

Feeding Your Muscles

Resistance training, along with the right amount, type, and timing of protein intake, can help muscles grow bigger and stronger. Resistance training includes weightlifting, band exercises and some forms of yoga and Pilates. The most time efficient form of exercise is what is known as high intensity interval exercise that combines resistance and aerobic exercise over a 30 to 45 minute time period. The proper form of exercise and proper nutrition are both important in feeding the muscle.

Any exercise that stretches a muscle will help to build that muscle. The basic process of growing muscle requires muscle fibers to stretch until they induce a signal to recruit satellite muscle cells to merge with the fiber to make it larger. This occurs best during what is known as the eccentric movement of muscle. Think of a simple biceps curl exercise. You contract the muscle to lift the weight. The eccentric movement occurs as you slowly lower the weight, stretching the muscle fibers. The muscle fibers then send a signal to satellite cells, which merge with the muscle fiber making it larger. Each specific exercise you do builds particular muscle fibers, so a golfer and hockey player will build up different muscle as they repeat exercises specific to their sport.

Muscle growth also depends on the nerve signals to the muscle, which is how the brain controls muscle movements. Much of this is subconscious during exercise. Golf swings and basketball shots are based on muscle memory. Sometimes conscious thoughts during the movements disrupt these signals, which are also involved in developing muscle strength.

It is clear from many studies that resistance exercise sensitizes muscle to growth, promoting activities of amino acids in the bloodstream derived from proteins in the diet (1). Protein feeding alone increases amino acids in the bloodstream and leads to some protein building in the muscle, but resistance exercises increases muscle mass more effectively when combined with protein in the diet. This occurs because resistance exercises prepare your muscle to take greater advantage of the increase in amino acids resulting from eating protein.

When you eat protein, the amount of protein, and the protein quality all affect how much your muscle grows. Consuming protein, along with carbohydrate and proper hydration, increases muscle mass. Muscle growth occurs more effectively when protein is consumed during an exercise recovery period within one hour after completing resistance exercise, rather than before or during resistance exercise. Studies have shown that 20 grams or more of protein at a meal will stimulate maximum protein synthesis in normal volunteers (2). The quality of the protein is also important and reflects the mix of amino acids found in the protein and their digestibility. Egg white, milk protein, and soy protein are the highest quality proteins followed by other animal proteins from beef, poultry, fish and seafood. Soy is the highest quality plant protein source. Plant proteins other than soy have less optimal mixes of protein. However, combinations of two lower quality plant proteins such as beans and rice or corn can increase the quality of the mixed protein to a level comparable to animal proteins. Among the 21 amino acids in protein, a position of prominence belongs to leucine as an amino acid that acts as a signaling molecule to stimulate muscle protein synthesis, as well as being a building block for protein. Leucine binds to a protein in the muscle called Sestrin2 which leads to the activation of a

number of enzymes that increase protein synthesis in the muscle cell. So the concentration of leucine inside the muscle cell following digestion of protein is more important than total protein alone. Choosing high quality proteins and combining protein intake with resistance exercise will help you build muscle mass and strength.