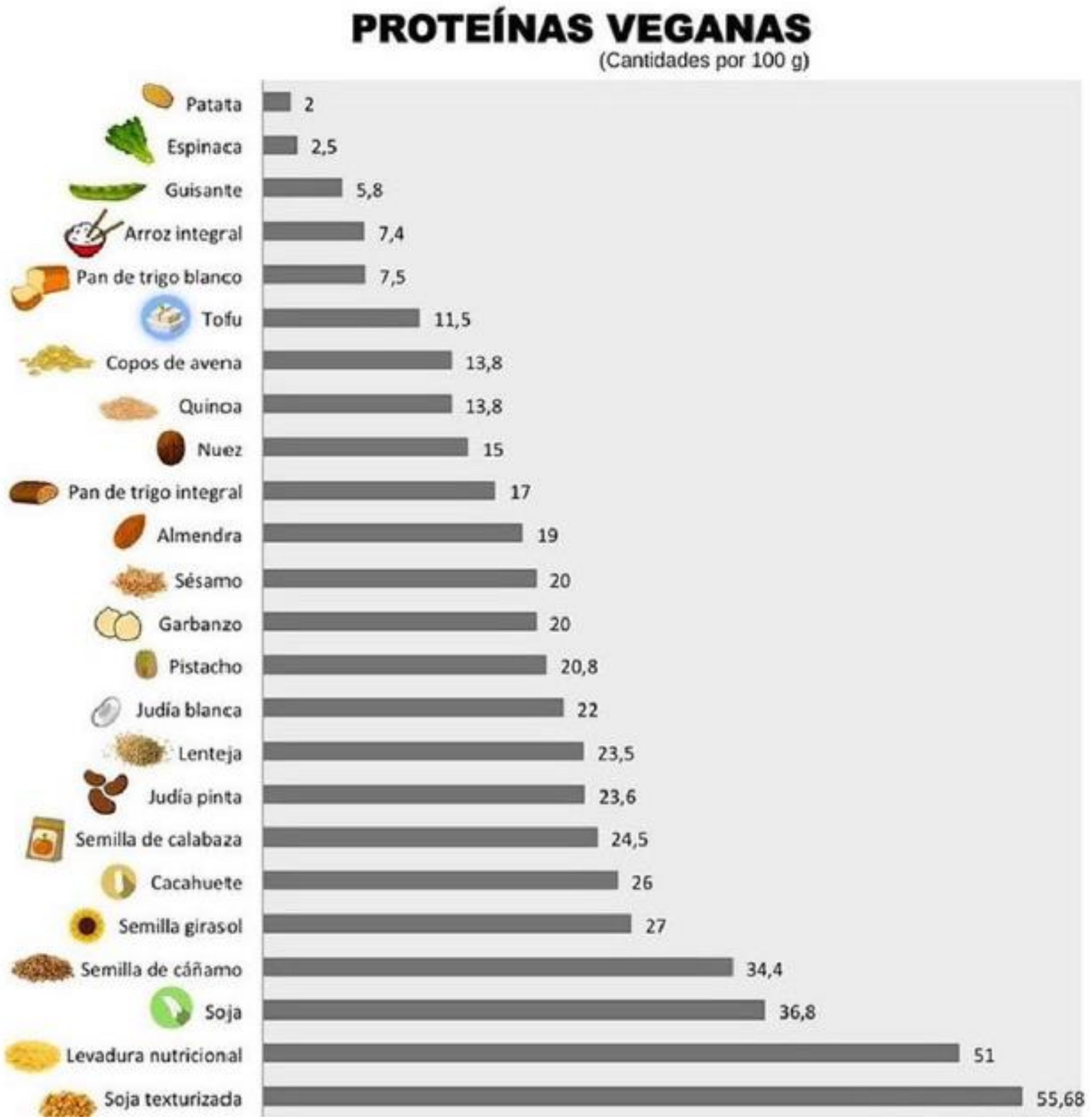
- 4% de proteína
- En 170g hay 7g de proteína

Aislados de Proteína de Soja

Alrededor de un 90% de proteína

Otros aislados de Proteína

Alrededor de un 75% de Proteína



¿100g = ración?

¿Crudo o cocido?

Consumo de Soja y Cáncer

- Las ***isoflavonas de la soja***, tienen la capacidad de unirse a receptores de estrógenos. Hay **25 mg de isoflavonas** aprox en una porción de soja.

- De 6 estudios prospectivos en poblaciones con ingestas de soya altas **(aprox. 1 o 2 raciones/d),** el Estudio de salud chino de Singapur, el Estudio de mujeres de Shanghai y el de Japón, se encontró que una mayor ingesta de soja se asociaba con un riesgo reducido de cáncer de mama. El **Japan Collaborative Cohort Study y el Japan Life Span Study** no encontraron asociación.

- En cuanto a las mujeres con cáncer de mama, incluidas aquellas con tumores que crecen en respuesta al contacto con el receptor de estrógeno + los autores del ultimo Estudio de alimentación y vida saludable de mujeres encontraron que el la mortalidad y riesgo de recurrencia se redujo a la mitad **(otro estudio del 2012 mostro 25% menor riesgo),** escribiendo: **"Our study is the third epidemiological study to report no adverse effects of soy foods on breast cancer prognosis. These studies. .provide the necessary epidemiological evidence that clinicians no longer need to advise against soy consumption for women diagnosed with breast cancer"**

Study on Soy Isoflavone Consumption and Risk of Breast Cancer and Survival

Hong-Bin Kang[1]*, Ya-Feng Zhang[1], Jin-Dun Yang[2], Kuan-Liang Lu[2]

Abstract

Aim: Isoflavones in soy foods are part of a larger class of flayonoid compounds that have have been demonstrated to be potent dietary anti-cancer agents, and the effect of soy intake on the survival of ovarian cancer is conflicting. Therefore, we aimed to explore the whether soy intake is related to the risk of death of breast cancer. Methods: A prospective study was conducted. A total of 256 patients included in this study had breast cancer and were recruited between January 2004 and January 2006. All of them were followed up from since January 2011. A univariate Cox's regression analysis was used to assess the association between soy intake and survival. Results: The education level, menopausal status, ER/PR status and TNM stage were significant difference in the survival of breast cancer. The highest soy isoflavone was associated with a decreased death risk of breast cancer (OR=0.25, 95% CI=0.09-0.54). Moreover, the higher consumption of soy protein also presented a trend decreased breast cancer risk, and the highest consumption significantly reduced the cancer risk compared with the lowest consumption (OR=0.38, 95% CI=0.17-0.86). Conclusion: The present study suggests soy intake is associated with a significant reduced death risk of breast cancer in Chinese population. Further large sample studies are warranted to confirm the inverse association of soy consumption and breast cancer survival by menopausal status.

Keywords: Soy isoflavones consumption - breast cancer - survival

Asian Pacific J Cancer Prev, **13**, 995-998

Table 2. Soy Isoflavone Intake and Survival of Breast Cancer

Variables	Cases, N(%)	Death, N(%)	HR (95% CI)[1]
Soy isoflavone (mg/day)			
Mean±SD	18.3±9.5		
<8.45	99(34.3)	57(45.8)	1.0(Reference)
8.45-	88(30.5)	46(36.7)	0.91(0.50-1.50)
20.24-	52(18.1)	17(13.6)	0.56(0.21-1.03)
>35.30	49(17.0)	5(3.9)	0.25(0.09-0.54)
Soy protein (g/day)			
Mean±SD	8.4±5.6		
<4.55	96(33.5)	52(42.3)	1.0(Reference)
4.55-	101(35.2)	50(40.5)	0.91(0.55-1.48)
9.54-	44(15.4)	13(10.3)	0.47(0.22-0.98)
>15.78	47(15.9)	9(6.9)	0.38(0.17-0.86)

Soy, Soy Isoflavones, and Protein Intake in Relation to Mortality from All Causes, Cancers, and Cardiovascular Diseases: A Systematic Review and Dose–Response Meta-Analysis of Prospective Cohort Studies

Seyed Mostafa Nachvak, PhD; Shima Moradi, MSc; Javad Anjom-shoae, MSc; Jamal Rahmani, MSc; Morteza Nasiri, MSc; Vahid Maleki, MSc; Omid Sadeghi, MSc

ARTICLE INFORMATION

Article history:
Submitted 7 November 2018
Accepted 16 April 2019
Available online 2 July 2019

Keywords:
Cancer
Isoflavones
Mortality
Meta-analysis
Soy foods

Supplementary materials:
Figures 1, 2, and 3 and Tables 1, 2, 3, and 4 are available at www.jandonline.org

https://doi.org/10.1016/j.jand.2019.04.011

ABSTRACT

Objective We conducted a systematic review and dose–response meta-analysis of prospective studies to summarize findings on the associations between intakes of soy, soy isoflavones, and soy protein and risk of mortality from all causes, cancers, and cardiovascular diseases.

Methods Online databases were systematically searched to identify relevant articles published earlier than May 2018. We applied restricted cubic splines using random-effects analysis to assess dose–response associations. Between-study heterogeneity was assessed by I^2 value and Cochrane *Q* test. Potential publication bias was assessed by visual inspection of funnel plots and Begg regression test.

Results In total, 23 prospective studies with an overall sample size of 330,826 participants were included in the current systematic review and the meta-analysis. Soy/soy products consumption was inversely associated with deaths from cancers (pooled relative risk 0.88, 95% CI 0.79 to 0.99; P=0.03; I^2=47.1%, 95% CI 0.0% to 75.4%) and cardiovascular diseases (pooled effect size: 0.85, 95% CI 0.72 to 0.99; P=0.04; I^2=50.0%, 95% CI 0.0% to 77.6%). Such significant associations were also observed for all-cause mortality in some subgroups of the included studies, particularly those with higher quality. In addition, higher intake of soy was associated with decreased risk of mortality from gastric, colorectal, and lung cancers as well as ischemic cardiovascular diseases. Participants in the highest category of dietary soy isoflavones intake had a 10% lower risk of all-cause mortality compared with those in the lowest category. We also found that a 10-mg/day increase in intake of soy isoflavones was associated with 7% and 9% decreased risk of mortality from all cancers and also breast cancer respectively. Furthermore, a 12% reduction in breast cancer death was indicated for each 5-g/day increase in consumption of soy protein. However, intake of soy protein was not significantly associated with all-cause and cardiovascular diseases mortality.

Conclusions Soy and its isoflavones may favorably influence risk of mortality. In addition, soy protein intake was associated with a decreased risk in the mortality of breast cancer. Our findings may support the current recommendations to increase intake of soy for greater longevity.
J Acad Nutr Diet. 2019;119(9):1483-1500.

Soya y Salud Masculina

- Un **metaanálisis** publicado en ***Fer$lity and Sterility*** **,** basado en más de 50 grupos de tratamiento, mostró que ni los productos de soya ni los suplementos de isoflavona de la soya afectan los niveles de testosterona en los hombres.
- Un análisis de 14 estudios publicados en el ***American Journal of Clinical Nutri$on*** mostró que una mayor ingesta de soja resultó en una reducción del 26 por ciento en el riesgo de cáncer de próstata.

Sistema de Equivalencias en Nutrición Deportiva

GRUPO DE ALIMENTOS		CALORÍAS	CARBOHIDRATOS	PROTEÍNAS	GRASAS
ALMIDÓN		80	15	2 – 3	1
FRUTAS		60	15	-	-
VERDURAS		25	5	2	-
LACTEOS	DESCREMADOS	90	12	8	-
	SEMIDESCREMADOS	120	12	8	4
	ENTERA	150	12	8	8
CARNES	ALTA EN GRASA	100	-	7	8
	MODERADO EN GRASA	75	-	7	5
	BAJA EN GRASA	55	-	7	3
	MUY BAJA EN GRASA	35	-	7	0-1
GRASAS		45	-	-	5

TALLER – CASOS PRÁCTICOS

Cliente 1

- **Mujer 30 años Ovovegetariana.**
- Instructora de Fitness
- **Objetivo:** Mantenimiento
- **Peso:** 60.9
- **Talla:** 1.72
- **Sumatoria de Pliegues: 49.7**
- Entrena 2 horas diarias L-S **(pilates, yoga, spinning,gimnasio)**
- **% de grasa 16%.**

Cliente 2

- **Paciente Varón de 25 años practicante de crossfit. Vegetariano**
- **Sumatoria de Pliegues:** 55mm
- **Quiere aumentar masa muscular**
- **Peso:** 63
- **Talla:** 172
- **Entrena:** 2.5 horas diarias de Lunes a Sábado
- **% de grasa: 11%**
- Activo **(va a trabajar en bicicleta)**

Cliente 3

- **Varón: 29 años Vegano**
- Trail running L-D, 2 Horas diárias
- **Peso:** 67.4
- **Talla:** 170
- **Objetivo:** Mejorar Rendimiento
- **Sumatoria de pliegues 49.5**
- **% de grasa:** 9.2%

Cliente 4

- **Mujer:** 30 años, vegetariana
- **Peso:** 80Kg
- **Talla:** 1.60 m
- **Cintura:** 96 cm
- **Cadera:** 108.7 cm
- **Cuello:** 36.3cm
- **% de grasa?**
- Ira al gimnasio 1 hora 5 veces x semana
- **Objetivo….???**

Modelo de Menú Atleta Resistencia
4.500 calorías: 60% de carbohidratos, 20% de proteínas, 20% de grasas

- **Merienda previa al entrenamiento (200-250 calorías)** 1 barra energética
- **Desayuno (1,000-1,100 calorías)**

1 Panecillo con(dona) con 2 cdas de mantequilla de maní y 2 cdas de Mermelada

Revuelto de tofu

1 taza de leche de soya

- **Merienda (300-400 calorías)**

Batido hecho con 120ml de leche vegetal, 240ml de jugo de naranja y 1 plátano

- **Almuerzo (800-900 calorías)**

1 taza de frijoles negros

1 taza de ensalada de choclo con aderezo

- 2 rebanadas de pan integral
- **Merienda (450-500 calorías)**

Tempeh o tofu al horno (60g)

1 plátano

15 almendras y 3 cdas de fruta deshidratada

- **Cena (800-900 calorías)**

2 tazas de garbanzos
1 taza de tofu en cubos
2 tazas de arroz
3 rebanadas de pan integral tostado con 1 cda de mermelada de frutas en cada rebanada
1.5 tazas de fruta picada

- **Merienda (250-400 calorías)**
- 12 galletas con mantequilla de maní

1 taza de leche de soya

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