



# Health Connections

LINKING NUTRITION RESEARCH TO PRACTICE

## PROTEIN'S ROLE IN PROMOTING OPTIMAL HEALTH

# Beyond Nitrogen Balance

The revision of the Dietary Guidelines 2010 offers an opportunity to review protein's contemporary role in optimizing health. New research demonstrates that higher protein diets—still within the Acceptable Macronutrient Distribution Range (AMDR)—can improve body composition and blood lipids, facilitate compliance to weight-loss plans and mitigate progression of sarcopenia. This issue of *Health Connections* describes the benefits of a higher-protein diet for certain population groups and under certain health and/or life-stage conditions, so health care professionals can customize their protein advice accordingly.

### Background

Although its name is derived from the Greek "prota," meaning "of primary importance," dietary recommendations for protein are based on the concept of preventing deficiency and often take a back seat to fat and carbohydrate in nutrition recommendations. In fact, the 2005 Dietary Guidelines do not specifically address protein, but state: "While protein is an important macronutrient in the diet, most Americans are already currently consuming enough (AMDR of 10 percent to 35 percent of calories) and do not need to increase their intake. As such, protein consumption, while important for nutrient adequacy, is not a focus of this document."<sup>1</sup>

Although protein malnutrition may not be prevalent in this country, the National Health and Nutrition Examination Survey (NHANES) 2003–2004 revealed that certain segments of the population, aging adults in particular, could benefit from higher levels of protein to help manage chronic diseases such as obesity and diabetes.<sup>2</sup>

### Protein Requirement and Intake

The Institute of Medicine (IOM) Recommended Dietary Allowance (RDA) for protein is 0.8 g/kg/day,

or about 45 grams for a 125-pound individual. The RDA is an estimate of the minimal amount of protein to maintain nitrogen (N)-balance in healthy, young adults, but may be inadequate for active adults and the elderly.<sup>3</sup> Since N-balance does not correlate directly with functional outcomes, it may not be the most appropriate endpoint for determination of optimal levels of protein in the context of the overall diet and health. Parameters related to muscle mass, strength and metabolic functions might be endpoints that are more relevant.<sup>3</sup>

The common belief is that protein intake by Americans is excessive. However, according to NHANES 2003–2004, 7 percent of adolescent females and almost 9 percent of older adult women consume insufficient protein. Food patterns in MyPyramid provide protein in a range of 17 percent to 21 percent of calories, yet few Americans consume even this amount. Virtually none of the population approaches the highest AMDR for protein of 35 percent of calories.<sup>2</sup>

### Benefits of Higher Protein Consumption

**IMPROVED BODY COMPOSITION** — There have been divergent results on the long-term efficacy of weight-loss diets of different macronutrient composition. A recent study discovered that reduced-calorie diets result in clinically meaningful weight loss regardless of the macronutrient emphasized.<sup>4</sup>

*continued on page 2*



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Other research suggests that macronutrient composition affects health in ways beyond weight loss. A 12-month multi-center weight-loss trial discovered that a diet with 30 percent energy from protein was more effective for fat loss and improved body composition during initial weight loss and long-term maintenance. It also produced sustained reductions in serum triacylglycerol and increases in HDL-C compared with a high-carbohydrate diet. Weight loss did not differ between the groups, but the protein group lost 22 percent more fat mass than the carbohydrate group during initial weight loss. Education guidelines for the protein group emphasized use of high-quality, low-fat proteins such as reduced-fat dairy, lean meats and eggs or egg substitutes.<sup>5</sup>

**PREVENTION OF SARCOPENIA** — Muscle proteins undergo constant synthesis and degradation and, therefore, are directly affected by protein in the diet. Protein quality (see Sidebar) is important not only at the minimum RDA level, but at higher intakes, as there is experimental support for the specific influence of indispensable amino acids on regulation of muscle protein synthesis.<sup>6</sup>

Muscle mass, strength and metabolic function are important not only for physical activity, but for

activities of daily living. By age 40, most show some decline in total muscle mass, sometimes masked by an increase in fat mass. Sarcopenia of aging is the involuntary, progressive loss of muscle mass with subsequent reduction in muscle strength associated with lowered mobility, increased risk of falls and associated morbidity. Sarcopenia is estimated to occur in 30 percent of those 60 years and older and will be an increasingly important public health concern as the population ages.<sup>7</sup> Metabolically active skeletal muscle can offset the morbidities associated with sarcopenia of aging—such as decline in aerobic fitness and reduction in metabolic rate that can lead to fat-mass accumulation, increased risk for obesity, cardiovascular disease and diabetes.<sup>8</sup>

In summary, although the optimal level of protein intake is unknown, research supports benefits of protein intakes in excess of the current RDA. More research will help assess the overall role of protein, and in particular protein quality, in optimal health.

### SIDE BAR: Role of Protein Quality

The role of protein quality in maximizing muscle anabolism suggests that not all “high-quality” proteins are equal. The ability of different protein sources to promote muscle protein synthesis depends on the essential amino acid content, in particular a critical trigger point or concentration of leucine that serves as the primary determinant of anabolic potential.

Whey protein, found naturally in milk, is a high-quality dairy protein and one of the best sources of branched-chain amino acids (BCAA), including leucine. Results of a collection of studies suggest that milk proteins are superior to soy in supporting muscle-mass accretion along with resistance training (with both superior to carbohydrate alone).<sup>8</sup>

For more information on the metabolic impact of increased protein and BCAA intake on weight loss, stabilization of blood glucose levels and retention of lean body mass, see Health Connections Fall 2004: <http://www.dairycouncilofca.org/HealthProfessionals/HealthConnections/>.

### PRACTICE POINTS FOR THE HEALTH PROFESSIONAL

- Use the RDA and AMDR range of intakes to customize dietary guidance about the role of high-quality protein in optimal health.
- Discuss the role of high-quality protein in retention of muscle strength with younger adults to help prevent the effects of sarcopenia in advanced years.
- Changes in bone mass, muscle mass and strength track together over the life span, making bone health a musculoskeletal issue, not just a skeletal issue. Low-fat dairy foods provide both calcium and protein important for preventing both bone and muscle loss. On average, dairy provides about 17 percent to 18 percent of protein to older adults; total animal sources, about 61 percent. Of the different animal sources (beef, dairy, poultry, fish and egg), dairy is the single biggest contributor.<sup>10</sup>
- To promote skeletal muscle protein anabolism for older adults, suggest a moderate serving of protein of high biological value such as lean meats and low-fat dairy during each meal. Distributing protein evenly over three meals has been found to stimulate muscle protein synthesis to a maximal extent compared to an unequal distribution with a majority of protein provided at dinner.<sup>11</sup>

## Interview — Nancy R. Rodriguez, Ph.D., R.D., F.A.C.S.M., Department of Nutritional Sciences, University of Connecticut, Storrs.

### Q. What issues might the IOM Committee and the Dietary Guidelines Advisory Committee consider when reviewing protein requirements?

A. My hope is that the committees will give more depth and direction regarding the role of protein for optimal health. Although negative N-balance may not occur when consuming protein at the RDA level, newer thinking is that it is beneficial to consume protein in excess of the RDA (but within the AMDR) because of associated health benefits. It is often thought that eating sufficient calories means getting sufficient protein. This is not always the case. Consuming high-quality protein is particularly important when energy levels are low.

I would also hope to see protein move from being the last macronutrient considered in the context of calories—an afterthought—to a more pivotal nutrient in the diet for which adequate intake is associated with reduced health risks and increased benefits. Fat intake is addressed in relation to cardiovascular risk factors and essential fatty acid profiles. Carbohydrate intake centers on the role of complex carbohydrates, insulin response and triglyceride levels. The question then comes—where does protein fit? When I teach medical nutrition therapy or sports nutrition, I begin with energy needs and then protein-intake needs. Consuming sufficient protein to incur the benefits associated with this nutrient should be a priority in diet design, in my opinion.

Nutrient recommendations already allow for higher intakes of certain nutrients based on special conditions, e.g., increased intake of vitamin C above the RDA for smokers. With caloric intake often declining with age and with boomers entering the 'young old' category, it is important to have a higher percentage of calories from high-quality protein because we certainly do not want a population of sarcopenic 65- to 80-year-olds. So ... even if the protein RDA does not change, the AMDR, which reflects a flexible range allowing for protein intake above the RDA, should be highlighted.

### Q. What is the current thinking on the role of animal and plant sources of protein in supporting optimal health?

A. A daily protein intake that provides a balance of essential amino acids to fulfill the body's need for the many roles protein plays is important. At one point we thought it was sufficient to get these essential amino acids over a period of time, say 3 to 5 days. Now we recognize the importance of digestibility and bioavailability of protein foods to provide the essential amino acids on a daily basis, as well as recognizing the other important nutrients protein foods provide. For example, the essential amino acid leucine, which is involved in stimulating muscle protein synthesis, is not provided to any significant extent in most plant foods.

Completely plant-based diets may not address the potential risk for sarcopenia in the general population. Health professionals can assist consumers to be thoughtful about their food choices and to understand the role of both plant and animal proteins in providing nutrients they need.

### Q. What is your vision for additional needed research?

A. I'd like to see research that helps revitalize the population—will the advice we are giving to the 'young old' baby boomers really make a difference in the quality of life they experience when they are 60–65? Can we design diets for an aging population that are affordable, enjoyable and impact functional capacity?

We are accustomed to studying nutrients at the cellular and molecular level, but how does all this progress downstream to build a strong skeleton with ample muscle strength that will enable someone to have more physical strength, flexibility, range of motion, balance and less stress? For older adults, resistance training may not be sustainable or practical. Would other activities that build core strength—stretching, yoga or Pilates—also help slow the loss of lean body mass in older adults? This may involve studies in more holistic terms and include looking at the impact of alternative types of physical activity on lean body mass.



Nancy R. Rodriguez, Ph.D., R.D., F.A.C.S.M

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