
Protein

Summary

- Proteins are made up of chains of smaller chemicals called amino acids.
 - The human body cannot 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.
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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 broken down during digestion to release amino acids, which are the building blocks of all proteins. Once inside the body, these amino acids are used to make new proteins including enzymes and hormones such as adrenalin. Proteins are sometimes also used as an energy source.

Your protein needs

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:

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

For example, a 75 kg adult male would need 63 g of protein per day. It is recommended that 15 to 25 per cent of total energy intake per day is from protein sources. The human body can't store protein and will excrete any excess. Therefore, the most effective way of using the daily protein requirement is to eat small amounts at every meal. Using the example of the 75 kg male above, this would require that he eats approximately 21 g of protein at three meals each 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:

- lean meat, poultry and fish
- eggs
- dairy products like milk, yoghurt and cheese
- seeds and nuts
- beans and legumes (such as lentils and chickpeas)
- soy products like tofu
- some grain and cereal-based products are also sources of protein, but are generally not as high in protein as meat and meat alternative products.

The Australian Dietary Guidelines recommend particular serves per day from the lean meat and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans food category, including:

- men aged 19-50 years = 3 serves
 - men aged 51 years and over = 2 ½ serves
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- women aged 19-50 years = 2½ serves
- women aged 51 years and over = 2 serves
- pregnant women = 3 ½ serves
- breastfeeding women = 2 ½ serves.

A standard serving size is one of:

- 65 g cooked lean meats such as beef, lamb, veal, pork, goat or kangaroo (about 90-100 g raw)
- 80 g cooked lean poultry such as chicken or turkey (100 g raw)
- 100 g cooked fish fillet (about 115 g raw weight) or one small can of fish
- 2 large eggs
- 1 cup (150 g) cooked dried beans, lentils, chickpeas, split peas or canned beans (preferably with no added salt)
- 170 g tofu
- 30 g nuts, seeds, peanut or almond butter or tahini or other nut or seed paste (no added salt).

The daily recommendations for adults for foods from the milk, yoghurt, cheese and/or alternatives (mostly reduced fat) group are:

- men aged 19-70 years = 2 ½ serves
- men aged 70 years and over = 3 ½ serves
- women aged 19-50 years = 2 ½ serves
- women aged 51 years and over = 4 serves.

A serve could include either:

- 250 ml (1 cup) fresh, UHT long life, reconstituted powdered milk or buttermilk
- 120 ml (1/2 cup) evaporated milk
- 200 g (3/4 cup or 1 small carton) yoghurt
- 40 g (2 slices) hard cheese such as cheddar
- 120 g (1/2 cup) ricotta cheese.

Amino acids explained

Proteins are made up of chains of smaller building blocks called amino acids, which are chemically linked to each other. There are about 20 different amino acids that can be put together in different combinations to make up the millions of proteins found in nature. A protein can consist of between 50 and tens of thousands of amino acids.

The two broad classes of amino acids are those that can be made by the human body (non-essential amino acids) and those that must be supplied to us through our diet (essential amino acids).

Nutritional value of protein

The nutritional value of a protein is measured by the quantity of essential amino acids that it provides.

Different foods contain different amounts of amino acids. Generally:

- Animal products (such as chicken, beef or fish) contain all of the essential amino acids.
- Soy products, quinoa and the seed of a leafy green called Amaranth (consumed in Asia and the Mediterranean) also contain all of the essential amino acids. However, plant proteins usually lack at least one amino acid.

People following a strict vegetarian or vegan diet need to choose a variety of protein sources from a combination of plant foods throughout the day to get an adequate mix of amino acids. For example, a meal containing cereals and legumes, such as baked beans on toast, 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 your stomach. Pancreatic enzymes released into the first portion of your 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 are taken to the liver via the bloodstream.

How amino acids are used

The three main ways that the human body uses amino acids include:

- **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 obtained from protein.

Ammonia – a toxic byproduct of protein

One of the byproducts of protein metabolism is ammonia. In high levels, ammonia is extremely dangerous to the body and so is converted into urea. This water-soluble chemical is collected by the kidneys and eliminated from the body in our urine. The more protein we eat each day, in excess of our needs, the more work our kidneys must do to get rid of the ammonia.

Maintaining muscle mass

Beginning at approximately 50 years of age, humans begin to gradually lose skeletal muscle. This loss is known as sarcopenia, is common in the elderly, but is also worsened by chronic illness, poor diet or inactivity. It is likely that protein intake at the upper end of the RDI range can help maintain muscle mass and strength, which is vital for walking ability and reducing the risk of injury in older people from falls.

It is also important for older people to eat protein 'effectively', which means to consume high-quality protein foods, such as lean meats.

Strenuous exercise and protein needs

Contrary to popular belief, people who exercise vigorously or are trying to put on muscle mass do **not** need to consume extra protein. Studies show that weight-trainers who do not 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.

Timing of protein consumption

Soon after exercising (either resistance or aerobic), it is recommended that you consume a high-quality protein source (such as a glass of milk or tub of yoghurt) combined with a carbohydrate meal to help maintain your body's protein balance. Studies have shown this to be beneficial, even when following low to moderate aerobic exercise (such as walking), particularly for older adults.

Symptoms of protein deficiency

As stated above, protein deficiencies in Australia are not common, but may occur in people with special requirements, such as older people. In particular, people following strict vegetarian or vegan diets must make sure that they eat a wide range of plant proteins every day.

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. High protein diets promote intakes of protein of between 200 and 400 g per day, which equates to approximately 5 g/kg each day (more than five times the RDI). This belief is false. It is the stimulation of muscle tissue through exercise, not

extra dietary protein, which leads to muscle growth.

The RDI for protein provides adequate protein to build and repair muscles, even for body builders and athletes. Fad diets that favour very high protein and fat intake, combined with very low carbohydrate intake, may be harmful.

Some of the problems with very high-protein diets (more than 35 per cent of total daily intake) include that:

- They usually promote a very low intake of carbohydrates. Glucose, made when your body breaks down dietary carbohydrate, is your body's preferred fuel source. If your body does not 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.
- Fibre is largely a carbohydrate. Foods rich in carbohydrates (such as wholegrains and legumes) are also rich in fibre. Avoiding these foods leads to an overall low-fibre intake, which 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 byproducts. 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.
- High-protein diets can cause mild dehydration due to increased water loss through urine. 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
- Dietitians Association of Australia Tel. 1800 812 942

Things to remember

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

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