



ACSM Information On...

## PROTEIN INTAKE FOR OPTIMAL MUSCLE MAINTENANCE

Resistance training is an important part of a complete exercise regimen. Consuming the appropriate amount and type of protein to maintain and build muscle is just as important.

### A Complete Physical Activity Program

A well-rounded physical activity program includes aerobic exercise and strength training exercise, but not necessarily in the same session. This blend helps maintain or improve cardiorespiratory and muscular fitness and overall health and function. Regular physical activity will provide more health benefits than sporadic, high intensity workouts, so choose exercises you are likely to enjoy and that you can incorporate into your schedule.

ACSM's physical activity recommendations for healthy adults, updated in 2011, recommend at least 30 minutes of moderate-intensity physical activity (working hard enough to break a sweat, but still able to carry on a conversation) five days per week, or 20 minutes of more vigorous activity three days per week. Combinations of moderate- and vigorous-intensity activity can be performed to meet this recommendation.

Examples of typical aerobic exercises are:

- Walking
- Running
- Stair climbing
- Cycling
- Rowing
- Cross country skiing
- Swimming

In addition, strength training should be performed a minimum of two days each week, with 8-12 repetitions of 8-10 different exercises that target all major muscle groups. This type of training can be accomplished using body weight, resistance bands, free weights, medicine balls or weight machines.

### What is Protein?

In the human body, proteins are a part of every cell and tissue, including our muscle. Our bodies are constantly recycling proteins on a daily basis. The proteins that we eat in our diet can be used to replace broken down proteins in order to maintain balance.

Proteins contain essential and non-essential amino acids. Amino acids are the building blocks for all our proteins in the body. Essential amino acids are those that our body cannot make on its own and thus, these amino acids must come from the foods we eat. A complete protein is named just that because it will contain all of the essential amino acids our body needs to repair and grow. These proteins sources are animal-based and include meat, poultry, fish, eggs and cheese. Foods like rice and dry beans also contain protein, but may not have all the essential amino acids our bodies need. However, when combined together, these two foods can provide adequate amounts of all the essential amino acids.

Protein can be found in relatively high concentrations in the following foods:

- meats, poultry, and fish
- legumes (dry beans and peas)
- tofu
- eggs
- nuts and seeds
- milk and milk products (cheese and yogurt)
- grains, some vegetables and some fruits (provide only small amounts of protein relative to other sources)

Protein intake from animal sources rather than plant-based sources tend to have better absorption rates. However, even vegetarians can achieve adequate protein intake when a variety of plant sources are included ensuring intake of all essential amino acids.

Here are some practical protein equivalents in common foods:

- One cup of milk has eight grams of protein
- One cup of soy milk has about seven grams of protein
- One egg has six grams of protein
- A three ounce piece of meat has about 21 grams of protein
- One cup of dry beans has about 16 grams of protein
- An eight ounce container of yogurt has about 11 grams of protein

### Recommended Intakes of Protein

In general, it is recommended that 10-35 percent of your daily energy intake comes from protein. If you consume 2,000 calories per day, this would work out to be between 200 to 700 calories of protein per day. The recommended daily intakes (RDIs) can also be calculated by a person's body weight. The Academy of Nutrition and Dietetics recommends that the average individual should consume 0.8 grams of protein per kilogram or 0.35 grams per pound of body weight per day for general health. So a person that weighs 75 kg (165 pounds) should consume an average of 60 grams of protein per day. Since there are approximately four calories per gram of protein, 60 grams of protein would result in the intake of 240 calories.

Muscle mass is built when the net protein balance is positive: muscle protein synthesis exceeds muscle protein breakdown. Research shows muscle protein turnover is the greatest after working out. Additionally, it has been shown that muscle mass increases over time when resistance exercise (*i.e.* weight lifting, body weight exercises, etc) is combined with nutrient intake.

However, as we age, we need to increase our protein intake. Around 50 years of age, we need to increase the protein in our diets to one gram per kilogram of our body weight to maintain muscle mass. People that exercise regularly also need to eat more protein than the recommended daily intake.

To increase muscle mass in combination with physical activity, it is recommended that a person that lifts weights regularly or is training for a running or cycling event eat a range of 1.2-1.7 grams of protein per kilogram of body weight per day, or 0.5 to 0.8 grams per pound of body weight. Consequently, the same 75 kilogram individual should increase their protein intake to 75 grams (300 calories) to 128 grams (512 calories) in order to gain muscle mass. This level of intake can generally be met through diet alone and without additional protein and amino acid supplementation.

### When Should I Consume My Protein?

The process of protein turnover is increased with resistance training and can remain elevated for up to 48 hours in people beginning a new resistance training program. Therefore it is important to provide enough energy including protein so there is a sufficient pool of amino acids available to repair and build new muscle. Of course, you do not want to exercise on an empty stomach. In fact, exercising in an unfed state leads to an increase in protein loss making it more difficult for the body to both repair and build muscle.

Research suggests there are several benefits to pre-exercise protein supplementation. Pre-exercise protein supplementation helps to improve body composition by increasing resting energy expenditure up to 48 hours after exercise. This is important because it suggests that pre-exercise protein ingestion will not only help increase lean muscle mass and thus strength, but will also simultaneously reduce fat mass. However, the most scientifically

supported and most significant benefits of consuming protein prior to exercise may be improved recovery and hypertrophy. This is thought to occur because of improved amino acid delivery.

Protein supplementation after exercise may have a more profound impact on skeletal muscle hypertrophy. Several studies have demonstrated that protein ingestion following an acute bout of resistance training stimulates muscle protein synthesis for up to three hours. In contrast, failing to eat after exercise may limit protein synthesis and therefore limit potential progress in lean muscle tissue development. Research actually suggests there may be an “anabolic window” such that protein intake within an hour of exercise has the greatest influence on resistance training adaptations.

### What Proteins Should I Consider?

Why protein is beneficial in supporting muscle adaptations due to its rapid absorption rate in addition to casein that has a slower and more sustained rate of amino acid absorption over a few hours. Branched chain amino acids are similarly beneficial and have been shown to aid in recovery from exercise with respect to not only protein synthesis but also aiding in replacing our muscle glycogen and delaying fatigue associated with exercise. Generally, naturally occurring animal proteins contain 2:1:1 ratio of leucine, isoleucine and valine. These proteins have been identified as providing optimal support of muscle adaptations with exercise training. In order to meet the recommended RDA a consumption of approximately 45 mg/kg/day of leucine and 22.5 mg/kg/day of isoleucine and valine is suggested.

### Summary

Protein supplementation has been shown to improve muscle building with regular exercise training. A diet based on the current protein intake recommendations may be achieved through a balanced diet and does not require additional supplementation. The benefits of resistance training and protein timing are not limited to sports performance or improving physique but can also delay the onset of age-related muscle loss and help preserve muscle mass and strength in the elderly helping to maintain independence and quality of life.

## Staying Active Pays Off!

Those who are physically active tend to live longer, healthier lives. Research shows that moderate physical activity—such as 30 minutes a day of brisk walking—significantly contributes to longevity. Even a person with risk factors like high blood pressure, diabetes or even a smoking habit can gain real benefits from incorporating regular physical activity into their daily life.

As many dieters have found, exercise can help you stay on a diet and lose weight. What's more – regular exercise can help lower blood pressure, control blood sugar, improve cholesterol levels and build stronger, denser bones.

### The First Step

Before you begin an exercise program, take a fitness test, or substantially increase your level of activity, make sure to answer the following questions. This physical activity readiness questionnaire (PAR-Q) will help determine if you're ready to begin an exercise routine or program.

- Has your doctor ever said that you have a heart condition or that you should participate in physical activity only as recommended by a doctor?
- Do you feel pain in your chest during physical activity?
- In the past month, have you had chest pain when you were not doing physical activity?
- Do you lose your balance from dizziness? Do you ever lose consciousness?
- Do you have a bone or joint problem that could be made worse by a change in your physical activity?
- Is your doctor currently prescribing drugs for your blood pressure or a heart condition?
- Do you know of any reason you should not participate in physical activity?

If you answered yes to one or more questions, if you are over 40 years of age and have recently been inactive, or if you are concerned about your health, consult a physician before taking a fitness test or substantially increasing your physical activity. If you answered no to each question, then it's likely that you can safely begin exercising.

### Prior to Exercise

Prior to beginning any exercise program, including the activities depicted in this brochure, individuals should seek medical evaluation and clearance to engage in activity. Not all exercise programs are suitable for everyone, and some programs may result in injury. Activities should be carried out at a pace that is comfortable for the user. Users should discontinue participation in any exercise activity that causes pain or discomfort. In such event, medical consultation should be immediately obtained.



**AMERICAN COLLEGE  
of SPORTS MEDICINE**  
LEADING THE WAY