

Protein

Brain cells, muscle, skin, hair and nails are just some of the body parts that are protein-based. Estimates suggest that about half of the human body's dry weight is made up of protein. Many of the foods we eat contain protein, particularly flesh foods (chicken, beef, lamb and fish) and legumes like beans and lentils. These proteins are digested to release amino acids. In the body the amino acids are used to make new proteins, converted into hormones such as adrenalin or used as an energy source.

How much protein you need

The amount of protein you need in your diet depends on your weight, age and health. As a rough guide, the recommended dietary intake (RDI) for protein (measured in grams per kilogram of bodyweight) is:

- 0.75g/kg for adult women
- 0.84g/kg for adult men
- Around 1g/kg for pregnant and breastfeeding women, and for men and women over 70 years.

So, for example, a 75kg adult male would need 63g of protein per day.

The needs of children and adolescents also vary according to their age and weight. A full list of recommendations for dietary protein is available from the Australian Nutrient Reference Values (NRVs) website.

Most Australians eat far more protein than they actually need, so deficiencies are rare.

Sources of protein

Some sources of dietary protein include:

- Meat, poultry and fish
- Eggs
- Dairy products
- Seeds and nuts
- Beans and lentils
- Soy products
- Grains, especially wheat and less so rice, barley and corn.

Amino acids explained

Proteins are made up of chains of smaller chemicals called amino acids. There are about 20 different amino acids that, in different combinations, make up the countless millions of proteins available in nature.

A protein can consist of between 50 and tens of thousands of amino acids, linked together by a kind of 'glue' called a peptide bond. There are two broad classes of amino acid: those that can be made by the human body (non-essential amino acids) and those that can only be supplied by food (essential amino acids).

Nutritional value explained

A protein's nutritional value is judged by how many of the essential amino acids it provides and in what quantity. Different foods contain different numbers and amounts of amino acids. Generally speaking:

- Animal products (such as chicken, beef or fish) contain all of the essential amino acids.
- Plant proteins usually lack at least one amino acid. Exceptions to this are soy products and the seed of a leafy green called Amaranth (consumed in Asia and the Mediterranean).

Strict vegetarians can solve this dietary problem by eating a combination of plant foods. For example, a meal containing cereals and legumes provides all the essential amino acids found in a typical meat dish.

Digestion of proteins

A protein-rich food, such as meat, is broken down into individual proteins by the gastric juices in the stomach. Pancreatic enzymes released into the first portion of the small intestine (duodenum) split the proteins into their separate amino acids. The amino acids are absorbed by the small finger-like projections (villi) lining the intestine walls, and taken to the liver via the bloodstream.

How amino acids are used

The human body uses amino acids in three main ways:

- **Protein synthesis** - new proteins are created constantly. For example, as old, dead cells are sloughed off the skin surface, new ones are pushed up to replace them.
- **Precursors of other compounds** - a range of substances are created using amino acids: for example, the brain chemical (neurotransmitter) serotonin and the 'fight or flight' chemical adrenalin.
- **Energy** - although carbohydrates are the body's preferred fuel source, about 10 per cent of energy is derived from protein.

The toxic byproduct ammonia is excreted

One of the byproducts of protein metabolism is ammonia. In high levels, ammonia is extremely dangerous to the body, so it is converted into urea. This water soluble chemical is collected by the kidneys and eliminated from the body via urine.

Amount of protein needed each day

Some people - such as growing children, pregnant women and breastfeeding mothers - need slightly more protein than the recommended daily allowance (RDA). However, most Australians consume more than enough dietary protein, so deficiencies are rare.

For elderly people, it is likely that protein intake at the upper end of the RDA range is desirable to maintain muscle mass and strength, which is a crucial component of walking ability.

Strenuous exercise doesn't mean you need extra protein

Contrary to popular belief, people who exercise vigorously or are trying to put on muscle mass don't need to consume extra protein. Studies show that weight-trainers who don't eat extra protein (either in food or protein powders) still gain muscle at the same rate as weight-trainers who supplement their diets with protein. A very high protein diet can strain the kidneys and liver, and prompt excessive loss of the mineral calcium.

Symptoms of protein deficiency

The human body can't store protein, so it must be supplied on a daily basis from the foods we eat. Strict vegetarians who don't consume any animal products at all are at increased risk of protein deficiency if they don't eat a wide range of complementary plant proteins. Symptoms of protein deficiency include:

- Wasting and shrinkage of muscle tissue
- Oedema (build-up of fluids, particularly in the feet and ankles)

- Anaemia (the blood's inability to deliver sufficient oxygen to the cells, usually caused by dietary deficiencies such as lack of iron)
- Slow growth (in children).

Very high protein diets are dangerous

Some weight-trainers and bodybuilders believe that high protein diets lead to increased muscle mass. This isn't true - it is stimulation of muscle tissue through exercise, not extra dietary protein that leads to muscle growth. Fad diets that favour very high protein and fat intake, combined with very low carbohydrate intake, may be harmful. The drawbacks of very high protein diets include:

- Very high protein diets usually advocate very low intake of carbohydrates. Glucose, made when the body breaks down dietary carbohydrate, is the body's preferred fuel source. If the body doesn't receive enough dietary carbohydrate, it will break down muscle tissue to make glucose. This causes muscle wastage, reduced metabolism and a build-up of ketones (byproducts of protein metabolism).
- Low fibre intakes can result in constipation, bowel disorders and increased risk of colon cancer.
- There is evidence to suggest that the heart may not function as well if its main source of fuel is ketones.
- High intake of animal products (which is usually recommended in such diets) can also be high in saturated fats and cholesterol, which is associated with a range of conditions including heart disease.
- The liver and kidneys are put under strain because they have to detoxify and eliminate unusually high quantities of protein by products. Kidney problems may be exacerbated in people with diabetes.
- There is an increased risk of developing gout and gall bladder colic.
- Greater losses of body calcium may increase the risk of osteoporosis.
- Increased risk of dehydration puts the body under pressure.
- Recent research shows that weight loss over one year is not greater on a high protein diet when compared to safer low fat eating patterns.

Where to get help

- Your doctor
- An accredited practising dietitian, contact the Dietitians Association of Australia

Things to remember

- Proteins are made up of chains of smaller chemicals called amino acids.
- The human body can't store amino acids, so it must be supplied daily from the foods we eat.
- Very high protein diets combined with very low carbohydrate intakes are not recommended.

This page has been produced in consultation with, and approved by:

Deakin University - School of Exercise and Nutrition Sciences

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