

# Protein

Protein in food is broken down to amino acids in our bodies. Amino acids provide the building blocks for growth and repair of ALL the body's cells, including skin cells, liver cells, immune cells, as well as muscle cells.

Read on to learn...

- Exactly how much protein you need.
- How vegetarians can meet their protein needs.
- The best way to build muscle.

## *How much protein do you need?*

The amount of protein you need depends on your weight (specifically your lean body mass), your total Calorie intake (specifically whether or not you are consuming adequate carbs and fats for energy), and your fitness goals.

TABLE 1: RECOMMENDED GRAMS OF PROTEIN PER DAY BASED ON BODY WEIGHT						
ACTIVITY LEVEL GRAMS PROTEIN PER POUND OF BODY WEIGHT	BODY WEIGHT IN POUNDS					
	110 lbs	130 lbs	150 lbs	170 lbs	190 lbs	210 lbs
Sedentary Person 0.36 g/lb	40	47	54	62	69	76
Recreational Athlete 0.45 – 0.68 g/lb	50-75	59-89	68-102	77-116	86-129	95-143
Endurance/Aerobic Athlete 0.55 – 0.64 g/lb	60-70	71-83	82-95	92-108	103-120	114-133
Strength Athlete 0.73 – 0.82 g/lb	80-90	94-106	109-122	123-139	138-155	152-171
Active Person Restricting Calories 0.82 g/lb	90	106	122	139	155	171
Maximum Usable Amount 0.91 g/lb	100	118	136	154	172	190

\*Note: If you are very overweight and your excess weight is from excess body fat (not muscle), this table will overestimate your protein needs. The extra fat on your body does not require extra protein intake. To avoid overestimating your protein needs, use your desired, healthy weight instead of your actual weight.

## *Do you need extra protein to build muscle?*

The key to building muscle is resistance training (not consuming protein or amino acids) and consuming adequate Calories and carbohydrate to fuel this type of training. In theory, it costs an extra 500 Calories every day to build a pound of muscle in a week. It only costs an extra 10-14 grams of protein every day to build a pound of muscle in a week. (NOTE: 14 grams of protein is the amount in 2 oz. of chicken—that's just a few bites!) In most cases, the only reason high protein, weight gainer drinks and sports bars help is because they provide these extra Calories. That being said, it is true that people trying to build muscle do

need more protein than a sedentary person.

From table 1, you can see that students trying to build muscle need up to 2 times as much protein as sedentary students. But that doesn't mean you need to go out of your way eating dozens of egg whites, multiple cans of tuna, tons of skinless chicken breasts, and several high protein bars and shakes on top of that to build muscle. To explain...

First, the average sedentary person already consumes much more protein than he/she really needs, without even trying. Look at the protein content of normal foods. A small 3 oz. chicken breast (about the size of a deck of cards) has about 25 g of protein. An 8 oz. glass of milk has 8 g. A slice of bread or ½ cup of vegetables has 2-3 g. An active man who eats like the MyPyramid Food Guidance System\* recommends (with 7 oz. equivalents from the meat and beans group, 3 cups from the milk group, and several servings from the vegetable group and bread, cereal, and grain group) will be consuming about 140 grams of protein per day.



\* [www.mypyramid.gov](http://www.mypyramid.gov)

Second, even though you need more total grams of protein per day for muscle building, you still only need to eat 12-15% of your total Calories from protein. This is the same percentage recommended for people who are sedentary. The trick is that if you are very active, you need to eat more total Calories every day. If you consume these extra Calories, you more than likely are consuming more protein too.

Finally, the body can only use a maximum of about 0.9 g protein per pound of body weight per day for tissue building. There is no way to store extra protein in the body. Whatever is not used is burned for energy, converted to carbohydrate for energy, or stored as fat. Since protein-rich foods tend to be more expensive than carbohydrate-rich foods, it's a waste to eat lots of extra protein in place of adequate carbohydrates.

#### Example

15% of 2000 Calories (175 lb sedentary man's diet) = 300 Calories, 75 g of protein (0.43 g/lb)  
15% of 3500 Calories (175 lb active man's diet) = 525 Calories, 131 g of protein (0.75 g/lb)

### *Are there any risks to consuming excessive protein?*

Too much protein can be harmful to your health and your physical performance.

- Unlike carbohydrate or fat, protein produces nitrogen waste products (urea, ammonia, uric acid, etc.) when it is used for energy. The kidneys must excrete these waste products. When a lot of urea is produced, the kidneys may get overworked and start to fail. There is definitely evidence to support this concern in people with diabetes and others with pre-existing kidney problems. There is limited evidence to support this concern in people with normally functioning kidneys, but some researchers still remain cautious and warn against excessive protein intake (>1 g/lb. per day).
- Too much protein can also promote dehydration, since extra water is needed to excrete the extra urea.
- Too much protein (especially from animal sources) may cause excessive calcium loss from your bones. Acid is generated when high protein foods are eaten. Calcium is released from the bone as a buffer to the increased acid load. Both the acid and the calcium are excreted in the urine.
- Many animal proteins (such as whole fat milk, cheese, red meat, and chicken with skin) are high in

saturated fats, which are associated with high blood cholesterol levels and heart disease. Also, many protein bars are packed with palm oil (which is highly saturated) and/or partially hydrogenated vegetable oils (a source of trans fat, which is equally damaging to your cholesterol levels and heart health).

- If you eat excessive protein, you're probably not getting adequate carbohydrate. Carbs are the muscles' only fuel source during high intensity anaerobic exercise (like weight training). If your muscles are carbo-depleted because you loaded up so much on protein, you're not going to be able to train as hard and you won't be able to build as much muscle.
- Also, carbohydrate stimulates insulin--an anabolic hormone that helps carry glucose (sugar), as well as amino acids into muscle cells. When consumed immediately after heavy training, carbohydrate seems to help prevent protein breakdown and promote optimal recovery and muscle building.
- If you are not eating adequate carbohydrate from the fruit, vegetable, grain, and milk groups, your diet is likely low in fiber and several other vitamins, minerals, and phytochemicals that are important to your health and physical performance.

## *Are there any risks to consuming too little protein?*

Absolutely!!!

- If you don't consume adequate protein from your diet, you will start breaking down your body's own proteins (i.e. your muscles, bones, and vital organs) to get the amino acids you need. Obviously, this is NOT desirable!
- Inadequate protein intakes are also associated with depressed immune function (so you get sick more often) and fatigue (so you don't have the energy to study, work, or play).
- In addition, low protein intake puts you at greater risk for exercise-related injuries and slower healing from these injuries because protein builds and repairs your cells. Low protein also lowers intakes of important minerals such as calcium, iron, and zinc (which are found predominantly in protein-rich foods like milk and meat products).
- Finally, protein contributes to satiety (a feeling of fullness) after eating. So, students who don't consume enough protein with meals may experience increased appetite and food cravings during the day, especially for sugary sweets and other carbohydrate-rich foods.

## *Who is at risk for low protein intake?*

### **1. People dieting to control weight**

Weight-conscious students are especially at risk for inadequate protein intakes. Some of these students exclude a lot of protein-rich foods from their diets because they perceive them to be too high in Calories and fat (which is NOT necessarily true). This is especially common among students participating in weight-class sports (like rowing, wrestling, and boxing), activities that focus on appearance (like modeling, acting, body building, Taekwondo, gymnastics, dance, and cheerleading), and sports in which low body weight is advantageous for quickness and speed (like running and cycling). Without adequate protein, these students lose muscle mass and bone density and suffer many other negative effects of restrictive dieting.

Other weight-conscious students falsely believe that if they follow a high protein (but low Calorie) diet they can lose weight without losing muscle. However, if you don't consume enough total Calories from carbohydrate and fat for energy, you will break down the protein you eat for energy and it will NOT be available for muscle building and maintenance. Adequate Calories (from carbohydrate and fat) are critical to spare protein for its building functions.

### **2. Vegetarians**

Students who follow a vegetarian diet, which excludes many (or all) animal foods, may also be at risk for

inadequate protein intakes. But, with a little education and planning, it is possible for vegetarians to get all the protein they need with plant foods alone.

## Animal vs. Plant Sources of Protein

Protein can be found in both animal and plant foods.

### 1. Animal sources

Animal foods that are rich in protein include meats, poultry, fish, eggs, cheese, milk and yogurt. These foods are considered “complete” or “high quality” proteins because they contain all the "essential" amino acids. "Essential" means that they must be consumed in our diet; our bodies cannot manufacture them. There are nine essential amino acids: phenylalanine, valine, tyrosine, methionine, tryptophan, histidine, isoleucine, leucine, and lysine. The other eleven amino acids are considered "non-essential" because they do not have to be consumed in the diet. Our bodies can manufacture them from the essential amino acids.

### 2. Plant sources

Plant foods that are rich in protein include soy products (tofu, tempeh, soy milk, and other products made from soy), beans, seeds, and nuts. There are also small amounts of protein in breads, cereals, and other grains, as well as in vegetables. Plant sources of protein are considered “incomplete” because they are missing one or more essential amino acids. Soy protein is the one exception--it is considered "complete."

But just because most plant proteins are incomplete does NOT mean that you can't build a healthy eating plan with plant foods alone. Vegetarians who include a variety of plant proteins throughout the day can get the full array of amino acids they need. For instance, beans are lacking in the essential amino acid (EAA) methionine, but they are rich in the EAA lysine. Meanwhile, grains are lacking in the EAA lysine, but they are rich in the EAA methionine. By consuming both beans and grains throughout the day, vegetarians CAN get all the essential amino acids they need.

## BOTTOM LINE FOR CONSUMING PROTEIN AND BUILDING MUSCLE:

- The most important factor to building muscle is **resistance training**, not eating extra protein and amino acids.
- Make sure you consume adequate Calories to build new muscle tissue. Increase your total Calorie intake by 350-500 Calories every day to gain about one pound per week.
- Make sure you consume adequate carbohydrate to meet your energy needs for heavy training (and to spare the protein you eat for its building functions). It's especially important to consume carbohydrate (along with a little protein) immediately after your workouts to promote recovery and building.
- Be sure to consume adequate (but not excessive) protein from a variety of animal and/or plant foods. Most students should aim for about 10-35% of total Calories from protein.
- Emphasize protein-rich foods that are low in saturated fat, such as lean meats, skinless poultry, fish, egg whites, 1% low fat or fat free milk products, beans, nuts, tofu, or other soy-based meat alternatives.
- That doesn't mean it's bad to enjoy a couple slices of pizza or a big juicy burger once in a while.



Just balance it out by eating other foods that are low in saturated fat at other meals during the day.

- Try to include one serving of a protein-rich food with each meal to insure that you are getting enough protein and to increase the satiety value of your meals. Choose from a variety of protein-rich foods, such as meat, poultry, fish, dairy, beans, tofu, and nuts. Protein, like fat, makes you feel full longer after you eat than if you ate a meal with just carbohydrate.
- If you're on the go and don't have time to eat protein-rich foods, a high protein drink or energy bar (with 20-30 g protein per serving) can come in quite handy. Just be sure that it is low in saturated fat and hydrogenated vegetable oils.
- If you decide to add a protein supplement to your diet, save your money and buy nonfat dried milk powder at the grocery store or a simple whey protein or soy protein powder, instead of expensive "designer weight gain products." Add the powder to beverages, soups, sauces, and hot cereals for a good boost of Calories and high quality protein.

## Take the Protein

