What's so great about Protein

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Why is it that we associate carbohydrates with energy, equate excess fat with potential cardiac disease and enough protein in the diet with a satisfactory standard of living?

Protein is good for us and necessary for life. Perhaps this is what Herbert Hoover was getting at in 1928 when he promised "a chicken in every pot" (1). We now know there are many good alternative sources of protein, such as soy, in addition to milk, eggs, and meat but the meaning is not lost.

What Do Proteins Do?

The protein we consume has both a structural and a physiological role. It is the source of amino acids which serve as the building blocks for not only the tissues of the body but the various substances and entities that help maintain homeostasis and allow us to thrive physically and emotionally. I am referring to mRNA, DNA, enzymes, antibodies, maintenance of our acid base balance, and growth in general. Our bodies simply would not function without proteins.

Why is protein so important? There are multiple reasons. Proteins created in our bodies carry out numerous functions we need to stay healthy and to even survive. Growth of the tissues of the body such as muscles, tendons, bone, and organs, from the cellular level up requires an adequate supply of protein. Our skeletal system is largely composed of a protein substance called collagen which contributes to ligaments, tendons, muscles, skin, teeth, and nails. (8).

Hormones are for the most part protein substances produced by a cell or a gland in one part of the body that sends out messages that affect cells in other parts of the organism. Hormones have a regulatory function. They are secreted by organs like the pancreas, pituitary gland, parathyroid glands, heart, stomach, liver, and kidneys.

Hormones maintain the body in homeostasis or balance (8). They promote growth and development and mediate responses of the nervous system. Insulin regulates the level of blood glucose and Substance P is a protein which mediates the sensation of pain. When an individual has either too little or too much of a particular hormone it will potentially result in medical problems such as diabetes mellitus.

Proteins contribute to the formation of enzymes which are catalysts for chemical reactions in the body without which we could not survive. Salivary amylase, lipase, and lactase are all proteins which play a significant role with respect to the absorption of nutrients from the food we ingest.

There are 13 blood clotting proteins (coagulation factors) found in the blood. They are designated by Roman Numerals I through XIII. If one factor is missing blood clotting is affected (8).

Antibodies are protein substances which defend our body against viruses and bacteria. If we lack sufficient protein to produce these antibodies our immunologic response is poor and we are more susceptible to disease (8).

Proteins also serve a "contractile" function in the body so that we are able to move about. Actin and myosin are proteins responsible for muscle contraction.

Our ability to maintain proper acid base balance within our body is due to the "buffering effect" of protein (8). The pH of arterial blood should be 7.4. If our bodily fluids become too acidic (low pH) or too basic (high pH) this situation can cause the shape of the proteins to change and they become "denatured" and unable to function normally. The chemical structure of proteins combines an acid, or carboxyl group (COOH) with a base (amine) and this enables proteins to act as an acid or base depending on the medium they are in.

Proteins have a very significant transportation function. Hemoglobin is a protein in the blood that transports oxygen throughout the body and thus enables cells to function normally. A deficiency of hemoglobin results in anemia which causes exercise intolerance and fatigue. Once hemoglobin reaches the muscles it is stored in another protein called myoglobin (8).

How Do Proteins Work?

Proteins are compounds that are made by linking together amino acids into chains-like structures called peptides. One amino acid is joined to a second; a third is then added to the first two and so on. The bonds between amino acids are called peptide bonds. Peptides are then linked together into longer polypeptide chains. An individual protein may have one or many polypeptide chains that form its structure.

The number, sequence, and assortment of combinations of amino acids make it possible to have almost an unlimited number of different protein structures. Two proteins may actually contain the exact same amino acids but have different functions because they are in a different sequence in the peptide chain (7).

Amino acids are different from compounds like glucose in that they contain nitrogen in addition to carbon, hydrogen, and oxygen. There are a total of 20 amino acids. 11 of these are called "non-essential" because the body can produce them in the liver. The other 9 are "essential amino acids" because we must get them from the food and supplements we eat. This makes them more critical. A "complete protein" source is one that contains all the essential and non-essential amino acids. Casein, whey, and soy are all complete protein sources.

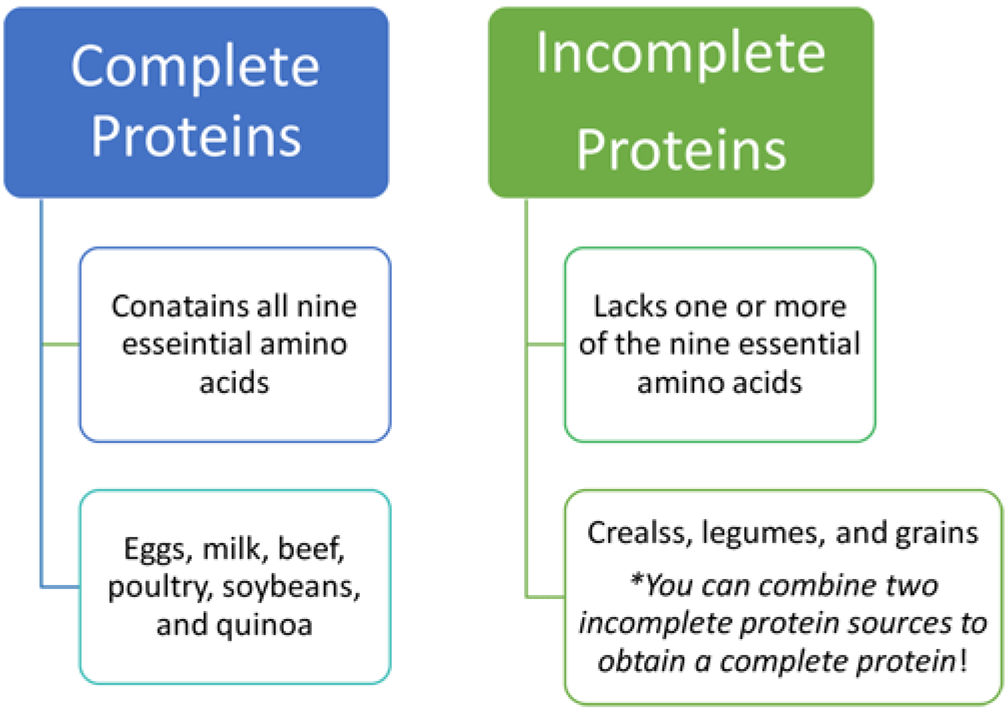
Essential Amino Acids	Non-essential Amino Acids
✔ Histidine	✔ Alanine
✔ Isoleucine	✔ Arginine
✔ Leucine	✔ Aspartic acid
✔ Lysine	✔ Cysteine
✔ Methionine	✔ Glutamic acid
✔ Phenylalanine	✔ Glutamine
✔ Threonine	✔ Glycine
✔ Tryptophan	✔ Proline
✔ Valine	✔ Serine
	✔ Tyrosine

A *Complete protein* is one that contains all nine essential amino acids in a quantity that is sufficient to support growth and maintenance of our bodies. Eggs, milk, beef, and poultry are all examples of complete proteins. Soybeans and quinoa (9) are two plant sources of complete protein. There are more.

Incomplete proteins lack one or more of the nine essential amino acids. Cereals, legumes, and grains are examples of incomplete proteins. It is possible to combine food from two incomplete protein sources to obtain a complete protein.   It is for this reason that vegetarians are able to get complete protein in their diet.

What Does Protein Malnutrition Cause?

Individuals in underdeveloped countries that do not have an adequate protein supply for their populations have diseases such as marasmus and kwashiorkor. Signs and symptoms of protein deficiency are many. They may include hair loss, lethargy and weakness, skin rashes, weight loss, trouble falling asleep, delayed wound healing, infections, muscle cramps, brittle nails, ridges in finger and toe nails, skin ulcers, headache, nausea, edema (water retention in legs, feet, hands, etc.), mood swings, depression, growth retardation, and anxiety(2). This disease clearly demonstrates that deficiency of proteins leads to extensive impairment of critical biological functions.



How Much Protein Do I need?

The Recommended Dietary Allowance (RDA) for protein is 0.8 g/kg/ (or 2.2 lbs.) (3). This works out to approximately 58 to 63 grams per day for an average adult male. Dietary protein is crucial for development and recovery of bone and muscle. This is why you see so much of it for sale at gyms. Some research has recommended that athletes participating in endurance or strength training use a figure of 1.2 to 1.7 g/kg (4)., and many geriatricians suggest that increasing dietary protein above the current (RDA) may help maintain bone and muscle mass in older individuals (5, 6).

From what we have learned above it is easy to see why quality protein supplementation is an important step in the formulation of multiple products, from snacks, and muscle recovery products to meal replacements. The positive effects that protein provides with regard to satiety, muscle recovery and growth, and health in general cannot be overestimated.

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