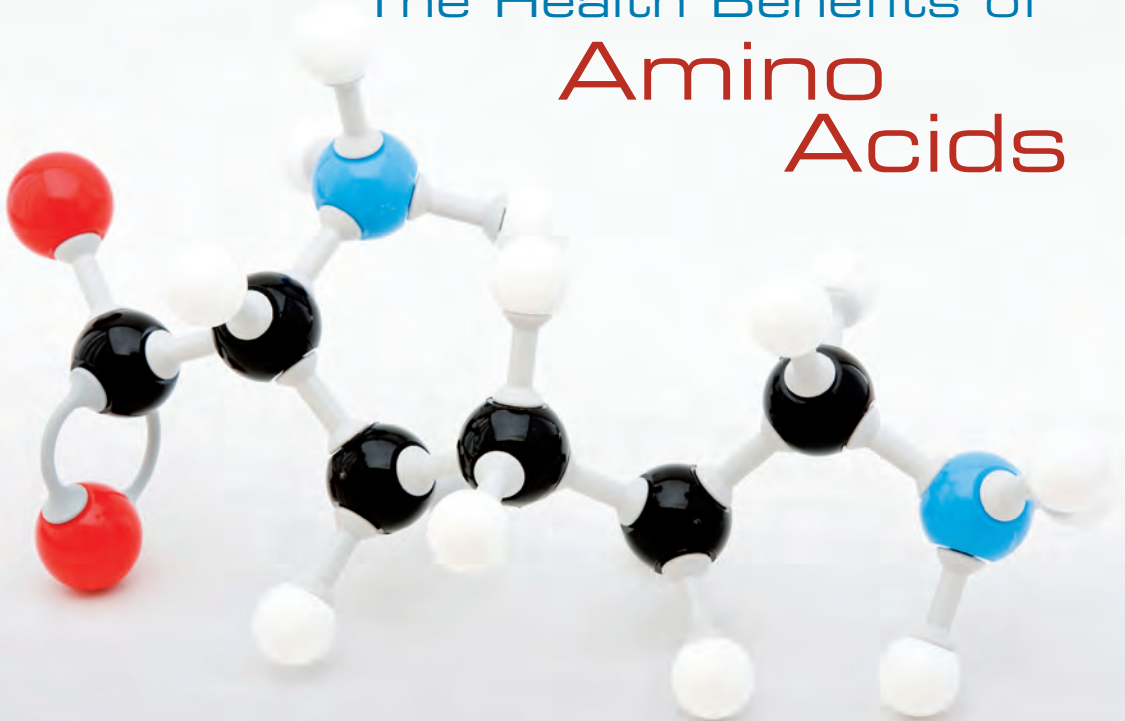


Amino Acids



NOW® Guide to Amino Acids

The Health Benefits of Amino Acids



Amino Acids

Amino acids are the foundation for all life on Earth. As the molecular building blocks of proteins, they're necessary for many essential life functions. Comprised primarily of carbon, hydrogen, nitrogen and oxygen, amino acids assemble in various sequences to create different proteins. In addition to their essentiality in the assembly of proteins for both collagen and muscle tissue, amino acids play an integral role in a wide range of bodily functions. They're required for the production of certain neurotransmitters, as well as enzymes for the digestion of foods and many other biochemical processes including tissue repair, detoxification, the production of genetic material and hormones, and much, much more. Amino acids and the proteins they comprise account for approximately 75% of the human body's dry weight.

Despite the almost infinite number of variations possible, and the more than 500 classified amino

acids, all organisms on Earth rely on the same 20 amino acids for life. All amino acids begin with a "backbone" consisting of a central carbon atom (C), an amine group (-NH₂), a carboxyl group (-COOH), and a hydrogen atom. Any subsequent atoms or groups are called side chains, or R groups. These side chains determine the individual identity of each amino acid. Single amino acids are then linked into peptides and assembled into various structures to form proteins.

There are actually 22 common amino acids that are incorporated into proteins, but only 20 of these are encoded by the universal genetic code. The other two (selenocysteine and pyrrolysine) are only incorporated into proteins via unique mechanisms. These 20 amino acids are grouped into three categories – essential, non-essential, and conditionally essential.



Essential Amino Acids

Essential amino acids are those that the human body cannot produce (synthesize) on its own; they're always obtained from the diet without exception.

There are nine essential amino acids. An RDA of 4,993 mg (about 5 grams) per day of essential amino acids was established by the National Academy of Sciences for adults 19 and

older; competitive athletes and individuals involved in resistance training may double these amounts.

L-Histidine – Histidine is important for tissue growth and repair; the maintenance of the myelin sheath that protects nerve cells, elimination of heavy metals, the production of red and white blood cells, and the production of histamine, which is important for immune system responses and the regulation of GI functions.*

L-Isoleucine – One of the three branched-chain amino acids (BCAAs; discussed later), isoleucine is necessary for the maintenance of energy and blood sugar levels, and the production of hemoglobin.* Like many amino acids, isoleucine is popular with fitness enthusiasts due to its roles in tissue healing and energy production.*

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L-Leucine – Another of the three branched-chain amino acids (BCAAs), leucine supports muscle growth and the repair of bone, skin, and muscle tissues.* Leucine is also involved in growth hormone production.*

L-Lysine – One of the more important amino acids, lysine is an integral component of all proteins. It's necessary for the maintenance of proper nitrogen balance, making it very popular with fitness enthusiasts.* Lysine aids calcium absorption and is involved in the production of several important physiological components, including antibodies, hormones, and enzymes.*

L-Methionine – This essential sulfur-containing amino acid is important for detoxification in the liver.* Methionine is necessary for the production of creatine, choline, and free radical scavengers.*

It's also a precursor of SAME (S-adenosylmethionine).*

L-Phenylalanine – Among its other functions in the body, phenylalanine is primarily used to create tyrosine, another amino acid that's necessary for the production of two important neurotransmitters, dopamine and norepinephrine.* Via this role, phenylalanine is widely involved in the function of the central nervous system.*

L-Threonine – Threonine is a precursor of the amino acids serine and glycine and plays an important role in the maintenance of proper protein balance and the production of structural proteins like collagen and elastin.* The immune system uses threonine to produce antibodies.*



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Essential Amino Acids (continued)

L-Tryptophan – Many people know tryptophan as the chemical in turkey that's often blamed for Thanksgiving dinner sleepiness (the real culprit is typically overeating). Tryptophan is used by the brain to create serotonin, a neurotransmitter responsible for relaxation and a precursor of the hormone melatonin that is necessary for healthy, normal sleep.* This essential amino acid is also involved in a wide array of bodily processes including protein synthesis.*



L-Valine – As the third branched-chain amino acid (along with isoleucine and leucine), valine is necessary for tissue healing, nitrogen balance, and the proper metabolism of muscle tissue.*

Non-Essential Amino Acids

Non-essential amino acids can be assembled (synthesized) by the human body from materials existing in the body and do not need to be obtained from the diet. There are four non-essential amino acids.

L-Alanine – This amino acid helps the body to convert glucose into energy, while promoting the elimination of toxins from the liver.* Alanine may also support prostate health.*

L-Asparagine – Asparagine has the unique distinction of being the first amino acid isolated by researchers from, you guessed it, asparagus. This amino acid exerts a balancing effect on the central nervous system and is important for healthy liver function.*

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L-Aspartic Acid – This non-essential amino acid plays a vital role in a number of body processes.* It aids in the removal of excess ammonia and supports stamina, both of which are important for active individuals.* Aspartic acid is involved in the production of inositol, nucleotides such as ribonucleic acid (RNA) and deoxyribonucleic acid (DNA), and nucleosides such as ATP (adenosine triphosphate).* It also functions as a neurotransmitter.*

L-Glutamic Acid – Glutamic acid detoxifies ammonia by robbing it of nitrogen atoms, in the process creating the amino acid glutamine.* Glutamine is found abundantly in blood and plays a major role in the metabolism of carbohydrates.* Glutamic acid is classified as an excitatory neurotransmitter because it increases neuron activity in the brain and central nervous system.*



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Conditionally Essential Amino Acids

Normally the body is capable of producing conditionally essential amino acids and doesn't need to obtain them from the diet. However, in certain stressful situations such as illness or injury, the body requires higher levels of these conditionally essential amino acids and needs to obtain them from the diet. These amino acids are also referred to as conditionally non-essential amino acids. There are seven conditionally essential amino acids.



L-Arginine – This amino acid is important for healthy immune system function and liver detoxification.* Arginine is a precursor to nitric oxide (NO), a molecule that expands blood vessels.* NO is an important component of the endothelium, which is the layer of cells that lines the interior of blood vessels. Arginine is heavily involved in muscle metabolism through its role in the maintenance of proper nitrogen balance and is found in the skin and connective tissues, where it aids normal healing and repair.*

L-Cysteine – This sulfur-containing amino acid is necessary for the production of glutathione, a powerful defender against oxidative damage that is also involved in detoxification processes.* Cysteine is necessary for collagen production and helps regulate skin texture and elasticity.*

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L-Glutamine – Also referred to as “brain fuel,” glutamine readily crosses the blood-brain barrier where it can be used as an alternative energy source.* It’s involved in the maintenance of healthy body pH and is the most abundant amino acid in muscle tissue, making it a popular and important addition to the fitness regimen of active individuals.*

L-Tyrosine – Tyrosine is important for a healthy mood due to its role as a precursor of the neurotransmitters dopamine and norepinephrine.* It’s also a component of thyroid hormones and supports healthy thyroid function.*

Glycine – Glycine is a major part of the amino acid pool and is used to make other non-essential amino acids.* Glycine is readily converted into creatine and

is necessary for the production of glutathione and hemoglobin.* It’s also important for central nervous system functions.*

L-Proline – Proline plays a vital role in the health of the skin, blood vessels and other connective tissues, as well as the heart muscle.* It’s especially important for healing.*

L-Serine – Serine is found in brain proteins and the protective myelin sheath around nerve cells.* It assists in the metabolism of fatty acids and lipids and is necessary for healthy immune system function.*

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Branched-Chain Amino Acids

The essential amino acids leucine, isoleucine and valine collectively are referred to as the branched-chain amino acids, or BCAAs. This amino acid group accounts for approximately 35% of the essential amino acids in muscle proteins and 40% of what is required from a healthy diet. They're critical for muscle protein synthesis and support normal muscle repair processes. *These amino acids are covered in the "Essential Amino Acids" section.

Free-Form Amino Acids

Free-form amino acids refer to single amino acids that are already in a pre-digested form and ready to be used by the body. Some nutritional products, especially amino acid blends, contain whole proteins and large peptides (chains of amino acids), which the body must break down into smaller peptides and individual amino acids before use. For faster utilization and superior biological activity look for single, free-form amino acids.

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Other Amino Acids of Nutritional Value

As mentioned earlier, there are more than 500 classified amino acids in addition to the essential, non-essential, and conditionally essential amino acids. While they may not be “essential” from a classification standpoint, many are vitally important for health and well-being.

5-HTP – 5-hydroxy-tryptophan (5-HTP) is a naturally occurring amino acid that's a necessary intermediate in the biosynthesis of serotonin and melatonin from tryptophan. Because of its role in the synthesis of neurotransmitters, 5-HTP helps to support a positive mood.*

L-Ornithine – Together with arginine and acetyl-L-carnitine, ornithine helps regulate body composition through its role in the production of growth hormone.* It supports a healthy immune system and,

like many amino acids, aids in normal tissue repair and healing.* Ornithine is important for maintaining arginine levels, and therefore, for NO production.*



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Other Amino Acids of Nutritional Value (continued)

L-Citrulline – Citrulline aids in the detoxification of ammonia. Citrulline is also involved in immune system function and energy production.*

L-Carnitine – Carnitine is actually more closely related to the family of B vitamins than amino acids, but because its structure is closer to that of amino acids it's categorized as such. Carnitine is popular with fitness enthusiasts and helps maintain lean body mass due to its role in transporting fatty acids into cellular mitochondria for energy production, a primary source of energy for resting muscles.*

Acetyl-L-Carnitine – Acetyl-L-carnitine is a derivative of carnitine that plays a role in the metabolism of fats.* It's important for the health of the central nervous system, supports acetylcholine production, and defends against oxidative damage.*

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L-Carnosine – Composed of the amino acids alanine and histidine, carnosine is known to possess free radical-scavenging capabilities and may act as a neurotransmitter.*

N-Acetyl-Cysteine (NAC) – A more stable version of the amino acid cysteine, NAC is vitally important for the body's rapid replenishment of the cellular free radical scavenger glutathione.* It's important for active individuals since it protects tissues from exercise-induced oxidative stress.*

Gamma-Aminobutyric Acid (GABA) – GABA (gamma-aminobutyric acid) is a non-protein amino acid that functions as a neurotransmitter in the human brain.* GABA is naturally produced in the body and its presence within the central nervous

system may help promote relaxation and ease nervous tension.*

Glutathione – As with carnosine, glutathione is technically not an amino acid. Glutathione is a tripeptide produced by the body from cysteine, glycine and glutamic acid. Glutathione is one of the body's most powerful free radical neutralizers and is the only one that can be recycled for further use.*

GPLC (Glycine Propionyl L-Carnitine) – This specialized nutritional ingredient combines a form of the amino acid carnitine with the amino acid glycine. It promotes nitric oxide (NO) production and enhances blood flow.* GPLC is especially effective for the support of healthy cardiovascular function.*

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Other Amino Acids of Nutritional Value *(continued)*

S-Adenosylmethionine (SAmE) – SAmE (pronounced Sammy) is a naturally occurring compound that's a critical component of many biochemical reactions such as detoxification, creation of the active coenzyme forms of vitamins, maintenance of normal mood, and joint health.*



L-Theanine – Theanine is a stress-busting amino acid found in green tea that promotes relaxation without drowsiness and supports healthy cognitive function.*

It also supports healthy cardiovascular function through its relaxing effect.*

Taurine – Taurine is technically classified as a sulfonic acid but is widely considered an amino acid. It's necessary for structural, cardiovascular, and nervous system health and is a major component of bile.* Taurine is widely distributed throughout the human body.

Beta-Alanine – Unlike most amino acids, beta-alanine is not used for the synthesis of proteins and enzymes. It's popular with fitness enthusiasts due to its role as a precursor of the peptide carnosine, which is believed to delay fatigue and support the effects of muscle-building exercises.*

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The Industry's Leading Amino Acid Brand

NOW® is the clear #1 brand in the amino acid category (SPINSscan Natural data 2018). We carry a comprehensive variety of amino acid supplements in capsule, vegetable capsule, tablet, liquid and powder forms for your convenience. NOW uses only the natural "L" form of amino acids and no "D" or "DL" synthetic forms. Aside from some of our combination amino acid supplements, NOW amino acids are bioavailable free-form aminos.



Amino Acids



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