THINK FITNESS

Can Eating Extra Protein Make Muscles Grow Stronger?

The answer is mostly "no" but also a qualified "yes." Athletes and fitness seekers cannot stimulate their muscles to gain size and strength simply by consuming more protein or amino acids. Hard work is necessary to trigger the genes to build more of the muscle tissue needed for sport. The "yes" part of the answer reflects research suggesting that well-timed protein intakes can often further stimulate muscle growth. Protein intake cannot replace exercise in this regard, however, as many supplement sellers would have people believe. Exercise generates cellular messages that stimulate the DNA to begin synthesizing the muscle proteins needed to perform the work. A protein-rich snack—say, a glass of skim milk or soy milk—consumed immediately before or within an hour or two after resistance exercise (such as weight lifting; see Chapter 10) may offer additional stimulus for muscle growth, but only within the context of the working muscle.

Athletes may need somewhat more dietary protein than other people do, and exercise authorities recommend higher protein intakes for athletes pursuing various activities (Chapter 10 has details).[8] Amino acid or protein supplements, however, offer no advantage over food, and amino acid supplements are more likely to cause problems (as this chapter's Consumer Corner makes clear). Bottom line: The path to bigger muscles is rigorous physical training with adequate energy and nutrients from balanced, well-timed meals and snacks. Many more details about dietary protein and muscles are interesting and important, but this truth remains: extra protein and amino acids without physical work add nothing but excess calories.

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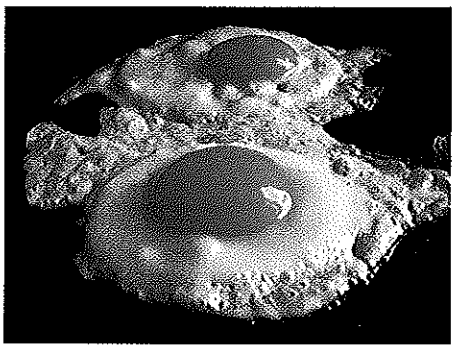
Denaturation of Proteins

Proteins can be denatured (distorted in shape) by heat, radiation, alcohol, acids, bases, or the salts of heavy metals. The **denaturation** of a protein is the first step in its destruction; thus, these agents are dangerous because they can disrupt a protein's folded structure, making it unable to function in the body. In digestion, however, denaturation is useful to the body.

During the digestion of a food protein, the stomach acid opens up the protein's structure, permitting digestive enzymes to make contact with the peptide bonds and cleave them. Denaturation also occurs during the cooking of foods. Cooking an egg denatures the proteins of the egg and makes it firm, as the margin photo demonstrates. More important for nutrition is that heat denatures two proteins in raw eggs: one binds the B vitamin biotin and the mineral iron, and the other slows protein digestion. Thus, cooking eggs liberates biotin and iron and aids digestion.

Many well-known poisons are salts of heavy metals like mercury and silver; these denature protein strands wherever they touch them. The common first-aid antidote for swallowing a heavy-metal poison is to drink milk. The poison then acts on the protein of the milk rather than on the protein tissues of the mouth, esophagus, and stomach. Later, vomiting can be induced to expel the poison that has combined with the milk.



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Heat denatures protein, making it firm.

denaturation the irreversible change in a protein's folded shape brought about by heat, acids, bases, alcohol, salts of heavy metals, or other agents.

KEY POINT Proteins can be denatured by heat, acids, bases, alcohol, or the salts of heavy metals. Denaturation begins the process of digesting food protein and can also destroy body proteins.