Protein

Every living cell contains protein. You need protein to constantly repair, replace, and make new cells. For example, skin cells only live for about 25 days. Your body has to make a huge number of cells to replace the cells that die (Royston, 2011). Your body also uses protein to manufacture enzymes used in every cell process. However, if the carbohydrates and lipids in your diet do not provide the energy you need, your body will stop using protein for growth and repair and start using it to provide energy instead.

Complete and Incomplete Proteins

Proteins are made of chains of amino acids. Different proteins have different combinations of amino acids in their chains. Your body uses 20 amino acids in various combinations in order to synthesize thousands of types of protein. Your body can manufacture 11 amino acids, but nine amino acids are essential—your body cannot manufacture them so you need to obtain them from food.

The proteins found in foods from animal sources such as beef, poultry, fish, and dairy products are complete proteins because they contain all nine essential amino acids. Proteins found in all plants, except in soy and quinoa (pronounced *keen-wah*), are incomplete proteins—they lack one or more essential amino acids. On their own, they would not provide adequate amounts of amino acids. However, two or more proteins that lack different amino acids are known as *complementary proteins*, and can be eaten together to provide a source of all nine essential amino acids. For example, you can form complete proteins by combining legumes with grains or nuts, or grains or nuts with dairy products. Complementary proteins do not have to be eaten at the same meal to have this effect, but within a few hours of one another. Eating a variety of foods containing protein will help ensure that you obtain all nine essential amino acids.

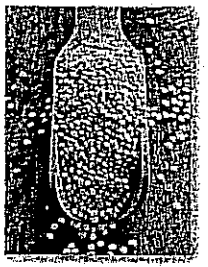

FIGURE 1.21 Soy products and this whole-grain quinoa are excellent sources of complete protein.

Daily Protein Requirement

Health experts recommend that people ages four to 18 consume 10 to 30 percent of their total Calories from protein. Eating two or three servings of meat and alternatives and three or four servings of milk and alternatives every day should provide you with enough protein in your diet. Athletes and those who want to increase muscle mass should consume around 20 grams of protein (for example, two cups of milk, one quarter cup of nuts, one hard-boiled egg) after athletic activity for optimal gain in strength and muscle mass.

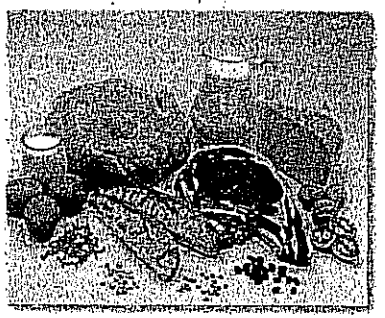

FIGURE 1.22 Each of these foods is an excellent source of protein.

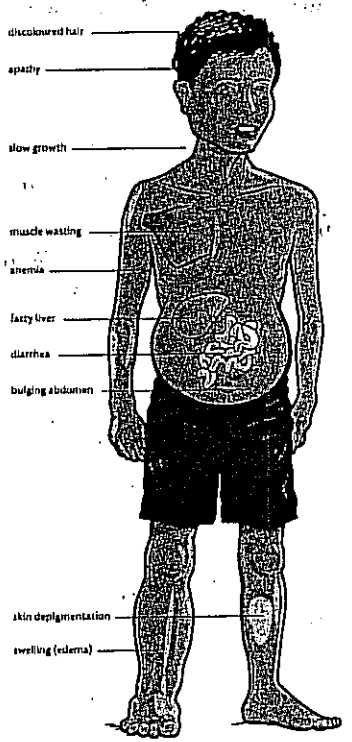

FIGURE 1.23 Kwashiorkor is a form of protein deficiency. Although protein deficiency is uncommon in Canada, what group(s) of Canadians might be at increased risk of developing kwashiorkor?

While some athletes who train heavily consume protein supplements in addition to the protein in the foods they eat, extra protein from protein shakes, powders and supplements does not have the added benefit of providing other essential nutrients and these supplements often costly (Dietitians of Canada, 2012). For people who consume sufficient protein in their diets, additional protein will simply be used as energy or stored as fat. It will not result in additional muscle growth.

Protein Toxicity and Deficiency

Extra protein is not stored in the body like carbohydrates and fats. Instead, some extra protein is converted to glucose or glycogen by the liver and the rest is filtered by the kidneys and excreted. If there is a large amount of extra protein in the diet, the extra work required of the liver and kidneys can lead to tissue damage.

Most Canadians get enough protein in their diet. However, some conditions, such as eating disorders or economic issues, may cause a protein deficiency. Early signs of protein deficiency include muscle weakness and an inability to fight off illness. A severe lack of protein can lead to a disease called *kwashiorkor*. A swollen belly filled with liquid collected below the skin (not fat) is a common symptom of kwashiorkor.

Tip for Healthy Living

Eat a variety of protein-rich foods. If you haven't already, try a soy-based veggie burger, a falafel made with chickpeas, or sprinkling nuts on your breakfast cereal.

THINK CRITICALLY

1. How can you ensure that your diet includes high-quality proteins?
2. Plan a meal that includes appropriate amounts of carbohydrates and lipids, and combines two or more incomplete proteins to make a complete protein.