AGING WELL: UNDERSTANDING THE ROLE OF PROTEIN TO MAINTAIN MUSCLE MASS AND FUNCTION

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Explore the role of protein as a key nutrient in the elderly;

Examine the loss of skeletal muscle mass and its role in aging;

Identify our understanding of protein’s effects on muscle metabolism; and

Identify protein recommendations that provide improved health outcomes.
As individuals age and move into the “older adult” group – body composition is one of the significant changes.

A remarkable variation is the reduction in total body protein which manifests itself in a decrease in skeletal muscle mass.

Loss of **muscle strength and function** are the main manifestation which affects physical performance and activities of daily living.

**Sarcopenia** is the clinical definition of this loss of muscle mass.
Sarcopenia is a late-life multifactorial syndrome with the potential to curtail quality of life and increase risk of physical disability.

Sarcopenia is characterized operationally by a low skeletal muscle mass, accompanied by low muscle strength and/or low physical performance.

The clinical implications of sarcopenia include functional impairments (e.g., slow walking speed, poor balance) including (difficulty performing activities of daily living, increased risk of falls).

Landi et al. 2012b, 2013
Sarcopenia related muscle loss
Most older adults fail to eat enough food to meet the estimated average requirement (EAR) for daily protein intake (0.8g protein/kg body weight/day).

At the same time, many older adults need more dietary protein than do younger adults.

An imbalance between protein supply and protein need often results in loss of skeletal muscle mass because of a chronic disruption in the balance between muscle protein synthesis and degradation.

Insufficient protein intake to satisfy daily requirements leads to negative protein balance and results in skeletal muscle atrophy, impaired muscle growth, and functional decline. Curr Opin Clin Nutr Metab Care 2015, 18:248-253.

A vicious cycle may develop where sarcopenia and malnutrition mutually magnify one another. Sarcopenia may compromise adequate nutrition. If physical activity is reduced, cooking and shopping may become burdensome, having a reduced appetite and impaired ability to prepare meals may contribute to sarcopenia.
➢ The RDA (Recommended Dietary Allowance) for protein (0.8g protein/kg of body weight/day) is the same for all adults, regardless of age or sex. To convert your body weight into kg, simply divide your weight in lb. by 2.2. \(150 \div 2.2 = 68 \times 0.8 = 54\text{g protein}\)

➢ The Daily Reference Intake: Estimated Average Requirement (EAR) (IOM) is the average daily protein intake level that meets the requirements of half of the healthy adults (0.66g protein/kg body weight/day).

➢ The Acceptable Macronutrient Distribution Range (AMDR) specifies that protein should represent (10-35%) of an individuals total daily energy intake.
The evidence suggests that older adults who consume more protein are able to maintain muscle mass and strength.

Older adults who consumed 1.1 g protein/kg of body weight/day lost less lean body mass than those who consumed 0.07-0.09 g protein/kg/weight/day. (75 G protein)

Among hospitalized older patients, at least 1.1 g protein/kg/weight/day was needed to achieve nitrogen balance, safe intake was up to 1.6 g protein/kg/weight/day. (109 G protein)
Some recommendations were made using nitrogen balance as a proxy for protein balance.

If intake of protein and nitrogen excretion match, there will be no changes in the protein levels in the body over time. Amer J Clin Nutr 2008:88:1322-1329

Other studies using the indicator amino acid oxidation technique that measures the amount of protein necessary for nitrogen balance found that adults age 65 years and older require protein intakes greater than the current RDA for protein. J Nutr 2015; 145:18-24.
What amount of protein is needed to stimulate muscle protein synthesis (MPS) in older adults?

It is important to identify the quantity of protein that is necessary to optimally stimulate MPS in older adults in order to replenish the amino acids lost during fasting and stress.

Metabolic studies have shown that utilization of dietary amino acids for MPS is blunted or impaired in healthy older adults as compared to younger individuals. This anabolic resistance can be overcome by higher amounts of protein/amino acids.

Of great importance is not just the amount of protein but the kind of protein and the distribution of protein intake over the day is important to protein turnover.

A small study examined the correlations between muscle mass and total protein intake and findings between muscle mass and animal protein intake were observed. Animal protein was the only independent predictor of muscle mass. A high-animal protein diet resulted in greater muscle protein synthesis than a high vegetable protein.  

Branched chain amino acids (BCAA), especially leucine, positively regulate signaling pathways for synthesis of muscle proteins.

Volpe et al. J Physiol 2013

In a randomized, controlled study of exercise and nutrition in older sarcopenic adult women in a Japanese community, those who exercised and consumed supplemental amino acids rich in leucine showed increased leg muscle mass, strength and faster walking speed.

Multiple studies have indicated that 25-30g (each meal) of high-quality protein is necessary to reach the threshold for maximal stimulation of MPS in older adults.

Curr Opin Clin Nutr Metab Care 2014: 17:5-11

These data indicate that both the total daily protein and the patterns of intake are important to maximally stimulate MPS and maintain muscle mass in older adults.
A thirteen week intervention of vitamin D and leucine-enriched whey protein oral nutritional supplement resulted in improvements in muscle mass and lower-extremity function among sarcopenic older adults. The study showed that specific nutritional supplementation alone might benefit geriatric patients, especially relevant for those who are unable to exercise.

Bauer et al. JAMDA 2015
Recent studies have indicated that protein supplementation (whey protein concentrate – 20 g twice daily) in a combination with resistance exercise tended to cause greater increases in lean body mass, and muscle strength.
RESULTS OF TWO STUDIES

• Protein to stimulate maximum protein synthesis:
  • Breakfast – 30 g
  • Lunch – 30 g
  • Dinner – 30 g

• Protein to stimulate maximum protein synthesis:
  • Breakfast – 10.7 g
  • Lunch – 16 g
  • Dinner – 63.4 g

J Nutr 2014; 144:876-880
Examples of amounts of protein in food:

• 1 cup of milk has 8 grams of protein
• A 3-ounce piece of meat or seafood has about 21 grams of protein
• 1 cup of dry beans has about 16 grams of protein
• An 8-ounce container of yogurt has about 11 grams of protein
• One slice non-fat mozzarella cheese – 9 g of protein
Here are examples of amounts of protein in food:

- 1 cup of milk has 8 grams of protein
- 2 eggs, 12.6 grams of protein
- An 8-ounce container of yogurt has about 11 grams of protein
- A 3-ounce piece of meat has about 21 grams of protein
- ½ cup of cooked beans has about 8 grams of protein
- 1/2 cup of spinach has 3 grams of protein

Added together, just these six sources would meet the protein needs of an adult male (63.6 grams of protein).
Additional Protein Ideas

- Egg whites
- Tuna/Salmon
- Peanut Butter
- Beans in soups
- Burger or bean pattie
- Smoothies
- Products like Ensure or Boost
- Protein bars
Aging Well!!
• For Aging Well, a well-balanced diet, with protein having major consideration.
• Take into consideration the amount, type and distribution of protein.
• Explore the use of amino acids, leucine, vitamin D, and whey protein.
• The importance of physical activity, specifically resistance training, is important to accelerate and maintain muscle protein synthesis.
Thank you!!

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