Dr. Paddon-Jones is a Research Investigator with current funding from the National Institute of Health (NIH) and the Dairy Research Institute.

Dr. Paddon-Jones is a member of the Scientific Advisory Board or provides education seminars for the National Dairy Council, American Egg Board, National Cattlemens Beef Association and Leprino Foods.
How much protein – need, want or desire…?

**Recommended Dietary Allowance (RDA)**

RDA: “estimate of the minimum daily average dietary intake level that meets the nutrient requirements of 97-98% of healthy individuals”

**RDA for protein:** 0.8 g of good quality protein / kg body weight / day

**Minimum Dietary Allowance (MDA)**?

Consequences of **too much** or **too little** protein?

Anabolic response to “whole-food” protein

References: Symons et. al. AJCN, 2007
Symons et. al. JADA, 2009
Synergistic Effect of Protein and Exercise

Reference: Symons et al. JNHA, 2010

Reality: Age-related dose-response

Reference: Katsanos et al. AJCN, 2005

Concept: Skewed / typical protein intake

Reference: Paddon-Jones and Rasmussen 2009

Humans can’t store excess protein for later anabolism

Reference: Paddon-Jones and Rasmussen 2009

average adult in US: 60-100 g protein/day (0.9 - 1.2 g/kg/day)
**Concept: Optimizing protein at each meal?**

- Anabolism:
  - 30 g
  - 30 g
  - 30 g
  - Total Protein: 90 g
  - Usable Protein: 90 g
  - ~ 1.2 g/kg/day

- Catabolism:

- Protein distribution impacts muscle protein synthesis

**Reference:** Paddon-Jones and Rasmussen 2009

**Sarcopenia**

Sarcopenia and protecting muscle during inactivity / illness

**Sarcopenia** is a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes such as physical disability, poor quality of life and death.


**Protein distribution impacts muscle protein synthesis**

- Even Protein: 30 - 30 - 30 g
- Skewed Protein: 10 - 15 - 65 g

Typical "uncomplicated" sarcopenia


Catabolic crisis model


If you are hospitalized - you are put in bed

Inactivity and Muscle Loss
- Bed Rest -


Loss of lean leg mass (g)

-2000 -1500 -1000 -500 0

Young Middle-aged Older Older Patients

28 Days 14 Days 10 Days 4 Days

Paddon-Jones et al. 2004
English et al. 2014
Karlsdotter et al. 2007
Paddon-Jones, Pilot Data
Leucine has a key regulatory role on muscle protein synthesis.

...are the benefits overstated?

...should you recommend a leucine supplement?

Leucine: partially protects muscle function

Leucine content of food

<table>
<thead>
<tr>
<th>Protein source</th>
<th>Leucine</th>
</tr>
</thead>
<tbody>
<tr>
<td>whey protein isolate</td>
<td>12 %</td>
</tr>
<tr>
<td>milk protein</td>
<td>10 %</td>
</tr>
<tr>
<td>egg protein</td>
<td>8.5 %</td>
</tr>
<tr>
<td>muscle protein</td>
<td>8 %</td>
</tr>
<tr>
<td>soy protein isolate</td>
<td>8 %</td>
</tr>
<tr>
<td>collagen</td>
<td>2 %</td>
</tr>
</tbody>
</table>

Nutrition during inactivity = a "leaky life preserver"?
**Protein Quality: Limiting amino acids:**

- lysine
- methionine & cysteine (soy)
- methionine / tryptophan

**Single source protein supplements:**

- Whey
- Casein
- Soy
- Blends
- Milk protein
- Collagen (− tryptophan; + arginine)
- Rice (− lysine)
- Pea (− methionine; − cysteine)

*note: low protein quality ≠ poor nutrition quality*

**Summary and recommendations**

Recommendations

For all adults....

Remember, the RDA is a **minimum**, not an upper limit.

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

Modify as necessary to accommodate individual needs:
- energy requirements
- physical activity
- health status
- body composition goals
- dentition, satiety
React aggressively with targeted protein interventions to preserve muscle health and reduce negative metabolic consequences of physical inactivity, illness or injury.

Recommendations

Paddon-Jones Lab
- Emily Arentson-Lantz
- Elfego Galvan

Medical Team
- Adam Wacher
- Elena Volpi
- Charles Mathers

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