Dietary Protein Recommendations For Adequate Intake and Optimal Health

A Tool Kit For Healthcare Professionals

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Introduction

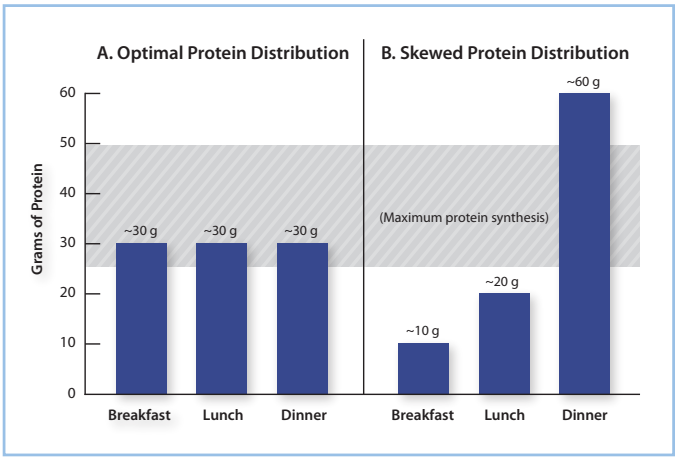
New research demonstrates that dietary protein intakes above minimum requirements can improve adult health and provide benefits for the treatment and prevention of diseases including obesity, osteoporosis, type 2 diabetes, metabolic syndrome, heart disease and sarcopenia.[1-4] Accepted dietary protein recommendations have long been based on the idea that eating a minimum amount of protein is valuable, but consuming more than the minimum offers no further value. In reality, there is scientific evidence that consuming the low-end range of the Recommended Daily Allowance (RDA) for protein may be a health liability and that adults may benefit from higher protein intake.

Research shows that adult skeletal muscle synthesis is fully stimulated when protein intake reaches about 15 grams of essential amino acids or 30 grams of total protein per meal.[5,6] Since dietary protein recommendations are often represented as a percentage of a person's total daily calorie intake (typically 10-20 percent), adults may not be able to achieve adequate protein intake per day when following a restricted calorie diet. Other individuals at potential risk for protein shortages could include vegetarians and high-performance athletes.

The materials in this tool kit will explore the important roles that protein serves in the body, current dietary protein recommendations, optimal protein intake recommendations for adults and how healthcare professionals can use new research to provide appropriate counsel for patients and clients.

Protein Distribution at Meals

Research shows that the consumption of 90 grams of protein per day, distributed evenly over three meals, stimulates maximal protein synthesis and is more likely to provide a greater protein anabolic response in 24 hours.[5]



AFTER READING THIS TOOL KIT YOU WILL BE ABLE TO:

- ✓ Understand the scientific debate regarding adequate versus optimal dietary protein recommendations and associated health outcomes
- ✓ Recognize the latest research demonstrating protein's role in health during the life span
- ✓ Identify the role of protein at breakfast and in the promotion of satiety, weight loss and weight management
- ✓ Communicate with patients and clients on the value of high-quality protein foods and how they fit into an affordable, nutrient-rich diet

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The Important Role of Dietary Protein in Human Health

Back to Basics

More than 40 percent of the body's protein is found in skeletal muscle and more than 25 percent is found in organs. Protein is essential for a healthy diet because it provides amino acids that allow the body to synthesize its own proteins and other nitrogen-containing molecules that make life possible. Research has shown that dietary protein is important in maintaining body composition, bone health, glucose homeostatis, body weight and overall health.[7,8,9,10,11,12]

There are 20 amino acids and of those, nine are essential – phenylalanine, valine, threonine, tryptophan, isoleucine, methionine, leucine, lysine and histidine. Dietary protein is the primary source of both the nine essential or indispensable amino acids and the 11 nonessential or dispensable amino acids. Each amino acid is required in the right amounts to make the thousands of proteins in the human body.

Dietary protein quality is determined by the amino acid composition of a protein and its digestibility. For example, eggs and milk have the highest digestibility in the human gut and contain all nine essential amino acids. In fact, the protein quality in eggs is so high that scientists often use eggs as the "gold standard" for measuring the protein quality of other foods. Other animal sources of high-quality protein that contain optimal levels of the nine essential amino acids include lean beef and pork, skinless poultry, fish and low-fat dairy products. Plant sources of protein, such as beans, nuts, seeds and legumes also provide protein, but plant proteins contain inadequate amounts of one or more of the nine essential amino acids.[13] Some plant proteins, such as soy protein, provide all nine essential amino acids, but are less digestible compared with animal protein.

ASSESSING THE PROTEIN CONTENT

In order to help Americans meet optimal protein needs, it is important that adults are aware that not all protein foods provide the same quality of protein or the same amount of protein per serving. The Protein Digestibility Corrected Amino Acid Score (PDCAAS) was developed to evaluate protein quality and is based on the amino acid requirements of humans. Eggs are considered to be the gold standard for high-quality protein in the PDCAAS system because of their digestibility and subsequent ability to be used in the body. Eggs are generally recognized as the standard reference for determining the protein quality of other foods.

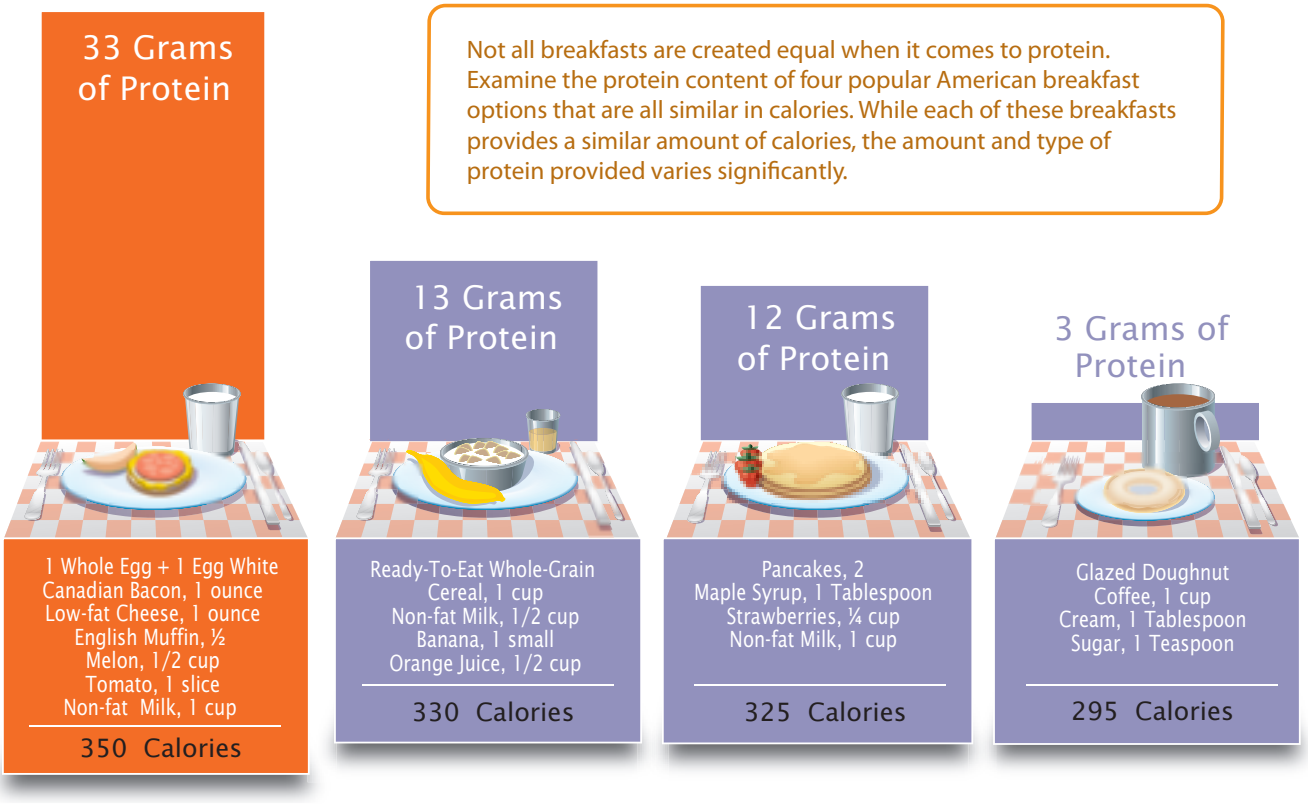
Understanding Protein Recommendations and Optimal Protein Intake

Protein needs for adults correlate to an individual's body weight, but current dietary recommendations are often represented as a percentage of energy intake. For example, the Dietary Reference Intakes (DRI) indicate an acceptable protein range for adults of 10 to 35 percent of total energy.[5,14] However, there are no guidelines that show how to select protein intake across all energy intake levels. Representing protein intake as a percentage of energy means that some individuals with low energy intakes may not be getting enough protein.

The current minimum RDA for protein for adults, based on a 150-pound person, is 56 grams or 0.8 grams of protein per kilogram of body weight.[14] For most adults, replacing some dietary carbohydrates with protein will help to maintain body composition and mobility, improve blood lipids and lipoproteins and help to control food intake. Research shows that 25-30 grams of high-quality protein per meal may be optimal to maintain healthy muscles and bones for adults.[5,6]

STACKING UP THE PROTEIN CONTENT OF POPULAR BREAKFASTS

Not all breakfasts are created equal when it comes to protein. Examine the protein content of four popular American breakfast options that are all similar in calories. While each of these breakfasts provides a similar amount of calories, the amount and type of protein provided varies significantly.



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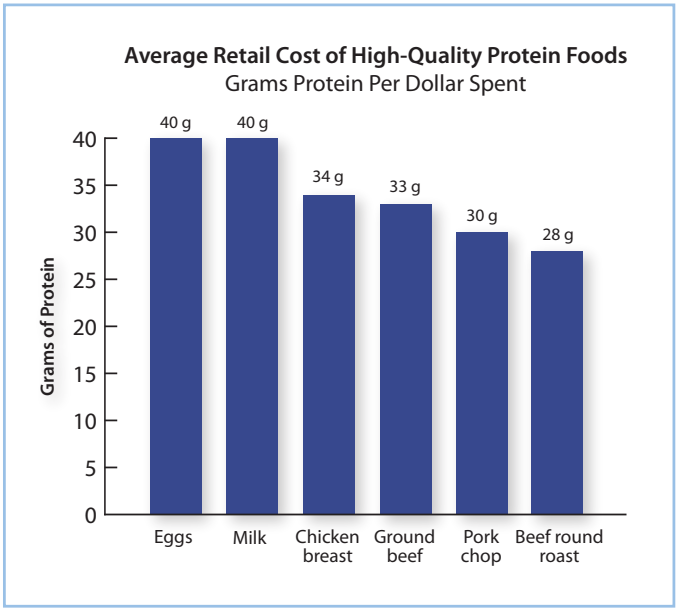
High-Quality Protein Affordability and Versatility

Many consumers believe that high-quality protein foods are expensive, but in reality there are a variety of affordable protein food sources available in today's marketplace. In fact, research shows that there are a variety of nutrient-rich, high-quality protein foods that provide the most protein at an affordable cost.[15]

Healthcare professionals can help educate consumers on the variety of protein options available in the supermarket, as well as help identify which options fit best within their budget, taste preferences and individual or family nutrient needs. Refer to the chart below to compare the grams of protein per dollar spent on high-quality protein foods.

Grams of High-Quality Protein Foods per Dollar Spent[16]



PROTEIN SUPPLEMENTS

Protein supplements are widely available, but adequate high-quality protein is readily available from food sources, which are recommended as the optimal strategy to meet protein needs. Whole foods provide an array of essential nutrients beyond protein, so consuming protein as part of a balanced diet is recommended. In the case of certain disease states or with extreme energy intake needs, protein supplementation may be warranted.

The Nutrient-Rich Egg

Eggs are an all-natural source of high-quality protein, and at an average of 15 cents each, eggs are an affordable, nutrient-rich option for people of all ages.[17]

Eggs are one of the highest-quality protein sources of any food available, and for this reason scientists often use eggs as the standard for measuring the protein quality of other foods. Eggs are also an "excellent" (20% or more of the Daily Value) or "good" source (10-19% of the Daily Value) of the following nutrients compared to the Daily Value (based on a 2,000 calorie diet):

- **Choline** (23% Daily Value) is essential for the normal functioning of all cells, including those involved with metabolism, brain and nerve function, memory and the transportation of nutrients throughout the body. Choline also helps prevent birth defects and promotes brain and memory development in infants.
- **Selenium** (23% Daily Value) acts as an antioxidant to protect the body from oxidative damage. Selenium works hand in hand with vitamin E to protect cell membranes from chronic damage.

- **Riboflavin** (14% Daily Value) helps to produce energy in mitochondria of all the cells of the body.
- **Vitamin B12** (11% Daily Value) works with choline and folate for normal nerve cell function and cell division.
- **Phosphorus** (10% Daily Value) is essential for healthy bones, teeth and cell membranes and is also required for energy production in the body.

An Egg's Nutrient Rich Package

Compared to the Daily Value, one whole, large egg (70 calories) provides:[18]

NUTRIENT	DAILY VALUE
Choline	23%
Selenium	23%
Protein	13%
Riboflavin	14%
Vitamin B12	11%
Phosphorus	10%
Pantothenic Acid	7%
Folate	6%
Iron	5%
Vitamin A	5%
Vitamin D	6%
Zinc	4%
Vitamin B6	4%

Research Review: The Benefits of Protein Throughout the Lifespan

Breakfast is often considered the most important meal of the day for children, but it is also a meal that is often skipped by adults. Research demonstrates the many benefits associated with eating breakfast at any age, including improved cognitive function, better school performance and improved markers for overall health.[19,20]

Breakfast, Cognition and School Performance

A review of the impact of breakfast quality on academic performance in children suggests that eating a breakfast that includes a variety of foods from the MyPyramid food groups can positively impact cognitive function.[19] In fact, data presented at the International Symposium on Breakfast and Performance suggests that omitting breakfast interferes with cognition and learning, especially short-term memory. For example, children and adolescents that did not eat breakfast demonstrated diminished speed and accuracy on short-term memory tests, immediate recall, delayed recall, recognition memory and spatial memory.[20]

In one study, a majority of children surveyed agreed that eating breakfast helped them pay attention and stay energized throughout the day.[21] Research also shows that eating breakfast is a marker for good behavior in schoolchildren. In fact, breakfast eaters participating in a school breakfast program were less likely to miss school due to illness or other issues and were less likely to be late to class.[22]

Breakfast and Overall Health

Children should meet daily nutrient recommendations in order to satisfy the basic demands for growth and development. Studies indicate that eating breakfast has nutritional benefits including improved overall intake of vitamins and minerals and may also play a role in improving overall nutritional status.

Research shows that breakfast eaters have a higher daily intake of micronutrients and are more likely to meet nutrient intake recommendations compared with breakfast skippers.[23]

Body weight may be another marker of overall health that is influenced by breakfast consumption. Research suggests an association between skipping breakfast and an increase in overweight and obesity among adolescents.[21] A recent study found that when adults ate eggs for breakfast, they had a greater sense of sustained fullness throughout the day compared with when more protein was eaten at lunch or dinner.[24]

Another study demonstrates that eating protein-rich eggs for breakfast reduces hunger and decreases calorie consumption at lunch and throughout the day. Men who consumed an egg-based breakfast ate significantly fewer calories when offered an unlimited lunch buffet compared with when they ate a carbohydrate-rich bagel breakfast of equal calories.[25] In addition, when the men ate the egg-based breakfast the researchers observed that the men consumed approximately 400 fewer calories in the 24-hour period following the egg breakfast, and blood tests showed that ghrelin, the hormone that stimulates hunger when elevated, was significantly higher after the bagel breakfast.

PUTTING SCIENCE INTO PRACTICE

- ✓ Discuss the nutritional benefits of breakfast with your patients of all ages and help them identify nutrient-rich breakfast foods, such as high-quality protein eggs, low-fat and fat-free milk and milk products, fruits and whole grains.
- ✓ Encourage parents to offer breakfast at home or suggest quick and easy breakfasts on-the-go that include nutrient-rich foods.

Satiety and Weight Loss

Appetite and Satiety

Scientists recognize that satiety, or the state of feeling full, plays an important role in suppressing appetite and encouraging the consumption of fewer calories. One study evaluated the importance of meal time on satiety and found that the satiating property of protein is influenced by the timing of protein consumption. The researchers found that combining increased protein intake at breakfast with energy restriction led to a greater initial and sustained feeling of fullness.[26] Appetite research among younger and older men found that when inadequate protein was consumed throughout the day, appetites increased and resulted in a greater consumption of food overall.[27]

Researchers from the Harvard School of Public Health completed a randomized clinical trial and found that higher protein diets may increase weight loss in the first six months of a diet when compared with lower protein diets. It has been suggested that this is due in part to increased satiety, thus causing decreased total energy intake associated with higher-protein diets.[28]

Protein and Satiety

Research reviews recommend increasing the satiating power of a diet to help people feel full and thus consume fewer calories. When evaluating diet patterns among Americans, research shows an increased protein diet may aid successful weight loss. One study conducted by researchers at the University of Washington found that increasing the consumption of dietary protein from 15 percent up to 30 percent of total calories, while consuming 50 percent of calories from carbohydrates produces a decrease in caloric intake.[11]

Increasing dietary consumption of high-quality protein while reducing dietary carbohydrates may encourage positive changes in body composition during weight loss. A moderate increase in dietary protein, when combined with physical activity and an energy-controlled diet, may help regulate body weight by favoring retention of fat-free mass at the expense of fat mass.[29]

Research has also shown that eating eggs as part of the first meal of the day helps people feel more satisfied, reduces total caloric intake throughout the day and prevents snacking between meals.[30] A follow-up study found that an egg breakfast during an energy-deficient diet helped dieters lose 65 percent more weight and feel more energetic than dieters who ate a bagel breakfast of equal calories and volume. In fact, dieters consumed an average of 330 calories fewer throughout the day when consuming an egg breakfast compared to a bagel breakfast. This study found no significant difference in the LDL and HDL cholesterol and triglyceride levels between the egg and bagel groups.[26]

PUTTING SCIENCE INTO PRACTICE

- ✓ Encourage patients to consume high-quality protein as part of their first meal of the day to help promote an increased feeling of fullness and help manage appetite and total calorie intake.
- ✓ When calculating protein needs among patients consuming a reduced-calorie diet, be sure they are consuming at least 30 grams of protein per meal and consuming at least adequate protein as part of any weight-loss effort.

Exercise and Aging

Research studying the effects of diet composition during exercise found that a diet high in protein and reduced in carbohydrates improved body composition in women when combined with exercise. In fact, participants who increased protein to 1.6 grams of protein per kilogram of body weight and decreased carbohydrate consumption while maintaining exercise lost more total weight and fat mass and better maintained lean mass than those who ate more carbohydrates and less protein while exercising.[31]

Protein and Sarcopenia

Chronic age-related muscle loss, or sarcopenia, causes frailty and increased risk for falling due to poor muscular support. The impact of sarcopenia is vast and this chronic muscle loss is estimated to affect 30 percent of people older than 60 years of age and may affect more than 50 percent of those older than 80 years of age. Research suggests that exercise, along with optimal protein intake, can slow the effects of sarcopenia.[2]

Dietary Protein and Chronic Age-Related Muscle Loss

Research has shown that muscle protein synthesis is inhibited in elderly subjects who consume less than approximately 20 grams of protein per meal.[1] As previously discussed, a moderately increased daily protein intake beyond the RDA may enhance muscle protein synthesis and provide a means of reducing the progressive loss of muscle mass with age.[2]

Studies have shown that multiple moderate-sized servings of high-quality protein over the course of a day may help optimize the potential for muscle growth while controlling total energy and nutrient intake. One study demonstrated that a four ounce portion of a protein food provides an equally effective and more energetically efficient means of stimulating muscle protein synthesis than a threefold larger serving.[32]

Protein, Nutrition and Exercise for Healthy Aging

Dietary protein intake (up to 1.6 grams of protein per kilogram daily) may enhance response to resistance exercise. In elderly men and women, the use of a protein-calorie supplement was associated with greater strength and muscle mass gains when compared with a placebo. Results of this study found that compared with older subjects, young people tend to have a greater increase in plasma amino acid concentration after the consumption of protein, which supports improved muscle synthesis.[33]

PUTTING SCIENCE INTO PRACTICE

- ✓ Encourage older adults to choose a variety of high-quality protein foods at breakfast, lunch and dinner and aim for 30 grams of protein per meal.
- ✓ Discuss and demonstrate simple forms of physical activity and encourage patients to do them daily in combination with a diet rich in high-quality protein.

The goal of this tool kit is to help provide healthcare professionals with the information they need to understand the scientific debate regarding adequate versus optimal dietary protein recommendations and associated health outcomes. The accompanying fact sheets provide healthcare professionals and consumers with additional information about the role of protein throughout the life span and will help healthcare professionals communicate with patients and clients on the value of high-quality protein foods and how they fit into an affordable, nutrient-rich diet.

PUTTING SCIENCE INTO PRACTICE

Use these ideas to educate your patients about the benefits of protein throughout the lifespan by discussing:

- ✓ The nutritional benefits of breakfast with your patients of all ages and help them identify nutrient-rich breakfast foods, such as high-quality eggs, low-fat and fat-free milk and milk products, fruits and whole grains
- ✓ Simple forms of physical activity and encourage patients to do them daily in combination with a diet rich in high-quality protein
- ✓ The importance of getting at least 30 grams of protein per meal and consuming at least adequate protein as part of any weight loss effort

Use these ideas to help patients meet protein needs by encouraging:

- ✓ Parents to offer breakfast at home or suggest quick and easy breakfasts on-the-go that include nutrient-rich foods
- ✓ Patients to consume high-quality protein as part of their first meal of the day to help promote an increased feeling of fullness and help manage appetite and total calorie intake
- ✓ Older adults to choose a variety of high-quality protein foods at breakfast, lunch and dinner and aim for 30 grams of protein per meal

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