

# PROTEIN BASICS

Protein is an important component of almost every cell and tissue in the body. Protein is made up of amino acids. There are 20 amino acids with biological significance; however, only nine are essential, meaning that our bodies cannot synthesize them and they must be obtained through food.

## KEY FACTS

- One medium-size 5.3 ounce potato with skin-on provides 3 grams of protein.
- One medium-size 5.3 ounce potato with skin-on provides 3 grams of plant-based protein.
- One medium-size 5.3 ounce potato with skin-on provides 3 grams of high-quality protein with an average biological value (BV) of 90. For comparison the BV for soybean protein is 84 and bean protein is 73.<sup>2</sup>
- The 3 grams of protein in one skin-on 5.3-ounce potato exceeds that of all other commonly consumed vegetables, except dried beans.<sup>1</sup>
- The Dietary Guidelines for Americans recommend eating a variety of plant-based foods to improve overall health.<sup>3</sup>

## PROTEIN QUALITY

- Protein quality is often expressed in terms of its “biological value,” which takes into account the amino acid profile of the protein along with its bioavailability. Egg protein has a biological value of 100 and is considered the reference protein. Potatoes have a relatively high BV of 90 compared with other key plant sources of protein (e.g., soybean with a BV of 84 and beans with a BV of 73).<sup>1,2</sup>
- It is a misconception that plant proteins, like the protein in potatoes, are missing one or more of the essential amino acids. Potato protein provides all 9 essential amino acids, although when compared on a gram per gram basis to egg protein (the reference protein), potato protein has lower amounts of 6 of the essential amino acids including histidine, isoleucine, leucine, methionine, phenylalanine, and threonine.<sup>1</sup>

## FUNCTIONS OF PROTEIN

Proteins play many important roles in the body including:<sup>4</sup>

- Providing structure: Protein is a key component of muscle, tendons, ligaments and connective tissues like collagen. In addition, our skin, hair and nails contain significant amounts of protein.
- Regulating metabolic processes: Enzymes which catalyze chemical reactions, hormones which regulate metabolic processes and cytokines that bind to the surface of cells and influence their functions are all proteins.
- Transporting substances: Transport proteins carry important substances in the body. For example, hemoglobin and myoglobin carry oxygen, albumin carries several vitamins and minerals as well as fatty acids, and transferrin and ferritin carry iron.
- Balancing fluid and electrolytes: Proteins, especially those found in the blood, help regulate fluid balance. Amino acids can be either positively or negatively charged, thus allowing them to help the body achieve acid-base balance and optimal pH.
- Providing energy: Protein provides 4 calories per gram (similar to carbohydrate); however, under normal circumstances protein contributes little to energy production. Under stressful conditions (e.g., severe illness, starvation, diabetic ketoacidosis) protein becomes a more significant source of energy; but, to the detriment of health.

## PROTEIN RECOMMENDATIONS

The current recommended dietary allowance (RDA) for protein is .8 grams per kilogram of body weight and the acceptable macronutrient distribution range (AMDR) is 10%-35% of total daily energy intake from protein. One 5.3-ounce skin-on potato is a source of 3 grams of plant-based protein. Current dietary guidance, including the Dietary Guidelines for Americans, recommends substituting plant-based proteins for some animal-based proteins to improve overall health and support the environment.<sup>3</sup>

## REFERENCES

1. Woolfe JA. *The Potato in the Human Diet*. 1987. Cambridge University Press.
2. McGill CR, Kurlich AC, Davignon J. The role of potatoes and potato components in cardiometabolic health: A review. *Ann Med*. 2013;45(7):467-73.
3. U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015 – 2020 Dietary Guidelines for Americans. 8th Edition. December 2015. Available at <https://health.gov/dietaryguidelines/2015/guidelines/>.
4. Gropper SS, Smith JL, Carr TP. *Advanced Nutrition and Human Metabolism*. 7th ed. 2018. Boston, MA. Cengage Learning.