Protein Requirements

What Is Required for Optimal Health?

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There are many controversies in health-care regarding the proper amount of dietary protein needed for optimal health. Previous concerns of high-protein diets included increased risk of renal (kidney) diseases, and decreases in bone mineral density from leaching of calcium and nutrients from bone. Both of these claims are speculative in nature, and our current recommendations have been based on less accurate forms of statistical analysis.[1] As such, our actual dietary protein requirements may have been underestimated. Additionally, we may have overlooked some of the beneficial outcomes of higher-protein diets when composed of high-quality protein, standardized for leucine content. Most notable are the protein requirements during pregnancy and aging into our senior years, which are much higher than current recommendations.

Current Guidelines and Calculation Methods

The current recommended dietary allowance (RDA) for protein in the United States and Canada is set at 0.8 g of protein per kilogram of body weight per day (g/kg/d).[2] This value was determined using select nitrogen-balance studies which now are being considered inappropriate and unreliable.[2][3] Advanced methods of determining protein requirements have been used recently in multiple studies and show that our current values have underestimated the population's protein requirements for optimal health.[1]

Indicator amino acid oxidation (IAAO) is a noninvasive method used to measure the amino-acid requirements for protein synthesis.[3] The IAAO method can determine the metabolic availability of amino acids from dietary protein intake to determine specific required amounts for the whole body.[1] Because of its noninvasive method, it can be used to determine requirements in neonates, children, and those with critical illnesses.[1]

What sets the IAAO method apart from previous measurement methods is that it reflects metabolic availability within the whole body, and therefore can account for losses of dietary amino acids during digestion, absorption, and cellular metabolism.[1] Our RDA for protein should reflect this and as such, the IAAO method has calculated a protein requirement between 0.96 g/kg/d and 1.29 g/kg/d, depending on age, with older women (65 years and older) requiring amounts in the higher end of the range.[3]

Most North Americans are likely meeting our current RDA of 0.8 g/kg/d, which was set as a value to prevent protein deficiency and the negative health outcomes thereof.[2] However, we cannot overlook the health benefits of relatively higher–protein diets, especially in the case of specific disorders, such as obesity, and hormonal dysfunction including polycystic ovarian syndrome.[2][4]

Benefits and Concerns of Higher-Protein Diets

Essential amino acids in dietary protein, such as leucine, stimulate muscle-protein synthesis. Increasing dietary protein therefore may improve weight management by preserving or increasing lean mass while reducing body weight via fat mass.[2] One study showed that even without calorie restriction, subjects who consumed 1.2–1.6 g/kg/d of protein showed greater weight loss, fat mass loss, and preservation of lean muscle mass.[2] It's important to note that the quality of the protein, as well as quantity and timing of consumption, may also influence weight management.

Protein helps to improve appetite control, which may suggest that our current timing of protein is skewed. Whereas most North Americans consume their largest amount of protein with dinner, it may be more beneficial for increasing fullness by consuming it at breakfast. One study showed that consumption of a high-protein breakfast containing 30 g protein, compared to a high-protein lunch or dinner, led to increased satiety which extended throughout the day and into the evening hours.[2] This effect may also help reduce voluntary high-carbohydrate / high-sugar snacking in the evening.

To address the concerns regarding kidney function with high dietary protein intake, more recent studies have looked into pushing intake even further: In a year-long study by Antonio et al, resistance-trained men consuming 2.51–3.32 g/kg/d of protein showed no abnormal measurements of blood lipids, and no adverse effects to liver and renal

function.[5] A similar study was done a year earlier, analyzing the effects in both men and women consuming > 3 g/kg/d, and showed similar results, with no deleterious effects in metabolic blood parameters.[6]

To address concerns regarding renal function, one study showed a positive correlation between creatinine clearance with protein intake, suggesting that a diet low in dietary protein may itself decrease renal function.[2] By restricting dietary protein, we have found that glomerular filtration rate (GFR) decreases, while those with normal kidney function showed an increase in GFR with increases in dietary protein.[2]

Protein Requirements in Pregnancy

Proper nutrition is essential for a healthy pregnancy, and crucial for reducing the risk of negative pregnancy outcomes. Not only are macro- and micronutrients necessary for the developing fetus, but also for the mother who is required to provide a healthy heart, blood flow, and circulation to support the placenta.[7] We also know that many nutrients are passed from mother to infant during breast-feeding, further increasing the need of proper nutrient composition in the mother's diet.[7]

The role of protein in our bodies goes beyond basic muscle support. In addition to providing skeletal and postural support as well as strength, proteins are used in our bodies as enzymes for metabolic reactions, as signalling molecules within and between cells, and for other functions such as binding and shuttling hormones in our blood. Dietary protein is especially important in pregnancy to reduce the risk of infant low birth weight, which can lead to other infant comorbidities such as cardiovascular disease, kidney disease, obstructive airway disease, and obesity later in life.[7]

Our current estimated recommendations for daily protein intake during pregnancy is between 1.22 g/kg/d and 1.52 g/kg/d, with the higher intake required in late gestation. On average, this equates to 79–108 g of protein per day.[7] This is supported by other studies showing that women who consumed 100 g of high-quality protein per day had the best pregnancy outcomes as measured by the reduced incidence of a low-birth-weight infant.[7]

Protein Requirements During Aging

As we age into our elderly years, we find that many individuals experience muscle loss and weakness.[2] Part of this may be attributed to a decrease in appetite, and therefore a decrease in daily calorie intake. Where we need to pay more attention is to the composition of meals, encouraging less carbohydrates from crackers, white breads, and other baked goods, and increasing intake of high-quality protein, standardized for leucine content.

In addition to stimulating protein synthesis, leucine has been shown to prevent the loss of muscle mass.[8] This is especially important in those with, or those at risk of, sarcopenia.[3]

In particular, one study showed that supplementing with 20 g whey protein with 2.8 g leucine, when combined with 800 IU vitamin D and resistance training (three times per week), can preserve muscle mass.[8] This protocol was followed in obese elderly adults who were trying to lose weight. While we encourage those who are obese to lose weight for optimal health including hormone functioning, cardiovascular health, and to reverse type 2 diabetes, we must keep in mind that with any weight loss, we risk losing muscle mass as well. By accelerating the development of sarcopenia, weakness and fall risk also increase. By correcting for these changes in body composition, preserving muscle mass while decreasing fat mass, we minimize the risk of secondary injuries while improving independence and activities of daily living in our aging population.[3][8]

Conclusions

Although some health-care practitioners may hesitate recommending larger protein intakes (or advocate against them altogether), there is no reliable evidence to support these concerns.[2] Multiple studies have investigated the metabolic changes occurring with higher protein intakes, including renal and liver function, and have concluded that no adverse effects occur with higher-protein diets in adults with otherwise normal kidney and liver function.

We now understand the importance and benefit to additional protein and leucine intake, especially in older adults, to prevent age-related muscle loss and weakness.[2][3] Furthermore, our current recommended targets do not account for the increased requirements during pregnancy. With regards to the amount of protein we should be consuming daily, an intake range of 1.2–1.6 g/kg/d is a more ideal target for optimal health outcomes.[2][7]

References

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