Egg Nutrition Center

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Protein Research

Evans WJ. Protein nutrition, exercise and aging. *J Am Coll Nutr* 2004;23:601S-9S.

Aging is associated with remarkable changes in body composition. Loss of skeletal muscle, a process called sarcopenia, is a prominent feature of these changes. In addition, gains in total body fat and visceral fat content continue into late life. The cause of sarcopenia is likely a result of a number of changes that also occur with aging. These include reduced levels of physical activity, changing endocrine function (reduced testosterone, growth hormone, and estrogen levels), insulin resistance, and increased dietary protein needs. Healthy free-living elderly men and women have been shown to accommodate to the Recommended Dietary Allowance (RDA) for protein of 0.8 g · kg–1 · d–1 with a continued decrease in urinary nitrogen excretion and reduced muscle mass. While many elderly people consume adequate amounts of protein, many older people have a reduced appetite and consume less than the protein RDA, likely resulting in an accelerated rate of sarcopenia.

One important strategy that counters sarcopenia is strength conditioning. Strength conditioning will result in an increase in muscle size and this increase in size is largely the result of increased contractile proteins. The mechanisms by which the mechanical events stimulate an increase in RNA synthesis and subsequent protein synthesis are not well understood. Lifting weight requires that a muscle shorten as it produces force (concentric contraction). Lowering the weight, on the other hand, forces the muscle to lengthen as it produces force (eccentric contraction). These lengthening muscle contractions have been shown to produce ultrastructural damage (microscopic tears in contractile proteins muscle cells) that may stimulate increased muscle protein turnover. This muscle damage produces a cascade of metabolic events which is similar to an acute phase response and includes complement activation, mobilization of neutrophils, increased circulating an skeletal muscle interleukin-1, macrophage accumulation in muscle, and an increase in muscle protein synthesis and degradation. While endurance exercise increases the oxidation of essential amino acids and increases the requirement for dietary protein, resistance exercise results in a decrease in nitrogen excretion, lowering dietary protein needs. This increased efficiency of protein use may be important for wasting diseases such as HIV infection and cancer and particularly in elderly people suffering from sarcopenia. Research has indicated that increased dietary protein intake (up to 1.6 g protein · kg–1 · d–1) may enhance the hypertrophic response to resistance exercise. It has also been demonstrated that in very old men and women the use of a protein-calorie supplement was associated with greater strength and muscle mass gains than did the use of placebo.