EAAs: The under recognized key to ~~anti~~-Healthy aging

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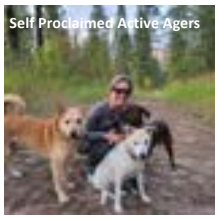
1

Susan J Hewlings PhD, RD

- Director of Scientific Affairs
  - Structure Function Claims Substantiation
- PhD Nutrition, MS Exercise Physiology, BS Nutrition
  - Florida State University
- Higher Education, over 20 years
  - Nova Southeastern Adjunct
  - Central Michigan University
  - University of Central Florida College of Medicine
  - Stetson University (Tenured)
- Author/ Medical Writer
- Founder and Director ARF Shack Animal Rescue



2

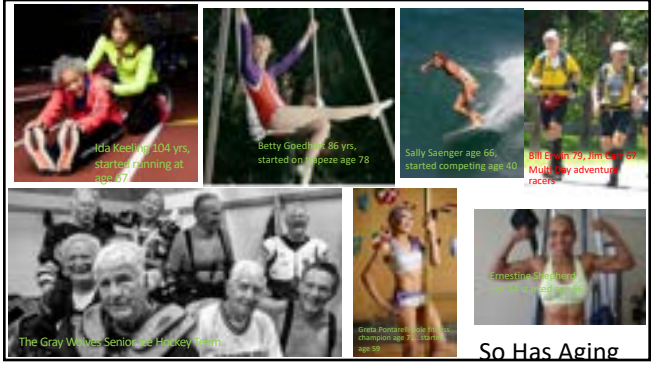
Overview

Summarize	Summarize research on high quality leucine rich protein on muscle protein synthesis and why it matters.
Discuss	Discuss the minimal and maximal amount of protein needed for max muscle protein synthesis •understand why some groups may find this intake challenging.
Describe	Describe why protein, especially essential amino acids are important to maintain lean body mass as you age.
Discuss	Research outlining the efficacy and dose of EAAs for optimal benefit
Look at the Market	Active aging consumers are an underserved market for this category

3

Protein has changed its image

4



So Has Aging

5

A Key Aspect of Aging.....

- "Skeletal muscle mass and function are progressively lost with age, a condition referred to as sarcopenia. By the age of 60, many older adults begin to be affected by muscle loss. There is a link between decreased muscle mass and strength and adverse health outcomes such as obesity, diabetes and cardiovascular disease."
- Causes of sarcopenia include poor nutrition, diminished responsiveness to the normal anabolic effect from hormones and/or nutrients, and a sedentary lifestyle.
- The etiology of sarcopenia includes malnutrition, increased inflammatory cytokine production, oxidative stress, hormone reduction (e.g., growth hormone and testosterone), and decreased physical activity

6

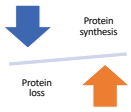
The Secret to Healthy-Aging Is……

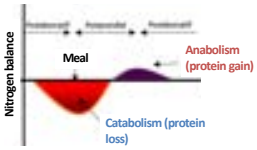
- "Resistance exercise and consumption of increased dietary protein and/or essential amino acids (EAAs) are the two most potent and safe methods to counteract the loss of muscle mass and strength experienced in aging"

7

Protein Metabolism

Muscle mass depends on the balance between protein loss and gain



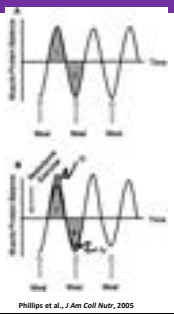


8

NET Protein Balance Response to Nutrition and Exercise

- Exercise is essentially ***catabolic***; energy is required for work
- Recovery is essentially ***anabolic***; energy and rest is required to repair, rebuild, and maintain muscle and body protein

Nutrients – primarily protein – need to be consumed to achieve an anabolic state, a positive NET balance



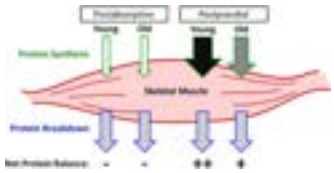
Phillips et al., *J Am Coll Nutr*, 2005

9

Protein Turnover

10

Protein Synthesis Changes with age

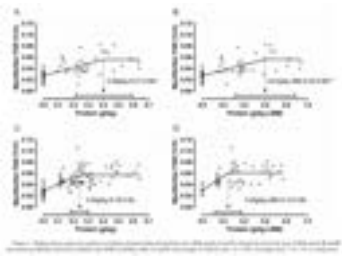


Skeletal muscle protein turnover balance between protein synthesis and breakdown in skeletal muscle switches from negative (−) net balance in the fasted (postabsorptive) state to positive (+) following AA intake (postprandial), primarily due to an upregulation of protein synthesis. **The anabolic sensitivity to AA availability is blunted with age**, which can result in a diminished acute synthetic response following meal ingestion in old (+) when compared with young (++) muscle.

(Dillon EL. Nutritionally essential amino acids and metabolic signaling in aging. Amino Acids. 2013 September ; 45(3): 431–441.)

11

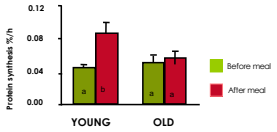
Protein Threshold? Older people may need more



Moore DR, et al. Protein Ingestion to Stimulate Myofibrillar Protein Synthesis Requires Greater Relative Protein Intakes in Healthy Older Versus Younger Men, The Journals of Gerontology: Series A, Volume 70, Issue 1, January 2015, Pages 57–62).

12

Anabolic Resistance » with aging



- Insulin resistance
- Higher splanchnic extraction

Volpi et al., 2000
Hébuterne et al., 1997

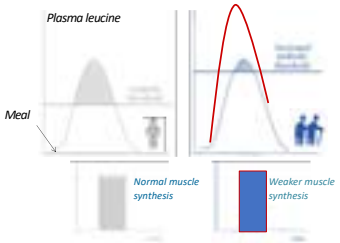
13

Protein metabolism in older people

Review Article

Muscle Wasting and Resistance of Muscle Anabolism: The "Anabolic Threshold Concept" for Adapted Nutritional Strategies during Sarcopenia

Dardevet et al., 2012



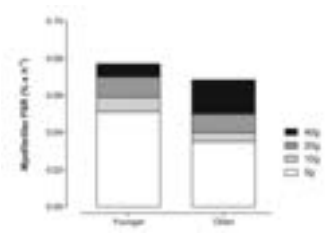
14

Especially for Recovery

Myofibrillar FSRs during recovery from resistance-type exercise in response to 0, 10, 20, and 40 g protein in younger and older adults.

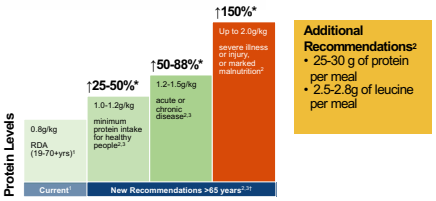
Witard et al. 2014 , Yang et al. 2012 , Robinson et al. 2013.

Figure: Churchward-Venne et al. What is the Optimal Amount of Protein to Support Post-Exercise Skeletal Muscle Reconditioning in the Older Adult? Sports Med (2016) 46:1205–1212



15

Healthy Aging: Recommendations from International Expert Groups Call for Higher Protein Intakes in Older Adults



Additional Recommendations[2]
- 25-30 g of protein per meal
- 2.5-2.8g of leucine per meal

**Increase above current Protein RDA[1]*
[2]Older people with severe kidney disease not on dialysis may need to limit protein intake.
[1]U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans, 2015. 8th Edition, Washington, DC: U.S Government Printing Office, January 2015.
[2]Bauer J et al., JAMDA 2013
[3]Deutz NEP et al., Clinical Nutrition, 2014
Slide adapted from Stu Phillips, PhD, SCAN Annual Meeting 2015

16

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

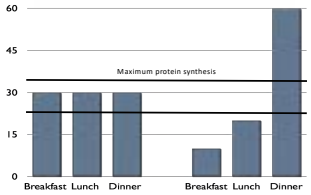
"to maximize anabolism one should consume protein at a target intake of 0.4 g/kg/meal across a minimum of four meals in order to reach a minimum of 1.6 g/kg/day. Using the upper daily intake of 2.2 g/kg/day reported in the literature spread out over the same four meals would necessitate a maximum of 0.55 g/kg/meal".

Ingestion of more than 30 g of protein in a test meal does not further stimulate muscle protein synthesis

Schoenfeld BJ; Aragon AA. How much protein can the body use in a single meal for muscle-building? Implications for daily protein distribution. Journal of the International Society of Sports Nutrition, 2018. **15**:10

17

Even Distribution of Protein Throughout the Day's Meals and Snacks can Maximize Anabolic Response Specific to Protein Utilization by the Body



Paddon-Jones and Rasmussen, *Curr Opin Clin Nutr Metab Care,* 2009

18

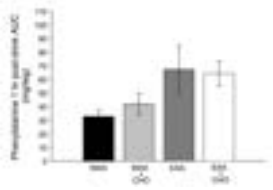
The recommendations focus on total protein .....Only Essential Amino Acids Needed to Achieve a Positive NET Balance

MAA =
6g mixed amino acids

EAA =
6g essential amino acids

MAA + CHO =
6g mixed amino acids
+ 35g carbohydrate

EAA+CHO =
6g essential amino acids
+ 35g carbohydrate



Borsheim E et al., Am J Physiol Endocrinol Metab. 2002

19

Quality and Quantity of Protein

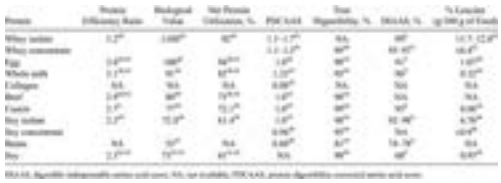
Especially in older adults

Important for protein quality:

- Characteristics of the protein
- The food matrix
- The individual
  - (e.g., age, health status, physiological status and energy balance)(Millward, D.J.; Layman, D.K.; Tome, D.; Schaafsma, G. Protein quality assessment: Impact of expanding understanding of protein and amino acid needs for optimal health. Am. J. Clin. Nutr. 2008, 87, 1576S–1581S.)

20

Comparison of Protein Quality According to Its Source



Savino P. Knowledge of Constituent Ingredients in Enteral Nutrition Formulas Can Make a Difference in Patient Response to Enteral Feeding. Nutrition in Clinical Practice 2017, 33(4).

21

Essential Amino Acid Density

Caloric Density

Nutrient Density

Essential Amino Acid Density

22

Small amount of dietary EAA intake efficiently increases MPS in older adults.

- Dietary EAA intake (7.5 g of EAA, twice a day) for 12 weeks significantly increased lean body mass in healthy older women (Dillon 2009).
- Dietary EAA intake as small as 3 g stimulated MPS to a similar extent as 20 g of whey protein in older adults (Bukhari 2015).
- When older subjects were given either an EAA mixture (15 g) or a whey protein supplement (13.6 g) after an overnight fast, subjects consuming the EAA mixture had higher mixed muscle fractional synthetic rate (Paddon-Jones, et al 2006)

23

Muscle Function

Metabolic dysfunction in aging can be ameliorated by free EAAs, through improvements in muscle mass."

To see functional benefits, such as improved muscle function, glycemic regulation and mitochondrial function. Leucine may be more important in older adults than in young individuals".

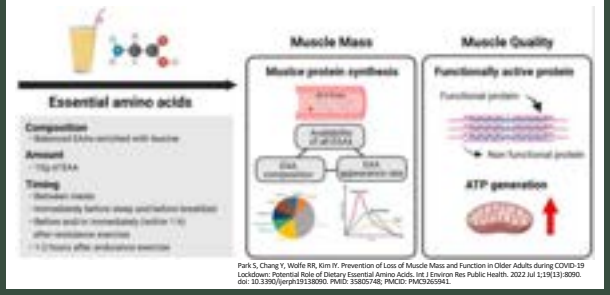
(Baum JI, Wolfe RR. The Link between Dietary Protein Intake, Skeletal Muscle Function and Health in Older Adults. *Healthcare*. 2015, 3, 529-543; doi:10.3390/healthcare3030529)

24

Why EAAs are beneficial compared to whey

- "The greater stimulatory effect of EAAs is due in part to their greater and more rapid availability in plasma following intake, as compared to an intact protein, due to the more rapid and complete absorption of EAAs in the free form"
- Less calories
- Less increase in satiety
- Consumption of an EAA composition also stimulates the utilization of endogenous NEAAs, which may reduce the metabolic burden on the liver and kidneys. (Park et al 2022)

25



Park S, Chang Y, Wolfe RR, Kim IY. Prevention of Loss of Muscle Mass and Function in Older Adults during COVID-19 Lockdown: Potential Role of Dietary Essential Amino Acids. Int J Environ Res Public Health. 2022 Jul 1;19(13):8090. doi: 10.3390/ijerph19138090. PMID: 35805748; PMCID: PMC9265941.

26

Conclusions

27

A Special Thanks

Two renowned protein researchers who never got to age

Dr. Kevin Tipton
1961 to 2022

Dr. Douglas Paddon-Jones

28

Questions?

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29