Principles of Protein

By: Christine M. Jenior PT, MSPT, ATC

Did you know that the average American diet for a sedentary adult contains over twice the amount of protein recommended by the RDA? How much protein are you taking in each day versus what is required for your body’s energy output? What are good sources of protein? This article describes what protein is, what it does and how the body uses it.

The basics of proteins:
• are critical to the structure and function of the body
• help maintain fluid and electrolyte balance
• aid in energy production before and after exercise
• are available in many forms such as whey, red meat, plant, poultry and soy
• act as a buffer to maintain the body’s pH
• help to make up the body’s organs, muscles, tendons, ligaments and bone
• are involved with hormones related to metabolism (insulin, glucagon, epinephrine)
• help with the building and repair of the muscles
• help with transport of micronutrients, minerals, and oxygen from the lungs to the muscles
• are made up of amino acids, 20 of which are recognized in our diets

Amino Acids:
Each amino acid contains at least one nitrogen group. When proteins are broken down, the amino acids are used for energy in the form of CO2 and water. The nitrogen group leaves the body through urine. Eleven of these amino acids are considered nonessential or dispensable. This means our bodies make them using other amino acids that we consume. The remaining nine, however, cannot be made by the body. These are known as essential or indispensable amino acids because we must rely on foods to obtain them. Protein rich foods contain all of the essential and nonessential amino acids. Amino acids help build and repair tissues after exercise. They are converted directly into muscles for energy and help to prevent hypoglycemia.

The recommended dietary allowance (RDA) for protein for non-vegetarian adults is .8g/kg/d. Research studies conclude that recommended daily protein intake for strength athletes is 1.6-1.7g/kg/d, and for endurance athletes the range is 1.2-1.4g/kg/d. *To reiterate, these are the RDA for your weight in kilograms, NOT pounds!

How to calculate your personal daily protein requirements:

Your weight in pounds ÷ 2.2 = your weight in kilograms. Multiply this amount by your energy level (normal healthy adult .8, endurance training athlete 1.2-1.4, strength training athlete 1.6-1.7)
For example: Bill, an endurance athlete, weighs 220lbs.

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220\text{lbs} ÷ 2.2 = 100\text{kg}
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\[
100\text{kg} \times 1.2\text{g} = 160\text{g/protein/d}.
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This may seem like an exorbitant amount of protein, but it is very easy to attain. The following is an example of foods Bill could eat to meet his protein requirements:

**Breakfast:** 1 c oatmeal, ½ c skim milk, 2 egg whites, 2 slices of whole wheat toast with jelly: \(\sim 22\text{g/protein} \)

**Pre-lunch snack:** 1 orange 1.3 g/protein

**Lunch:** turkey sandwich on whole wheat bread with 1 slice Swiss cheese, ½ c. low-fat cottage cheese, 1 banana, 8 oz. glass of skim milk: 56.4g/protein

**Pre-dinner snack:** 6oz. c yogurt with ¼ c granola: 9g/protein

**Dinner:** 6oz. broiled skinless chicken breast, 1c steamed broccoli, salad with 6oz. fresh spinach and 1oz. almonds (dressing), 8oz. skim milk: \(\sim 67.4\text{g/protein} \)

**Post-dinner snack:** 1 banana, 1tbsp peanut butter: 5.3g/protein

**Total protein intake:** 161.4g/protein

**Can one consume too much protein?**

Yes. Many individuals consume much more protein than is required by their bodies. There are a variety of protein shakes, bars, powders and other supplements that can be consumed that contain plenty of protein if certain foods are not available. **Always note the calorie and fat content of supplements and keep in mind that food is the best and purest way to attain your daily protein requirements.**

Evidence indicates that the body cannot synthesize protein if it is consumed in excess of 2.0g/kg/d. Beware, as this means that the body will store the protein as fat! Evidence also suggests that the body’s protein requirements return to baseline (the RDA of .8g/kg/d) after 3-4 weeks of training.

Too much protein can put the kidneys into overdrive causing damage, increased urinary calcium excretion, higher risk for heart disease, dehydration and amino acid toxicity. Although one may not be affected by kidney problems now, the probability of developing renal failure later in life is much higher than individuals that ingest the proper amount of protein.

There is currently no known benefit of one type of protein over the other- for example: soy vs. animal protein. Our bodies are designed to utilize both sources, however, when ingesting plant based protein, such as soy, it is recommended that other forms of protein are also ingested to maximize amino acid intake. Plant and animal based protein contain different variations of amino acids and so a balanced diet is recommended. Keep in mind that animal based protein is usually higher in fat and cholesterol, and often calories- so choose wisely!

For individuals wanting to increase their protein consumption, calculate the amount
of protein your body requires for your weight in kilograms according to your activity level, increase your water intake to prevent dehydration and ingest a well balanced diet for maximum performance during workouts. Remember that a diet sufficient in protein can be attained without the use of supplements.

**High protein foods:**

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving size</th>
<th>Protein (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground beef</td>
<td>3.5oz</td>
<td>24.3</td>
</tr>
<tr>
<td>Top sirloin</td>
<td>3.5oz</td>
<td>27.4</td>
</tr>
<tr>
<td>Skinless chicken breast</td>
<td>3.0oz</td>
<td>25.3</td>
</tr>
<tr>
<td>Roasted turkey breast</td>
<td>3.5oz</td>
<td>19.9</td>
</tr>
<tr>
<td>Salmon, baked</td>
<td>3.5oz</td>
<td>25.5</td>
</tr>
<tr>
<td>Tuna, water packed</td>
<td>3.5oz</td>
<td>29.4</td>
</tr>
<tr>
<td>Skim milk</td>
<td>8oz</td>
<td>8</td>
</tr>
<tr>
<td>Cottage cheese</td>
<td>1c</td>
<td>31</td>
</tr>
<tr>
<td>Peanut butter</td>
<td>2tbsp</td>
<td>8.2</td>
</tr>
<tr>
<td>Almonds</td>
<td>1oz</td>
<td>6</td>
</tr>
<tr>
<td>Oatmeal</td>
<td>1c</td>
<td>6.1</td>
</tr>
<tr>
<td>Cheerios</td>
<td>1 ¼c</td>
<td>4.3</td>
</tr>
<tr>
<td>Whole wheat bread</td>
<td>1 slice</td>
<td>1.2</td>
</tr>
<tr>
<td>Triscuit crackers</td>
<td>3 crackers</td>
<td>1.1</td>
</tr>
<tr>
<td>Banana</td>
<td>Medium</td>
<td>1.2</td>
</tr>
<tr>
<td>Orange</td>
<td>Medium</td>
<td>1.3</td>
</tr>
<tr>
<td>Asparagus</td>
<td>6 spears</td>
<td>2.3</td>
</tr>
<tr>
<td>Broccoli</td>
<td>1/2c</td>
<td>1.3</td>
</tr>
</tbody>
</table>

References:

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