6.4: Protein Recommendations

Learning Objectives

- Identify the RDA and AMDR for protein.
- Describe nitrogen balance.
- Identify foods high in protein.
- Compare and contrast incomplete and complete proteins.
- Describe various vegetarian diets.

How Much Protein Does a Person Need in Their Diet?

The recommendations for protein for different groups are listed in Table 6.1. Nitrogen is one of the basic components of all living cells.

<table>
<thead>
<tr>
<th>Group</th>
<th>RDA (g/kilogram body weight)</th>
<th>AMDR (% calories)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary adults</td>
<td>0.8</td>
<td>10-35</td>
</tr>
<tr>
<td>Athletes</td>
<td>1.2-2.0</td>
<td>10–35</td>
</tr>
</tbody>
</table>

Protein Input = Protein Used by the Body + Protein Excreted

The appropriate amount of protein in a person’s diet is that which maintains a balance between what is taken in and what is used. The RDAs for protein were determined by assessing nitrogen balance. Nitrogen is one of the basic elements of all living cells.
elements contained in all amino acids. When proteins are broken down and amino acids are catabolized, nitrogen is released. Remember that when the liver breaks down amino acids, it produces ammonia, which is rapidly converted to nontoxic, nitrogen-containing urea, which is then transported to the kidneys for excretion. Most nitrogen is lost as urea in the urine, but urea is also excreted in the feces. Proteins are also lost in sweat and as hair and nails grow. The RDA, therefore, is the amount of protein a person should consume in their diet to balance the amount of protein used up and lost from the body. For healthy adults, this amount of protein was determined to be 0.8 grams of protein per kilogram of body weight. You can calculate your exact recommended protein intake per day based on your weight by using the following equation:

\[(\text{Weight in lbs. ÷ 2.2 kg/lb}) \times 0.8 \text{ g/kg}\]

The IOM used data from multiple studies that determined nitrogen balance in people of different age groups to calculate the RDA for protein. A person is said to be in nitrogen balance when the nitrogen input equals the amount of nitrogen used and excreted (Figure \(\PageIndex{1}\)). A person is in negative nitrogen balance when the amount of excreted nitrogen is greater than that consumed, meaning that the body is breaking down more protein to meet its demands. This state of imbalance can occur in people who have certain diseases, such as cancer or muscular dystrophy. Someone who has a low-protein diet may also be in negative nitrogen balance as they are taking in less protein than what they actually need. Positive nitrogen balance occurs when a person excretes less nitrogen than what is taken in by the diet, such as during child growth or pregnancy. At these times the body requires more protein to build new tissues, so more of what gets consumed gets used up and less nitrogen is excreted. A person healing from a severe wound may also be in positive nitrogen balance because protein is being used up to repair tissues.

Figure \(\PageIndex{1}\): Nitrogen Balance

*Normal use of protein*

Nitrogen taken in = Nitrogen excreted

*Higher use of protein*

Nitrogen taken in > Nitrogen excreted

(occurs during pregnancy or high growth periods)

*Body is undersupplied with protein*

Nitrogen taken in < Nitrogen excreted

(occurs during fasting, certain diseases, injuries, and wounds)
Dietary Sources of Protein

The protein food group consists of foods made from meat, seafood, poultry, eggs, soy, beans, peas, nuts and seeds. The overall suggestion is to eat a variety of protein-rich foods to benefit health. Different protein foods provide different nutrients. For example, animal proteins contain Vitamin B₁₂ and plant proteins contain a higher amount of fiber. In addition, recommendations suggest choosing leaner/less fatty cuts of meat.

Protein Quality

While protein is contained in a wide variety of foods, it differs in quality. High-quality protein contains all the essential amino acids in the proportions needed by the human body. The amino acid profile of different foods is therefore one component of protein quality. Foods that contain some of the essential amino acids are called incomplete protein sources, while those that contain all nine essential amino acids are called complete protein sources, or high-quality protein sources. Foods that are complete protein sources include animal foods such as milk, cheese, eggs, fish, poultry, and meat, and a few plant foods, such as soy and quinoa.

Most plant-based foods are deficient in at least one essential amino acid and therefore are incomplete protein sources. For example, grains are usually deficient in the amino acid lysine, and legumes do not contain methionine or tryptophan. Because grains and legumes are not deficient in the same amino acids they can complement each other in a diet. The process of combining two or more incomplete protein sources to make a complete protein is known as mutual supplementation. Some examples of mutual supplementation are provided in Table \(\PageIndex{2}\). Complementary protein sources do not have to be consumed at the same time—as long as they are consumed within the same day, you will meet your protein needs.

<table>
<thead>
<tr>
<th>Foods</th>
<th>Lacking Amino Acids</th>
<th>Complementary Food</th>
<th>Complementary Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legumes</td>
<td>Methionine, tryptophan</td>
<td>Grains, nuts, and seeds</td>
<td>Hummus and whole-wheat pita</td>
</tr>
<tr>
<td>Grains</td>
<td>Lysine, isoleucine, threonine</td>
<td>Legumes</td>
<td>Cornbread and kidney bean chili</td>
</tr>
<tr>
<td>Nuts and seeds</td>
<td>Lysine, isoleucine</td>
<td>Legumes</td>
<td>Stir-fried tofu with cashews</td>
</tr>
</tbody>
</table>

Vegetarian and Vegan Diets

Some people wonder if vegetarians and vegans get enough protein in their diet. There are different types of vegetarian and vegan diets, but some commons forms include:

- Plant-based diet: 50% of protein is obtained from plant foods
- Lacto-ovo vegetarian: all animal products except eggs and dairy are eliminated
- Pescevegetarian: all animal products except fish are eliminated
- Vegan: all animal products are eliminated
People who follow vegetarian or vegan diets can meet their protein requirements with high-quality plant-based protein sources. Those consuming some animal products as part of their vegetarian diet can easily meet their protein requirements by consuming adequate amounts of these foods.

**Key Takeaways**

- The RDA set for protein for adults is 0.8 grams per kilogram of body weight and represents the amount of protein in the diet required to balance the protein that is used up by the body and that is excreted.
- The protein foods group consists of foods made from meat, seafood, poultry, eggs, soy, beans, peas, nuts and seeds.
- Most animal-based proteins are complete protein sources and most plant-based proteins are incomplete protein sources.

**References**