

Addressing Sarcopenia: Optimizing Protein Intake with Aging

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Objectives

- Explain changes in skeletal muscle with aging across community and clinical settings
- Describe the benefits of protein for patients with sarcopenia and sarcopenic obesity
- Explain the importance of protein quality and quantity on muscle health and functionality in older adults

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Disclosures

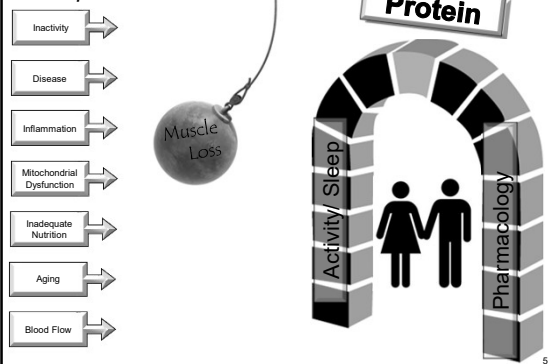
I have received funding, participated on a Scientific Advisory Board or Speaker's Bureau for:

- National Dairy Council
- US Dairy Export Council
- American Egg Board
- National Cattlemen Beef Association
- Abbott Nutrition
- Agropur
- Leprino Foods
- Sabra Wellness
- National Space Biomedical Research Institute

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Conceptual Model.....



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How much protein do we need ?

+ *when, why, how and who....*

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Recommended Dietary Allowance (RDA)
→ 0.8 g protein / kg bodyweight / day

"The minimum daily average dietary intake level ...
[of good quality protein]...that meets the nutrient
requirements of 97 – 98% of healthy individuals"

0.8 g/kg/day:

220 lb - 100 kg	= 80 g protein/day
165 lb - 75 kg	= 60 g protein/day
130 lb - 60 kg	= 48 g protein/day
110 lb - 50 kg	= 40 g protein/day

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Position Statements: healthy older adults

JAMDA
journal homepage: www.jamda.com

PROT-AGE Group

Special Article
Evidence-Based Recommendations for Optimal Dietary Protein Intake in Older People: A Position Paper from the PROT-AGE Study Group
Jürgen Bauer MD^{1,*}, Gianni Biale MD, PhD², Tommy Cedersholm MD, PhD³, Matteo Cressi MD, PhD⁴, Alfonso Cruz-Jentoft MD⁵, John E. Morley MB, BCh⁶, Stuart Phillips PhD⁷, Cornel Sauer MD, PhD⁸, Peter Taylor MD, PhD⁹, Daniel Teta MD, PhD¹⁰, Benuka Visvanathan MBBS, PhD¹¹, Emma Velho MD, PhD¹², Yves Boirie MD, PhD¹³

1.0 - 1.2 g/kg/day

Clinical Nutrition
journal homepage: http://www.elsevier.com/locate/clinut

ESPEN Expert Group

ESPEN endorsed recommendation
Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group
Nicolaas E.F. Deutz¹, Jürgen M. Bauer², Rocco Barazzoni³, Gianni Biale⁴, Yves Boirie⁵, Anja Berg-Wegmann⁶, Tommy Cedersholm⁷, Alfonso Cruz-Jentoft⁸, Zdzisław Krzyżanicki⁹, R. Sreekumaran Nair¹⁰, Pierre Singer¹¹, Daniel Teta¹², Kevin Tipton¹³, Philip C. Calder¹⁴

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Position Statements: highly active older adults

American College of Sports Medicine

Dietitians of Canada

Academy of Nutrition and Dietetics

**Protein intake
should be increased
in highly active people:
1.2 - 1.7 g/kg-/day**

ACSM/ADA/DC Position, MSSE, 2009

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Position Statements: inpatient / clinical populations

American Society for Parenteral and Enteral Nutrition

Society of Critical Care Medicine

.....actual consumption < 0.7 g/kg/day

1.2 – 2.5 g/kg/day

The European Society for Clinical Nutrition and Metabolism

Heyland et. al. Nutrients, 2018

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If the RDA defines the minimum protein intake for healthy adults...is there a maximum ?

IOM / FNB: No Tolerable Upper Intake Level

AMDR: Up to 35% of daily energy (~ 220 g protein / day)

Institute of Medicine

Dietary Reference Intakes

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Dangers of too much protein... ?

Institute of Medicine:

" protein content of diet is not related to progressive decline in kidney function with age "

Dietary Reference Intakes
for
Energy
Carbohydrate
Fiber
Fat
Fatty Acids
Cholesterol
Protein
And Amino acids

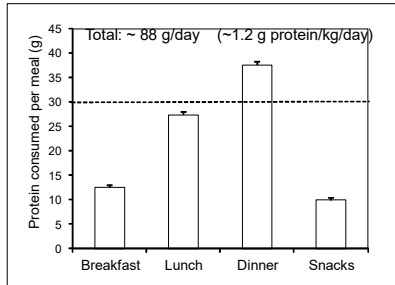
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How Much Protein Do We Eat ?

National Health and Nutrition Examination Survey (NHANES)

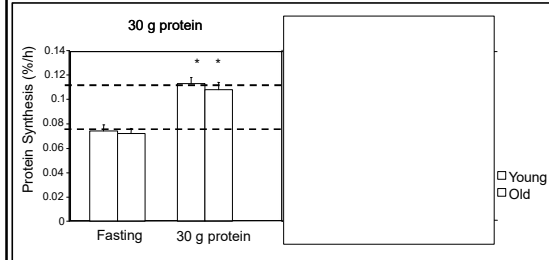


https://www.cdc.gov/nchs/nhanes/about_nhanes.htm 13

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How much protein per meal do we need ?

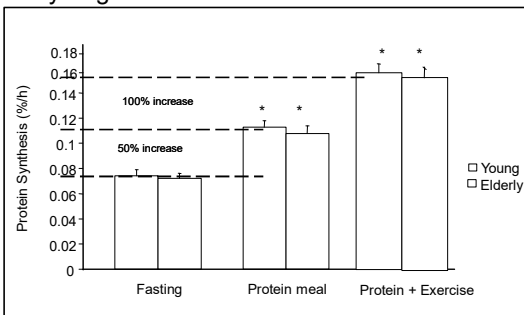
- a message of moderation -



Symons et. al. AJCN, 2007
Symons et. al. JADA, 2009 14

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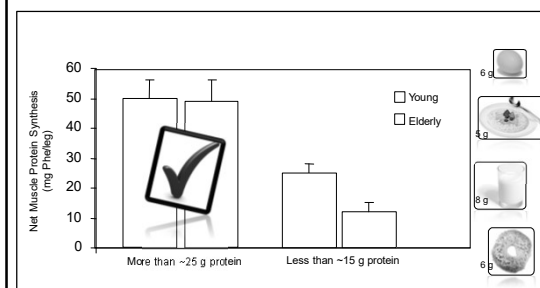
Synergistic Effect of Protein and Exercise



Symons et. al. JNHA, 2011 15

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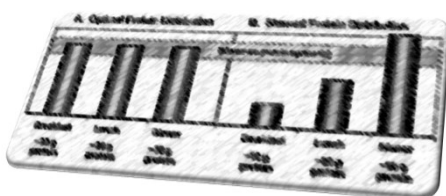
Reality: Age-related dose-response



Katsanos et. al. AJCN, 2005 16

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Protein Quantity and Daily Distribution

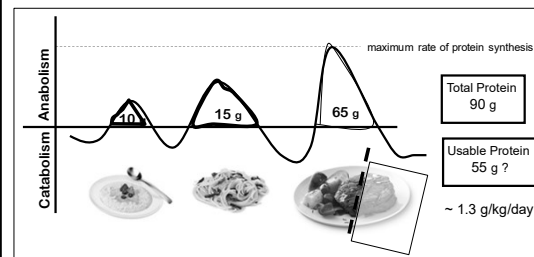


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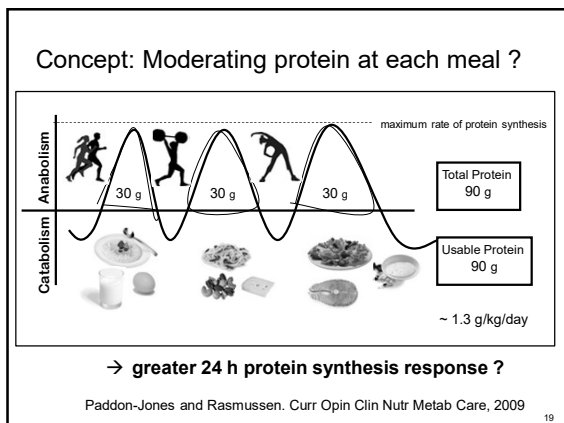
Concept: Typical / skewed protein intake

We can't store excess protein for later anabolism

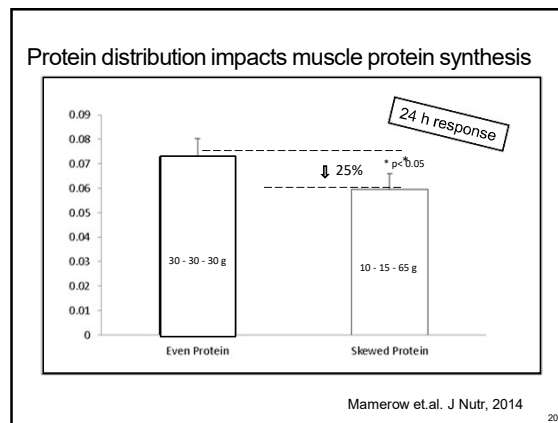


Paddon-Jones and Rasmussen. Curr Opin Clin Nutr Metab Care, 2009 18

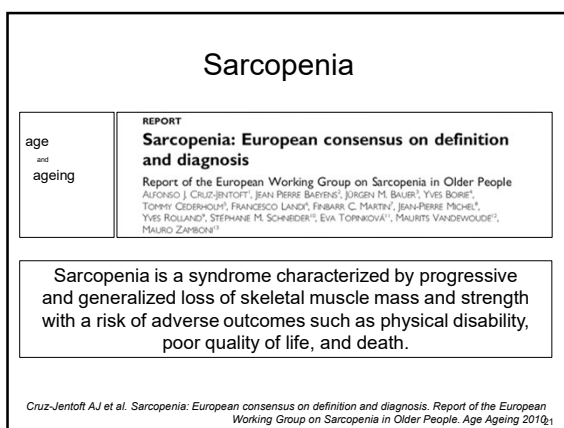
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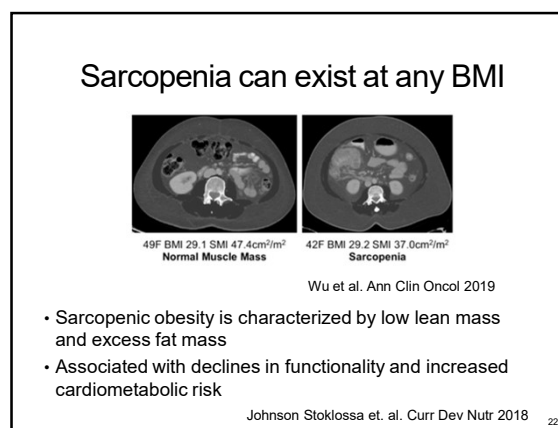
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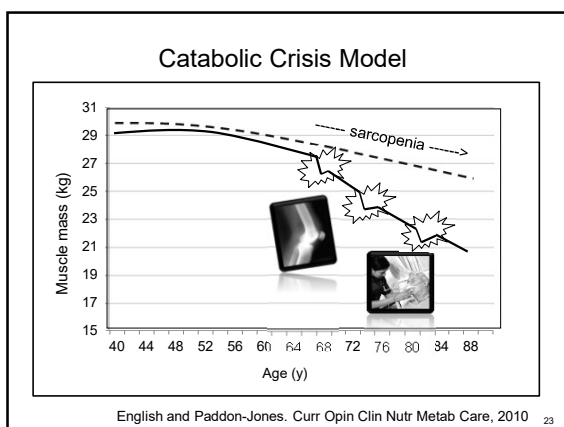
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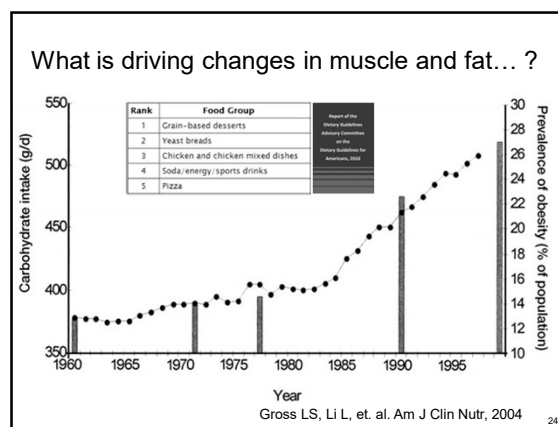
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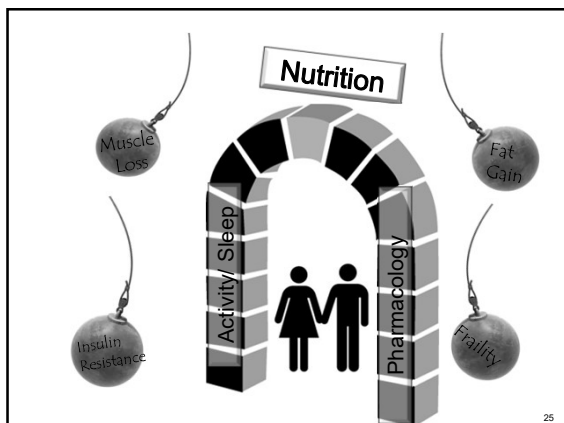
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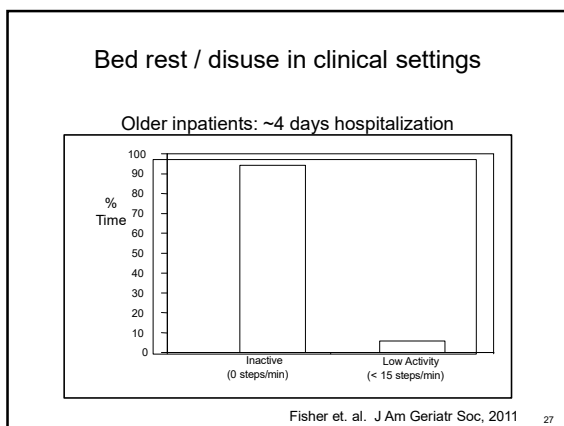
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Research models to assess nutrition interventions:

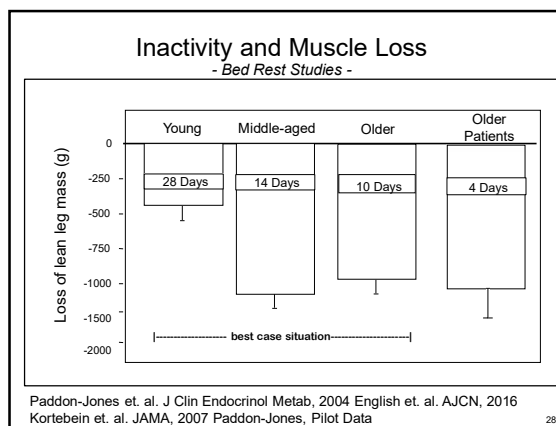
Bed Rest Studies

Mimics the physical inactivity of hospitalization, while separating the catabolic, disease-related effects from the intrinsic effects of skeletal muscle disuse.

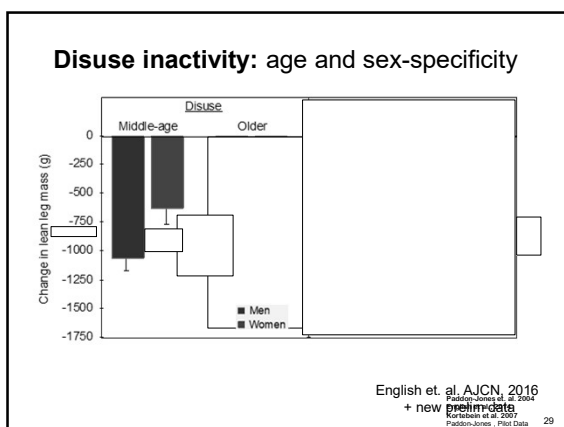
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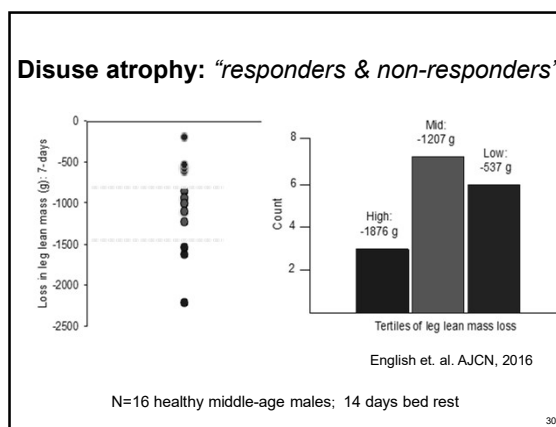
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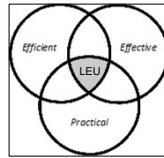
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Dietary Interventions: obstacles and opportunities

→ Pragmatic approach: efficiency and protein quality

Leucine:

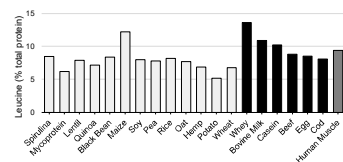
- branch chain amino acid (BCAA)
- common in most high quality proteins
- key regulatory role in protein synthesis
- overstated benefits ?



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Protein Quality

- Defined in terms of essential amino acid content and digestibility (bioavailability)
- Protein Digestibility Corrected Amino Acid Score (PDCAAS)
- Leucine varies among protein sources (highest concentration in whey)

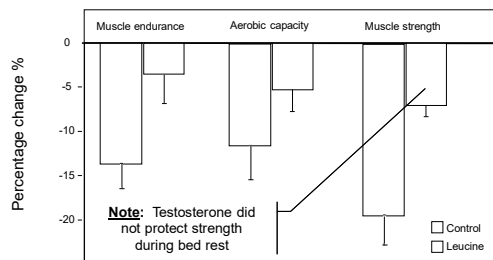


Source	PDCAAS
Milk	1.00
Whey	1.00
Egg	1.00
Soy protein isolate	1.00
Casein	1.00
Beef	0.92
Soy	0.91
Pea	0.67
Oat	0.57
Whole wheat	0.45

van Vliet et. al. J Nutr 2015

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Leucine (4 g/meal): partially protects muscle function



Note: Testosterone did not protect strength during bed rest

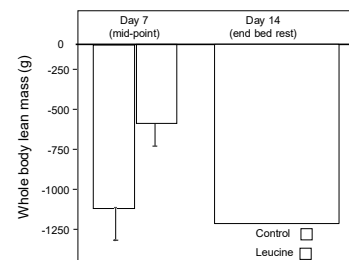


Healthy middle-age adults; 14 days bed rest

English et. al. AJCN, 2016
Zachwieja et. al. JCEM 1999

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Leucine: partially / temporarily protects muscle mass



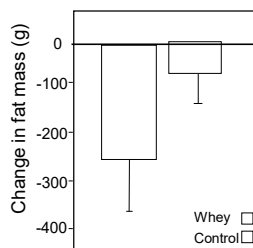
Healthy middle-age adults; 14 days bed rest

English et. al. AJCN 2016

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Anabolic efficiency:

→ Improving dietary protein quality (whey) enhances fat loss ?



Arentson-Lantz et. al. J Gerontol A Biol Sci Med Sci, 2019

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Design

- 7 days bed rest
- N = 20
- healthy older adults

Diets

- 0.9 g protein/kg/day
- whey protein augmentation
- mildly (10%) hypocaloric
- Loss of lean leg mass

WHEY: - 680 ± 131 g
MIXED: - 1035 ± 138 g (p=0.08)

Protein Intake and Functionality

- Observational studies show higher protein intake is associated with better physical function (e.g. strength, functional status), while results from clinical trials are mixed

TABLE 3 Studies assessing the relation between dietary protein intake and physical function¹

Study (ref)	Subjects, n	Age, y	Design	Dietary assessment	Physical function measurement	Protein intake	Outcomes
Gregorio et al. (78)	387 F	60-90	CS	4-d food record	PPT, SPB	In-g: 44.2 ± 4.1; LP: 40.8; HP: 20.8	Upper and lower extremity function was impaired in those who consumed an LP diet
McLean et al. (84)	750 M, 980 F	29-85	L (6 y)	FFQ	HHQD	In-g: 65; Q1: 63; Q2: 74; Q3: 82; Q4: 94	Higher total and animal protein intakes preserved grip strength in adults ≥65 y
Sahni et al. (82)	1160 M, 1496 F	29-86	CS	FFQ	HHQD	In-g: 65; Q1: 64.2; F 56.9; Q2: 61.2; F 43.1; Q3: 68.9; F 73.4; Q4: 101.6; F 93.6	Higher plant but not total and animal protein intake was associated with greater quadriceps strength
Isanidis et al. (79)	554 F	65-72	L (3 y)	3-d food record	HHQD, SPB	In % of energy (g · kg ⁻¹ · d ⁻¹): T1: 16.4 (±0.8); T2: 17.4 (0.8-1.2); T3: 18.6 (±1.2)	Higher protein intake is positively associated with muscle strength and physical function

¹CS, cross-sectional; HP, high protein; HHQD, isometric hand-held dynamometer; L, longitudinal; LP, low protein; PPT, physical performance test; Q, quartile; ref, reference; SPB, short physical performance battery; T, tertile.

Traylor et. al. Adv Nutr 2018

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Recommendations: Prevention and Treatment

For healthy older adults: day-to-day

Establish a dietary framework that includes a **moderate** amount of **high quality** protein at **each meal**.

Modify as necessary to accommodate individual needs:

- *energy requirements*
- *physical activity*
- *health status*
- *body composition goals*
- *dentition, satiety*

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Recommendations: Prevention and Treatment

During periods of catabolic crisis:

- ❖ **0.8 g protein/kg/day is insufficient**
- ❖ **Blunt addition of protein/energy is inefficient**
- ❖ **Aggressive support with high quality protein (*whey/leucine*) and activity may help preserve muscle health**

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- Heather Leidy
- Wayne Campbell
- Don Layman

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- National Cattlemen's Beef Association
- National Dairy Council
- UTMB Claude D. Pepper Older Americans Independence Center



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Questions?

Nutrition-related resources and tools
are available from Nestlé Nutrition Institute:
nestlenutrition-institute.org

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MyCEeducation.com
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