NUTRICIÓN DEPORTIVA

MACRONUTRIENTES : PROTEÍNAS

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Nutrición Deportiva : TEMAS

Conceptos básicos de Nutrición

Digestión; Absorción y metabolismo de nutrientes

Energía
- Sistemas energéticos
- Sustratos energéticos

Macronutrientes
- Hidratos de Carbono
- Proteínas
- Lípidos

Micronutrientes
- Vitaminas
- Minerales

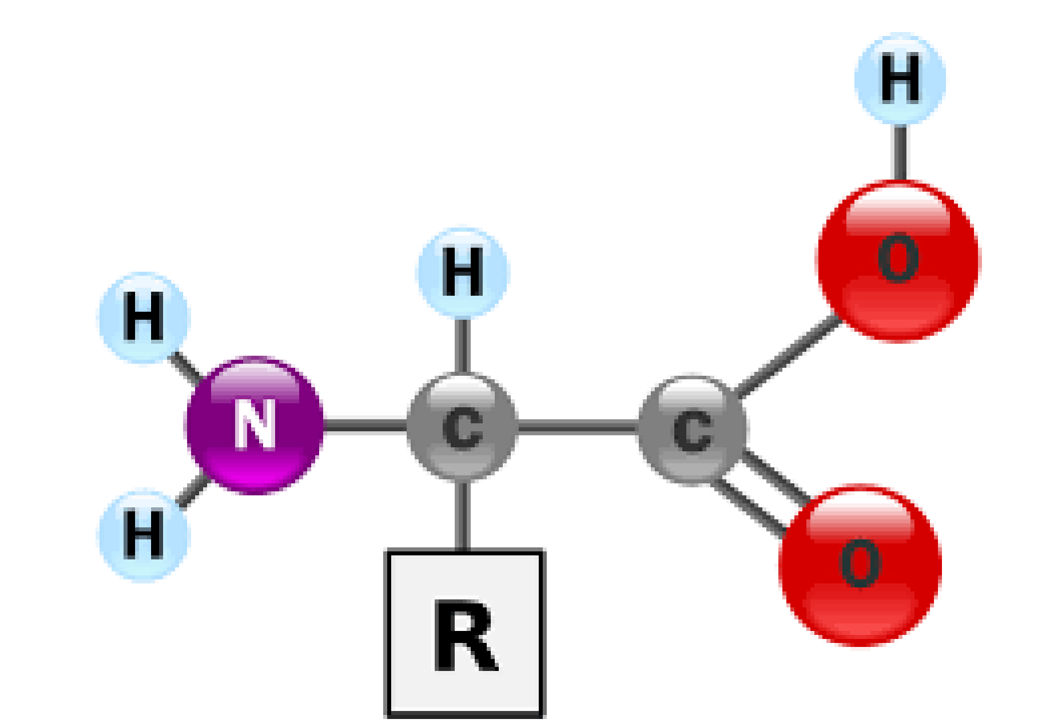
Hidratación

Suplementos

Proteínas

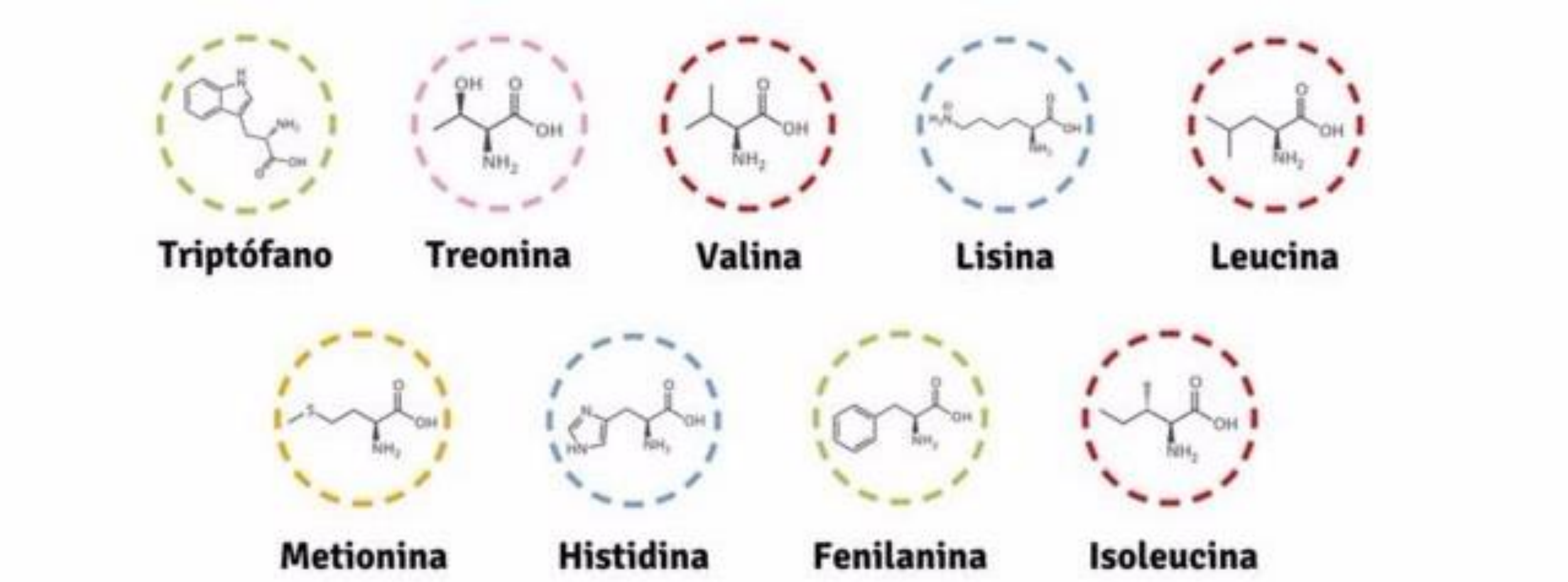
Proteínas

- ✓ Forman parte de todas las células corporales
- ✓ Constituidas por carbono, hidrógeno, oxígeno y **nitrógeno**

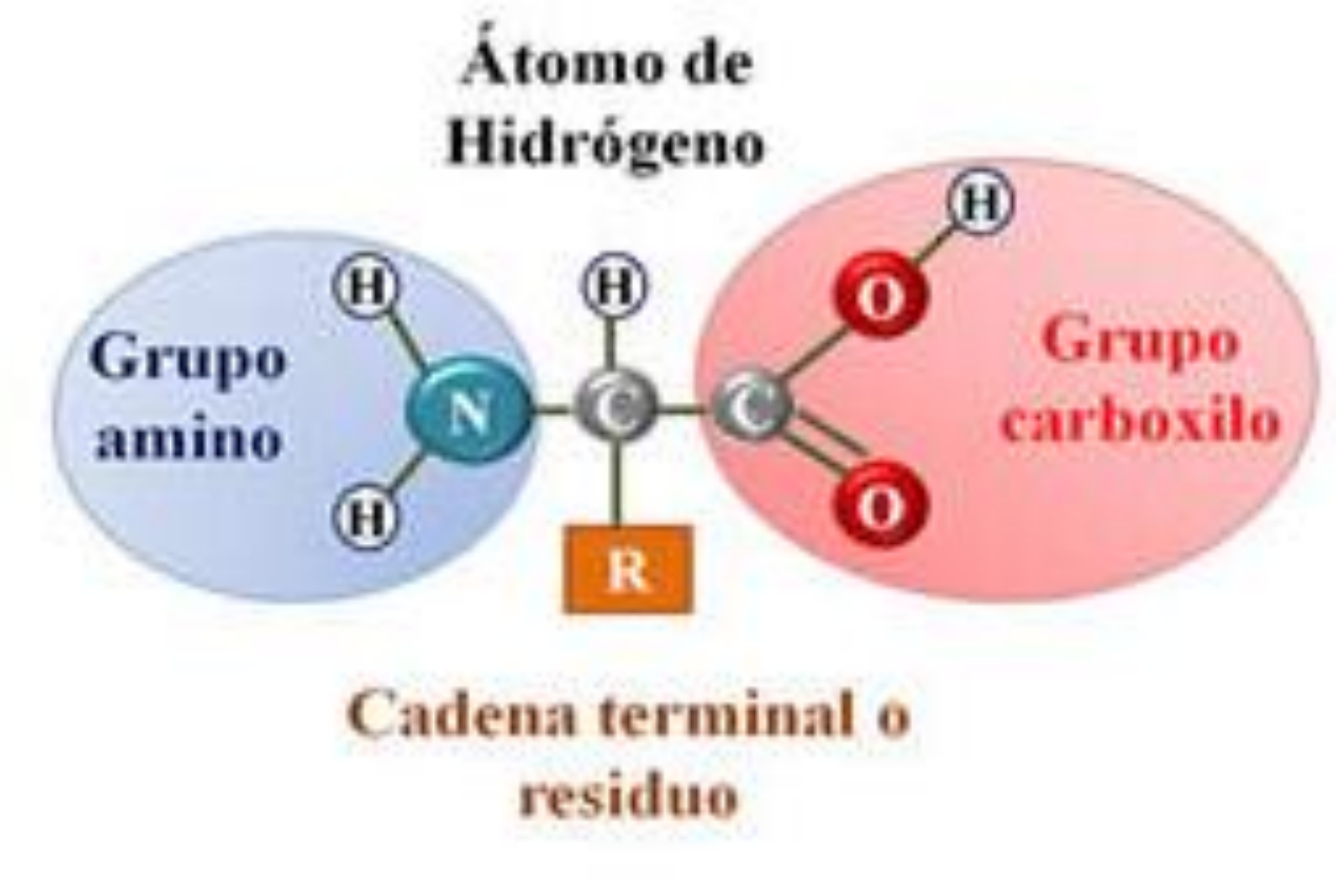


Aminoácidos (aa)

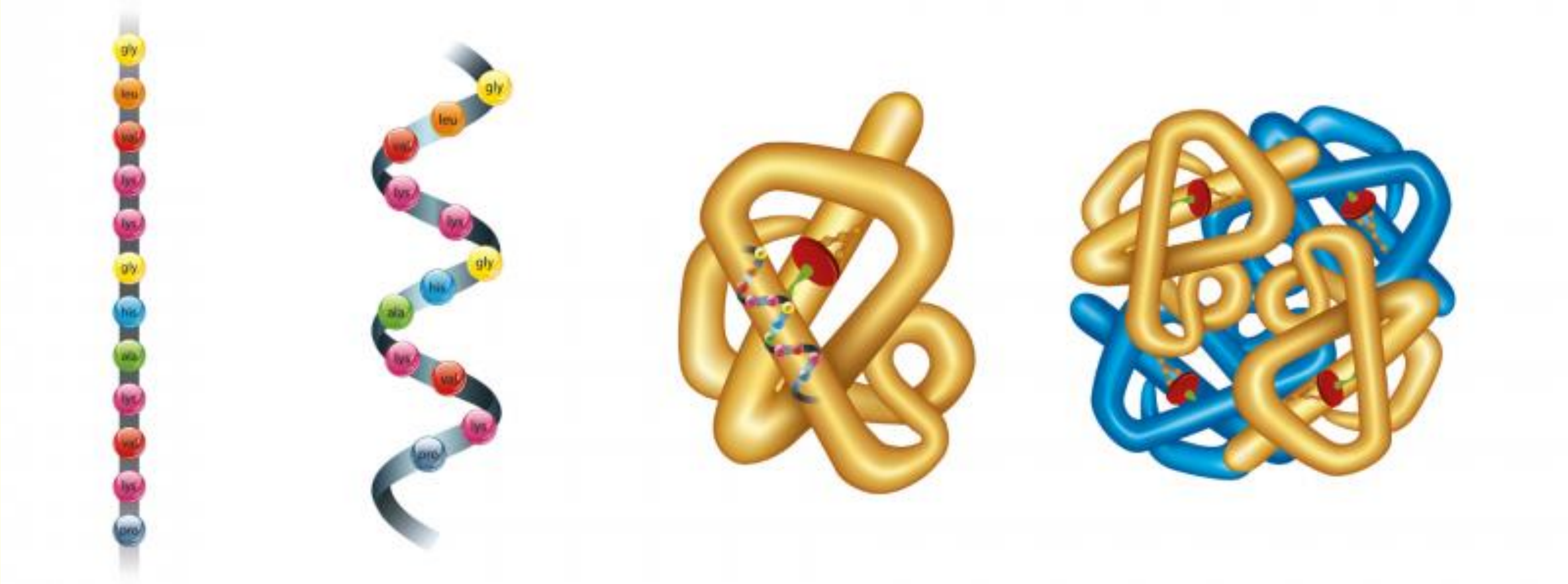
- ✓ Unidades más simples que componen a las proteínas
- ✓ Son 20 aa
- ✓ 9 de ellos se denominan "esenciales" (el organismo **NO** puede sintetizarlos, es necesario incluirlos con la alimentación)



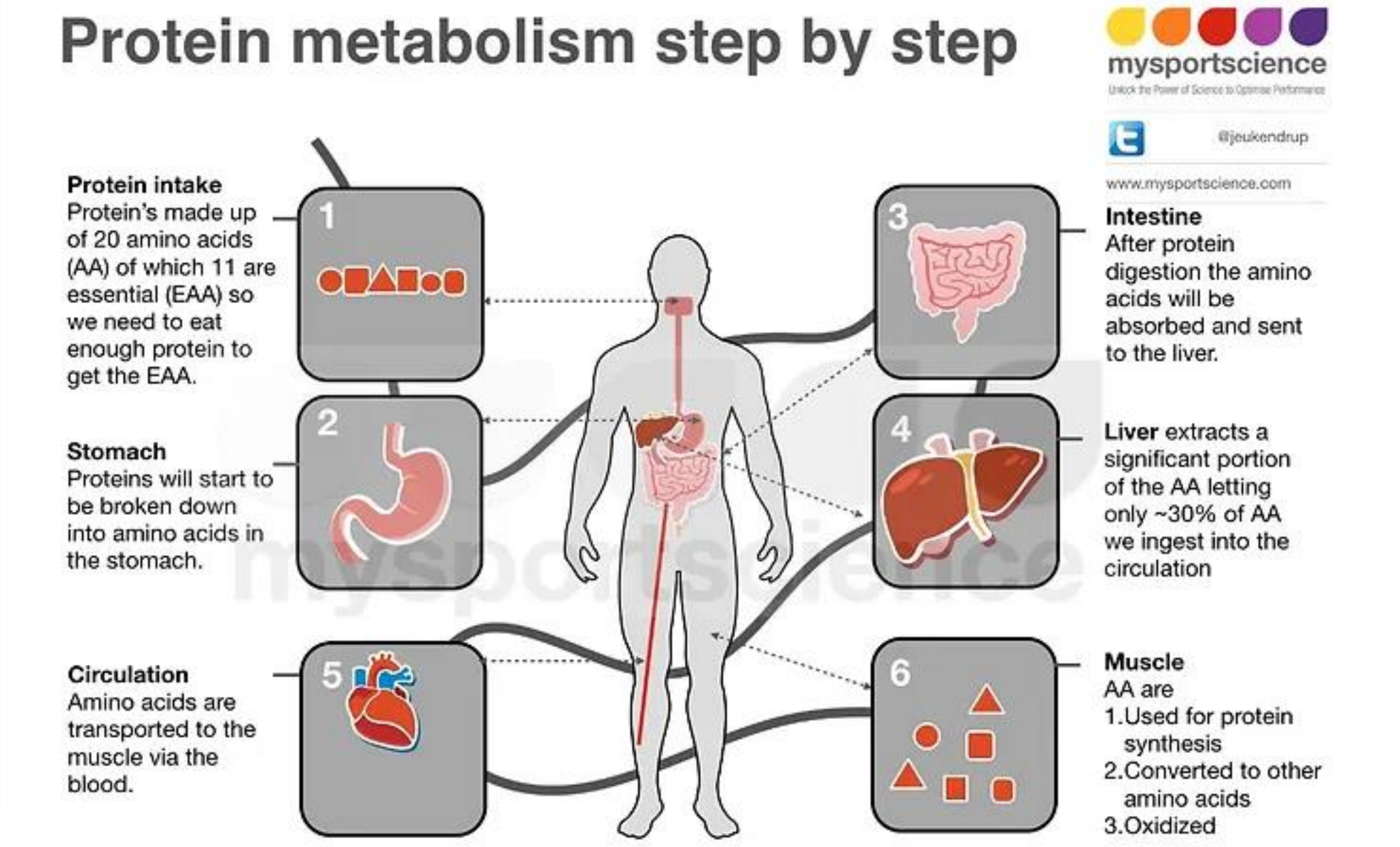
Estructura de los aa



Estructura de las proteínas



Metabolismo proteico paso a paso



Proteínas – Funciones

- **Estructural:** forman parte de diferentes tejidos como músculos, huesos, tendones, ligamentos, órganos. Ej. colágeno
- **Enzimática:** son parte constituyente de casi todas las enzimas que sirven para regular los procesos fisiológicos. Ej. Enzimas digestivas
- **Hormonal y neurotransmisora:** forman parte de las hormonas y neurotransmisores. Ej. insulina, glucagón, adrenalina, noradrenalina, hormona de crecimiento
- **Movimiento:** proteínas estructurales del músculo utilizan energía para contraerse. Ej. Actina y Miosina
- **Balance de fluidos:** ejercen presión osmótica para mantener un equilibrio óptimo de los líquidos en los tejidos corporales. Ej. albúmina
- **Buffer ácido – base:** funcionan como amortiguador. Regula pH de la sangre (acidez)
- **Transporte:** vehiculizan diferentes sustancias en la sangre. Ej. Albúmina, hemoglobina, etc.
- **Inmunitaria:** son parte de componentes del sistema inmune. Células defensivas
- **Energética:** solo si faltan CHO.

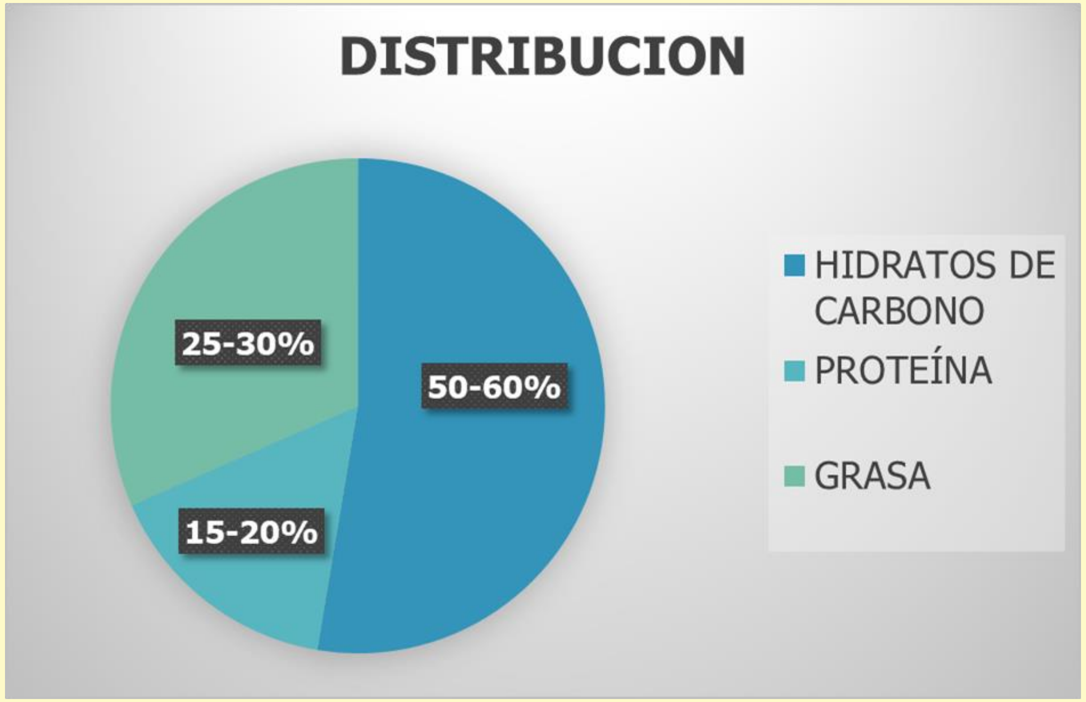
  1 g de proteína = 4 Kcal.

Proteínas - Otras Funciones

- **Disparador celular de procesos anabólicos**
  - mTOR
- **Protector de la masa muscular durante proceso de descenso de peso**
- **Ayuda en descenso de grasa corporal**
  - Incrementa saciedad
  - Incrementa metabolismo

Requerimientos

- FAO / OMS, para población normal
- 15 a 20% del GET
- 0.8 - 1g/ Kg



Proteínas en el Ejercicio

- No son fuente importante de energía. Contribución de energía entre un 5-10% del total de la energía utilizada
- Glucógeno muscular disminuye = catabolismo de proteínas aumenta

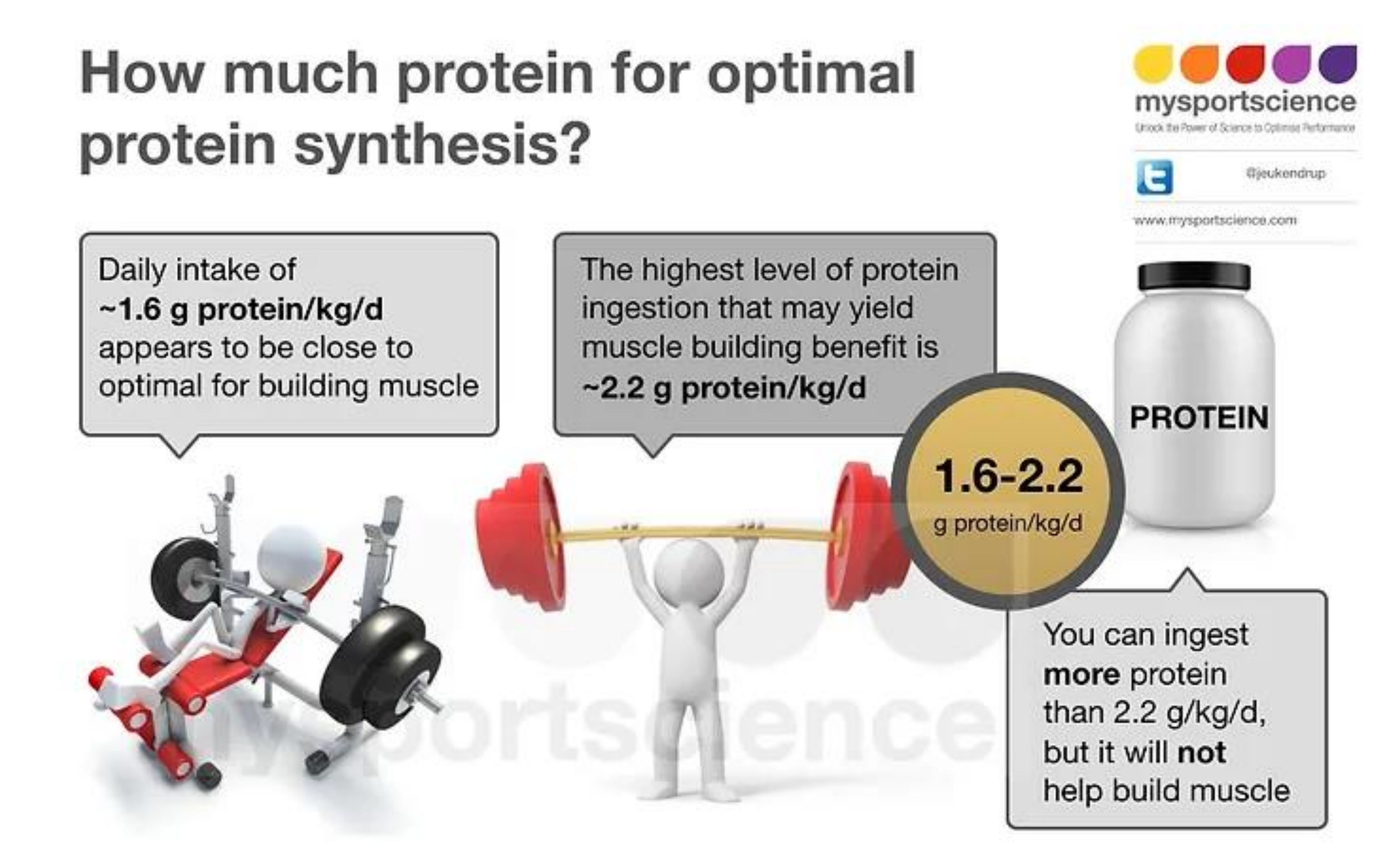
Requerimientos en el Ejercicio

Factores que influyen en el requerimiento:

- ✓Nivel de entrenamiento
- ✓Tipo de entrenamiento
- ✓Intensidad y frecuencia
- ✓Ingesta de energía
- ✓Contenido de H de C y reservas corporales

Dietary protein requirements and adaptive advantages in athletes.
Stuart M. Phillips Exercise Metabolism Research Group, Department of Kinesiology, McMaster University, 1280 Main St. West, Hamilton ON, Canada, L8S 4K1

Fuente	Población	Requerimiento
Helms et al (2013)	Atletas magros, avanzados en entrenamiento fuerza, en condición hipocalórica	2,3-3,1 g/Kg masa magra
Churchward-Venne (2011)	Atletas fuerza en condición hipocalórica	1,2-2,3 g/kg peso
Phillips & Van Loon (2011)	Atletas en condición hipocalórica	1,8-2,7 g/Kg peso
ASA/DC/ACSM Position Stand(2009)	Atletas de resistencia y fuerza	1,2-1,7 g/Kg peso
JISSN Position Stand (2016)	Individuos que hacen ejercicio	1,4-2,0 g/Kg peso
Wilson & Wilson (2006)	Atletas que entrenan fuerza	1,2-2,2 g/Kg peso


How much protein for optimal protein synthesis?
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@jeukendrup
www.mysportscience.com
Daily intake of **~1.6 g protein/kg/d** appears to be close to optimal for building muscle
The highest level of protein ingestion that may yield muscle building benefit is **~2.2 g protein/kg/d**
1.6-2.2
g protein/kg/d
PROTEIN
You can ingest **more** protein than 2.2 g/kg/d, but it will **not** help build muscle
mysportscience

Ojo con las Traducciones!!!!

ENDURANCE
=
RESISTENCIA

RESISTANCE
=
FUERZA

Timing

Para optimizar la respuesta al entrenamiento de fuerza,
el **momento** de la ingesta es clave

Randomized Controlled Trial > J Physiol. 2013 May 1;591(9):2319-31.
doi: 10.1113/jphysiol.2012.244897. Epub 2013 Mar 4.

Timing and distribution of protein ingestion during prolonged recovery from resistance exercise alters myofibrillar protein synthesis

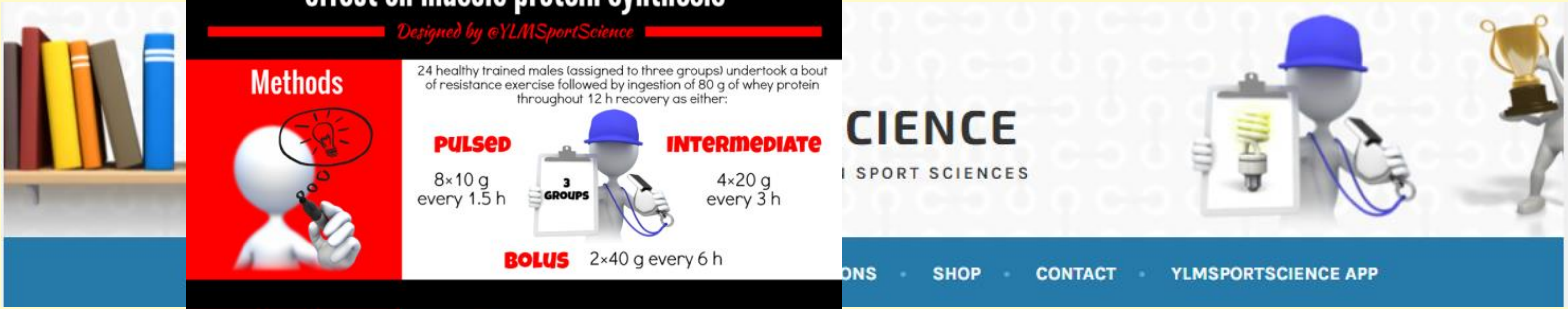
José L Areta [1], Louise M Burke, Megan L Ross, Donny M Camera, Daniel W D West, Elizabeth M Broad, Nikki A Jeacocke, Daniel R Moore, Trent Stellingwerff, Stuart M Phillips, John A Hawley, Vernon G Coffey

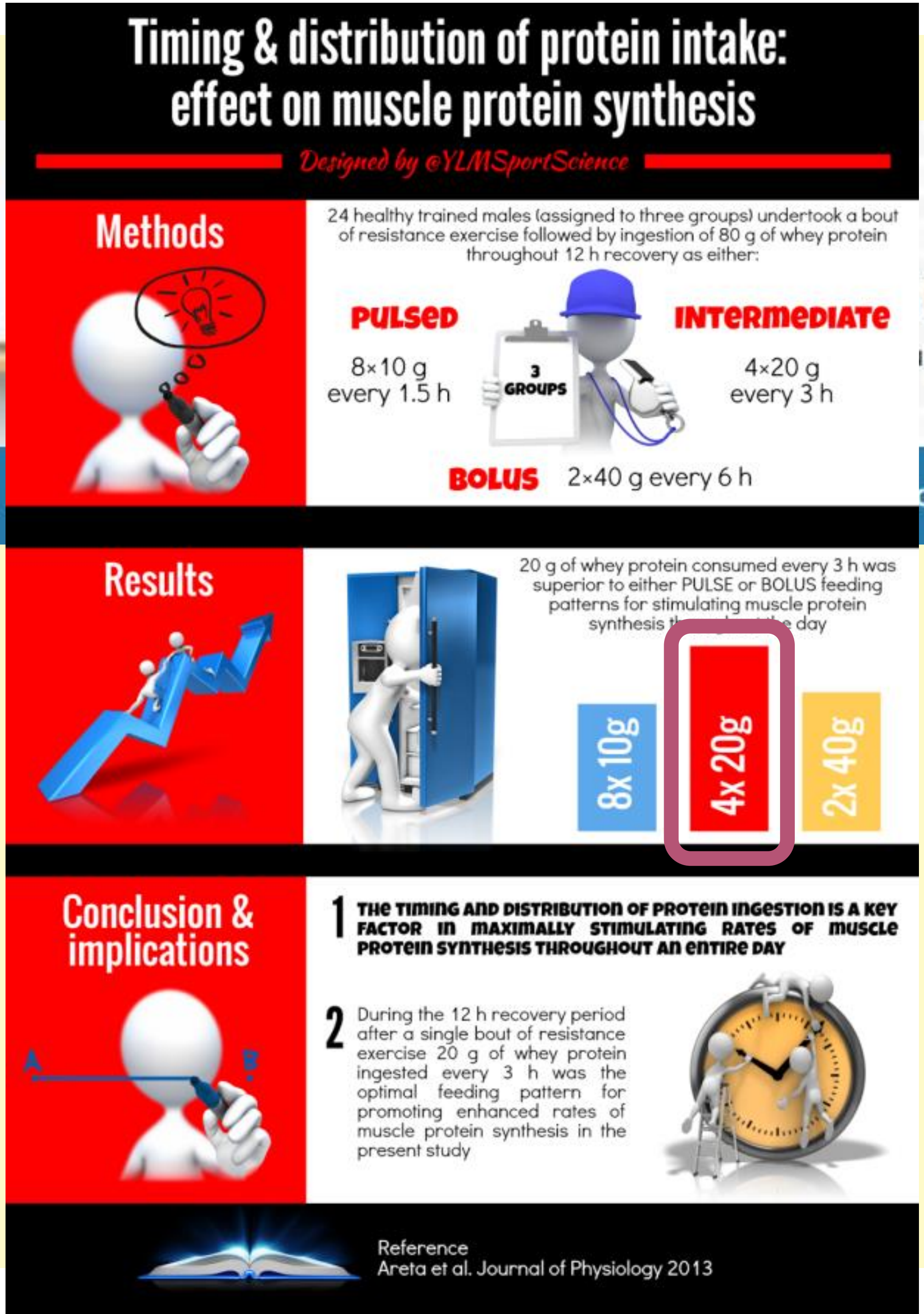
Affiliations + expand

PMID: 23459753 PMCID: PMC3650697 DOI: 10.1113/jphysiol.2012.244897

Abstract

Quantity and timing of protein ingestion are major factors regulating myofibrillar protein synthesis (MPS). However, the effect of specific ingestion patterns on MPS throughout a 12 h period is unknown. We determined how different distributions of protein feeding during 12 h recovery after resistance exercise affects anabolic responses in skeletal muscle. Twenty-four healthy trained males were assigned to three groups (n = 8/group) and undertook a bout of resistance exercise followed by ingestion of 80 g of whey protein throughout 12 h recovery in one of the following protocols: 8 × 10 g every 1.5 h (PULSE); 4 × 20 g every 3 h (intermediate: INT); or 2 × 40 g every 6 h (BOLUS). Muscle biopsies were obtained at rest and after 1, 4, 6, 7 and 12 h post exercise. Resting and post-exercise





"El timing y la distribución de la cantidad de proteínas ingeridas en el día es un FACTOR CLAVE para la estimulación de la síntesis de proteínas musculares"

Timing de Proteínas

Desayuno		Almuerzo		Merienda		Cena		Total Diario
0,4 g / Kg	+	0,4 g / Kg	+	0,4 g / Kg	+	0,4 g / Kg	=	1,6 g/ Kg

Atleta de 80 Kg. = 32 g. x comida

¿Cuál es la capacidad máxima de absorción de proteínas por comida?

Schoenfeld and Aragon *Journal of the International Society of Sports Nutrition* (2018) 15:10
https://doi.org/10.1186/s12970-018-0215-1

Journal of the International Society of Sports Nutrition

REVIEW **Open Access**

CrossMark

How much protein can the body use in a single meal for muscle-building? Implications for daily protein distribution

Brad Jon Schoenfeld[1*] and Alan Albert Aragon[2]

Abstract

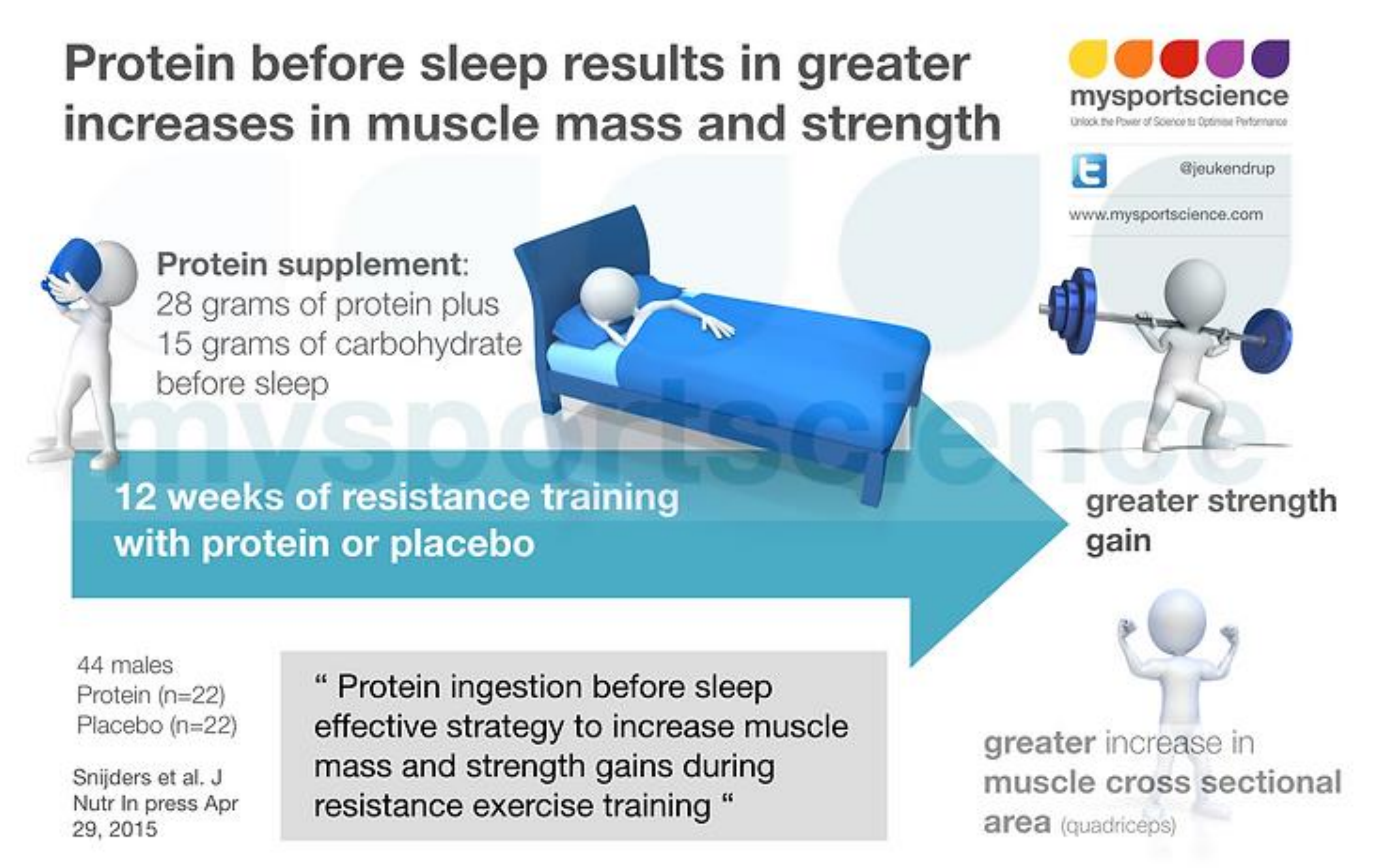
Controversy exists about the maximum amount of protein that can be utilized for lean tissue-building purpose single meal for those involved in regimented resistance training. It has been proposed that muscle protein syr maximized in young adults with an intake of ~ 20–25 g of a high-quality protein; anything above this amount believed to be oxidized for energy or transaminated to form urea and other organic acids. However, these finc specific to the provision of fast-digesting proteins without the addition of other macronutrients. Consumption of slower-acting protein sources, particularly when consumed in combination with other macronutrients, would delay absorption and thus conceivably enhance the utilization of the constituent amino acids. The purpose of this paper was twofold: 1) to objectively review the literature in an effort to determine an upper anabolic threshold for per-meal protein intake; 2) draw relevant conclusions based on the current data so as to elucidate guidelines for per-meal daily protein distribution to optimize lean tissue accretion. Both acute and long-term studies on the topic were evaluated and their findings placed into context with respect to per-meal utilization of protein and the associated implications to distribution of protein feedings across the course of a day. The preponderance of data indicate that while consumption of higher protein doses (> 20 g) results in greater AA oxidation, this is not the fate for all the additional ingested AAs as some are utilized for tissue-building purposes. Based on the current evidence, we conclude that to maximize anabolism one should consume protein at a target intake of 0.4 g/kg/meal across a minimum of four meals in order to reach a *minimum* of 1.6 g/kg/day. Using the upper daily intake of 2.2 g/kg/day reported in the literature spread out over the same four meals would necessitate a maximum of 0.55 g/kg/meal.

Keywords: Protein feeding pattern, Amino acid oxidation, Protein intake, Protein metabolism, Lean tissue mass

0,55 g. / Kg.
x comida

¿Proteínas antes de ir a dormir?

La ingestión de proteínas antes del sueño podría representar una estrategia dietética efectiva para aumentar la masa muscular y las ganancias de fuerza durante el entrenamiento con ejercicios de fuerza


Protein before sleep results in greater increases in muscle mass and strength
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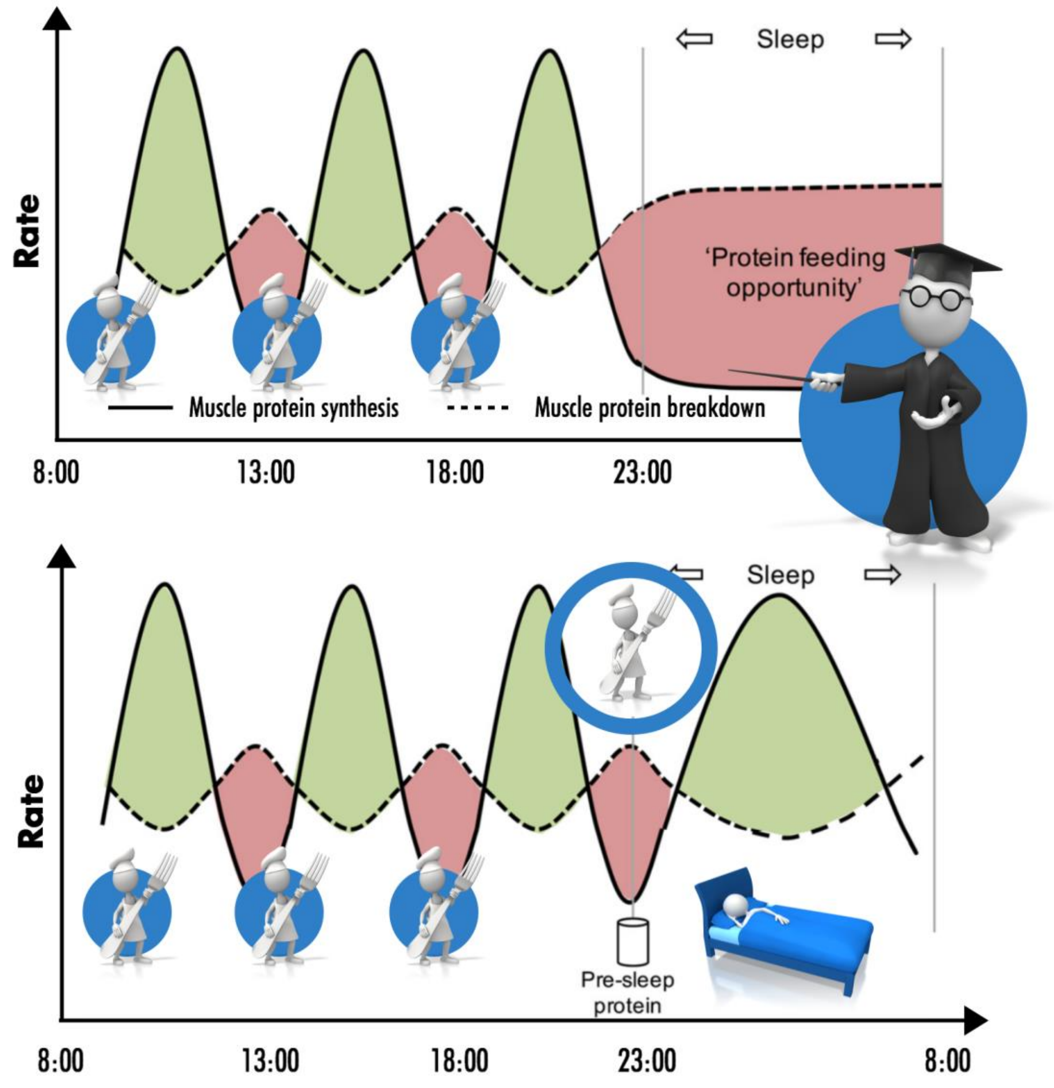
@jeukendrup
www.mysportscience.com
Protein supplement:
28 grams of protein plus
15 grams of carbohydrate
before sleep
12 weeks of resistance training
with protein or placebo
greater strength gain
44 males
Protein (n=22)
Placebo (n=22)
Snijders et al. J Nutr In press Apr 29, 2015
" Protein ingestion before sleep effective strategy to increase muscle mass and strength gains during resistance exercise training "
greater increase in muscle cross sectional area (quadriceps)

Pre-Sleep Protein Ingestion to Improve Muscle Response to Training

Reference: by Trommelen & van Loon, Nutrients November 2016

Designed by @YLMSportScience



Pre-sleep protein ingestion represents an effective dietary strategy to improve overnight muscle protein synthesis, thereby improving the skeletal muscle adaptive response to exercise training

Consideraciones

Ingestas superiores a 2,4 g/Kg/día no tienen efecto anabólico en deportistas sino que inducen aumento de oxidación de aa

Consideraciones

El efecto elevado de proteínas (2,8g/Kg/día) **no tendría efectos nocivos sobre la función renal en personas sanas.** Se desconocen los efectos sobre la salud para ingestas superiores a los 3g/Kg/día durante períodos prolongados

Consideraciones

El exceso de alimentos fuente de proteínas puede producir carencia de nutrientes como: H de C, vitaminas, minerales y fibra

Alimentos Fuente de Proteína

Alimento cada 100g.	Hidratos de Carbono	Proteínas	Grasas
Carne Vacuna	0	**20**	7
Carne Pescado	0	**18**	1
Carne Ave	0	**20**	5
Legumbres	59	**20**	2
Cereales	70	**12**	0
Leche Entera	5	**3**	3
Leche p/ descremada	5	**3**	1,5
Queso Fresco	0	**19**	22
Queso Semi Duro	0	**26**	29
Queso de Rallar	0	**29**	31

Fuentes de proteínas animales

3 g / 100

20 g / 100

6 g x unidad

20 g / 100

Quesos:
Untables: 8-9 g /100
Blandos: 14-19 g/100
Duros y semiduros:
19-29 g /100

Fuentes de proteínas vegetales

Alimento cada 100g en seco	Proteínas	Alimento cada 100g en seco	Proteínas
Lentejas	**24,6**	Avena	**13,1**
Garbanzos	**20,4**	Maíz	**9,4**
Porotos de Soja	**36,5**	Trigo Integral	**12**
Tofu	**10-18**	Mijo	**11**
Tempeh	**20-35**	Seitán	**19**
Maní	**26,1**	Quinoa	**14,1**
Arroz Integral	**7,2**	Trigo Sarraceno	**13,2**

Fuente: USDA www.fdc.nal.usda.gov/

Fuentes de proteínas vegetales derivadas de la SOJA

OTRAS FUENTES de proteína vegetal

¿Qué proteína consumir?

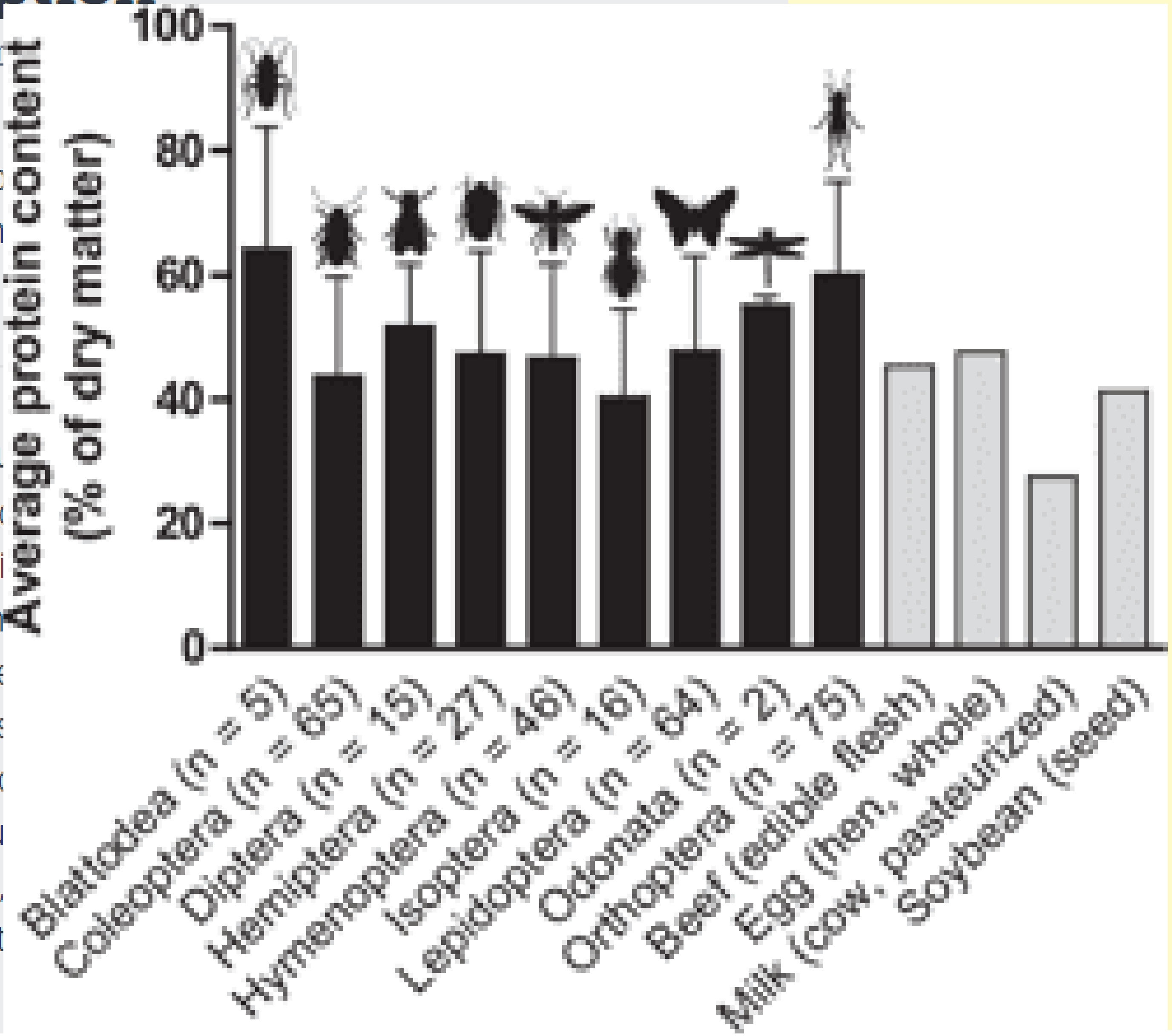
Consideration of insects as a source of dietary protein for human consumption

T. Churchward-Venne, Philippe J. M. Pinckaers, +1 author L. V. van Loon

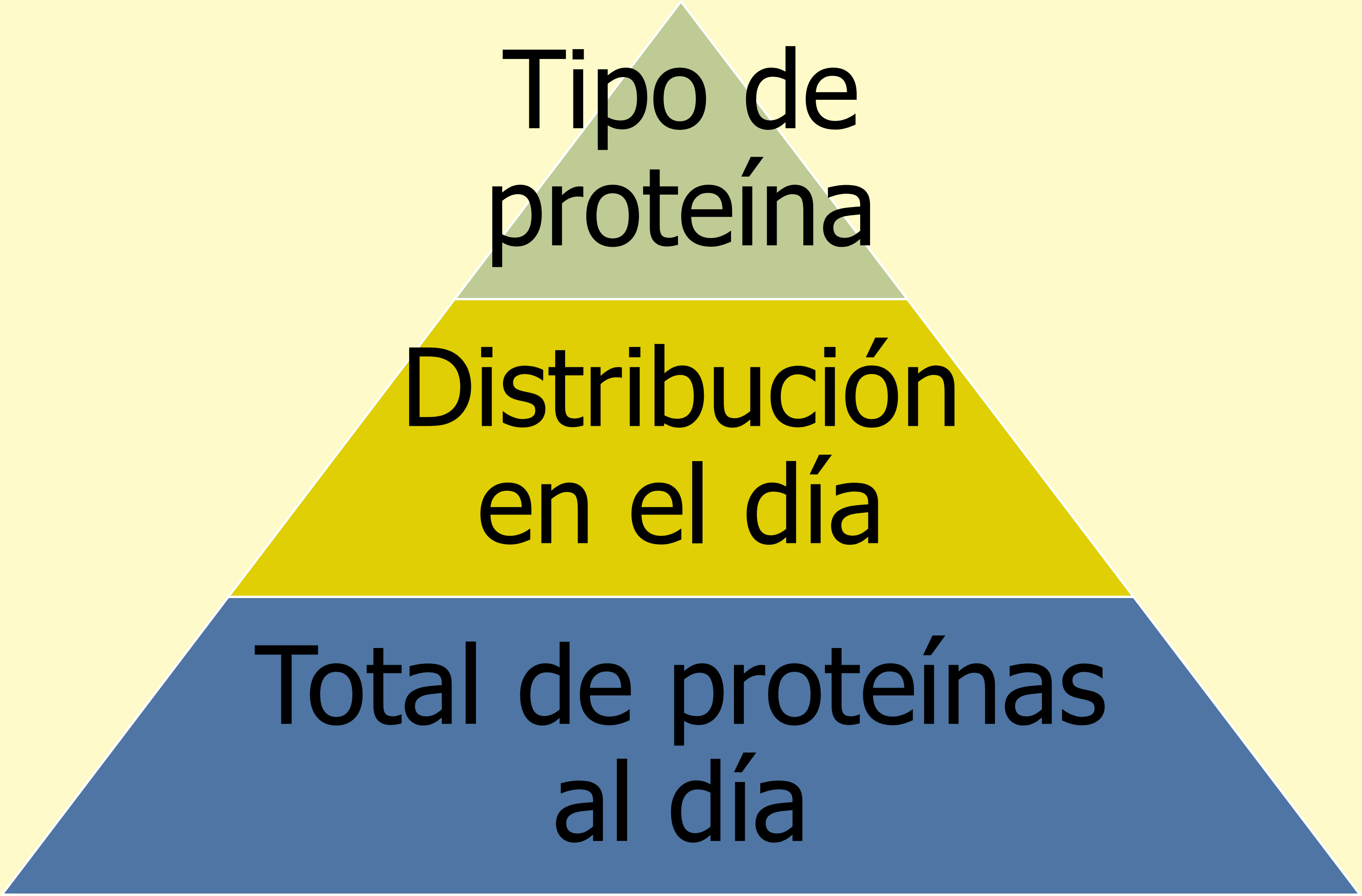
Nutrition Reviews

TLDR This review evaluates the protein content, amino
insects and considers their proposed quality and poten
consumption.

Abstract Consumption of sufficient dietary protein is fu
overall health. Conventional animal-based protein sour
poultry, fish, eggs, and dairy are generally considered hi
they meet all of the indispensable amino-acid requirem
However, the production of sufficient amounts of conve
global food demands represents a challenge. Edible ins
alternative source of dietary protein that may be produc
commercial scale and, as such, may contribute to ensu
evaluates the protein content, amino-acid composition,
considers their proposed quality and potential as an alt
consumption.



Pirámide de importancia proteica



Conclusiones…

- ✓ Más de 1,6 g/Kg/día de proteínas no tendría mejoras en ganancia de masa muscular y fuerza – rendimiento
- ✓ Timing: al menos 4 comidas con dosis similares de proteínas (nuestro mayor problema está en desayuno)
- ✓ Para mantener masa magra en planes de descenso de peso aumentar la cantidad diaria de proteínas puede ser beneficioso (hasta 2,3 g/Kg/día)
- ✓ Planes de alimentación con hasta 2,8 g/Kg/día de proteínas en atletas no afectaría la función renal

Protein post exercise

To optimise muscle protein synthesis

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@jeukendrup
www.mysportscience.com

Aim for 20-25g of protein, maybe more for some, depending on training

Leucine content of protein is important (aim for 3g leucine)

Aim for 8-10g of essential amino acids

Have regular meals (every3-4h)

Investigadores de proteínas

Stuart Phillips

Mark Tarnopolsky

Kevin Tipton

Luc Van Loon