HEALTH BASICS

Amino acids

Amino acids are small molecules your body uses to build proteins and perform other essential tasks.

WHAT IT IS
Building blocks your body uses to make proteins

WHERE IT COMES UP
Nutrition, food labels, supplements, newborn screening, and blood tests

WHY IT MATTERS
Supports tissues, enzymes, hormones, and other vital molecules

WHAT IT IS NOT
Not a disease or diagnosis

WHO TO ASK
Primary care clinician, dietitian, or metabolic specialist

HOW IT IS CHECKED
Blood or urine amino acid testing when clinically indicated

Overview

Amino acids are small molecules used throughout your body. Their best-known role is joining together to form proteins. Proteins help make muscles, skin, organs, blood components, enzymes, antibodies, and some hormones.

Amino acids are not a disease or a diagnosis. You may come across them on a supplement label, in nutrition advice, or as part of a blood, urine, or newborn screening test.

The human body uses 20 main amino acids to make proteins. Nine are called essential amino acids because your body cannot make enough of them. They must come from food. These are histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.

Your body can usually make the other amino acids. Some may become conditionally essential during certain illnesses, injuries, or stages of growth. This means the body's needs may temporarily be greater than its ability to make them.

How it works

When you eat protein, digestion breaks it into amino acids and short chains called peptides. These are absorbed through the small intestine and carried in the blood.

Your cells use amino acids to build new proteins. The order of amino acids in each protein is controlled by genetic instructions. Even a small change in that order can affect how a protein works.

The body does not store extra amino acids in the same way that it stores fat. Amino acids are constantly entering and leaving a shared supply sometimes called the amino acid pool . They come from food, from normal protein breakdown, and from the body making certain amino acids.

When an amino acid is not needed for protein production, its nitrogen-containing part can be removed. Much of this nitrogen is converted into urea in the liver. Urea then travels through the blood to the kidneys and leaves the body in urine. The remaining part of the amino acid may be used for energy or converted into other molecules.

Amino acids also have jobs beyond making proteins. For example, they help the body produce chemical messengers used by the brain and nerves. They contribute to substances involved in immune function, energy use, and the transport of nitrogen.

Why it matters for your health

You need both enough protein and an appropriate range of essential amino acids. Most people can meet these needs through a varied diet.

Meat, fish, eggs, and dairy products contain all nine essential amino acids in useful proportions. Soy foods also provide all nine. Plant foods such as beans, lentils, peas, nuts, seeds, and grains provide protein but differ in their amino acid balance.

You do not usually need to combine specific plant proteins at every meal. Eating a range of foods across the day can provide the essential amino acids your body needs. People who avoid many food groups may benefit from advice from a registered dietitian.

A standard food label usually lists total protein rather than each individual amino acid. A product marketed as an amino acid or branched-chain amino acid supplement may list specific amounts.

Protein needs are influenced by factors such as age, body size, pregnancy, activity, illness, recovery from injury, and kidney or liver function. A higher intake is not automatically better. Medical conditions can change both protein needs and how the body processes amino acids.

What can go wrong

Rare inherited conditions can affect how particular amino acids are broken down or used. These conditions are diseases; amino acids themselves are not.

Examples include:

Many health systems include some of these conditions in newborn screening. The conditions tested for differ by location. A screening result does not confirm a diagnosis. Further blood, urine, or genetic testing may be needed.

Liver disease can interfere with amino acid processing and urea production. Kidney disease can affect how protein waste products are removed. This does not mean everyone with liver or kidney disease must avoid protein. Nutrition plans should be matched to the specific condition.

An unusual blood amino acid result can also be influenced by recent food intake, fasting, illness, medicines, supplements, or how the sample was collected and handled. A single value may not explain the cause.

Amino acid supplements are not automatically harmless because amino acids occur naturally in food. Concentrated products may provide much larger amounts than a normal meal. Evidence for benefits differs by product and purpose. Branched-chain amino acid supplements, for example, have not consistently been shown to improve performance when a person already gets enough high-quality protein.

An abnormal screening or test result usually needs prompt routine follow-up with the service that ordered it, especially for a newborn. It is not necessarily an emergency by itself.

Seek urgent medical help if a baby or person with a known or suspected metabolic disorder develops repeated vomiting, marked sleepiness, confusion, seizures, trouble breathing, or becomes difficult to wake. These signs can have many causes, but they need rapid assessment.

- Phenylketonuria , or PKU, which affects the processing of phenylalanine
- Maple syrup urine disease , which affects branched-chain amino acids
- Homocystinuria , which can involve the pathway that processes methionine
- Tyrosinemia , which affects the breakdown of tyrosine

What you can do

Most people do not need to count individual amino acids or have amino acid testing. A varied diet containing suitable protein sources is usually the practical focus.

If you are looking at a laboratory result, ask:

Keep a list of supplements you use, including powders and sports products. Record the brand, serving size, and how often you take them. Share this information with your healthcare team before testing or if you have kidney disease, liver disease, or an inherited metabolic condition.

Do not start a low-protein or amino-acid-restricted diet based only on an internet search or an isolated result. Restricting an essential amino acid without a medical reason can make nutrition inadequate. Treatment diets for inherited metabolic disorders often use specialist foods and careful monitoring.

If your newborn has an out-of-range screening result, respond promptly to the screening service or child health team. Attend the recommended confirmatory testing even if your baby appears well.

If you have no symptoms, no relevant diagnosis, and no abnormal test result, there is usually nothing specific you need to do about individual amino acids.

- Which amino acid was measured and why
- Whether the test required fasting
- How illness, medicines, or supplements may affect the result
- Whether the result needs repeating or confirming
- Whether referral to a metabolic specialist or dietitian is appropriate

Common questions

Are amino acids the same as protein?

No. Amino acids are the smaller units that join together to make proteins. Digestion breaks food proteins back into amino acids and short peptides so the body can absorb and reuse them.

What does "complete protein" mean?

A complete protein provides all nine essential amino acids in suitable proportions. Many animal foods and soy are complete proteins. A varied plant-based diet can also meet amino acid needs without every food or meal being complete.

What are branched-chain amino acids?

Leucine, isoleucine, and valine are branched-chain amino acids, often shortened to BCAAs. They are essential amino acids found naturally in protein-rich foods. Supplements are marketed for exercise and muscle recovery, but they are not a substitute for adequate food,

training, or overall protein intake.

Can a blood test show whether I need more protein?

Not by itself. Plasma amino acid testing is mainly used when a clinician suspects a metabolic disorder or needs to investigate a specific medical problem. It is not a routine test of diet quality or general protein status.

Are amino acid supplements necessary on a vegetarian or vegan diet?

Usually not if the diet provides enough energy, protein, and variety. Beans, lentils, soy foods, grains, nuts, and seeds can contribute different amino acids. A dietitian can help if your food choices are highly restricted or your nutritional needs are increased.

Can amino acids on a newborn screen diagnose a condition?

No. Newborn screening identifies babies who may need more testing. An out-of-range result can have several explanations. Confirmatory tests and specialist assessment determine whether a condition is present.

Sources

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