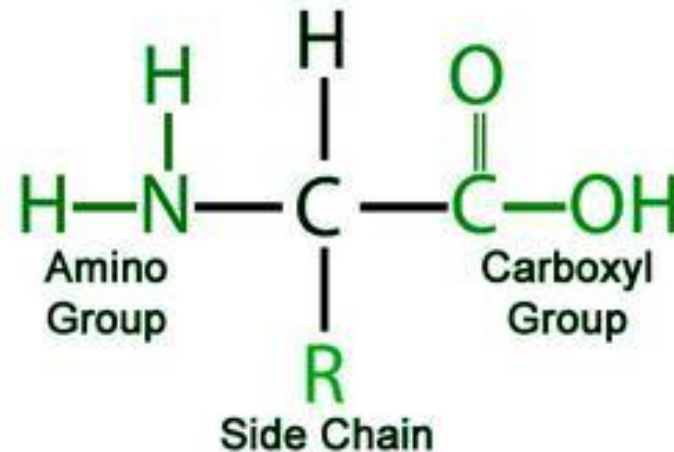


**Physiological
importance of essential
and non-essential α -
amino acids**

- **Amino acids** are a group of organic molecules that consist of a basic amino group ($-\text{NH}_2$), an acidic carboxyl group ($-\text{COOH}$), and an organic R group (or side chain) that is unique to each amino acid. The term *amino acid* is short for α -amino [*alpha-amino*] *carboxylic acid*. Each molecule contains a central carbon (C) atom, called the α -carbon, to which both an amino and a carboxyl group are attached. The remaining two bonds of the α -carbon atom are generally satisfied by a hydrogen (H) atom and the R group. The formula of a general amino acid is:



- Essential amino acids are the amino acids which have to be taken in through diet as they **"CAN NOT"** be produced by the body

- Nonessential amino acids need not be taken in through diet as they **CAN BE** produced by the body

Essential

Histidine

Isoleucine

Leucine

Lysine

Methionine

Phenylalanine

Threonine

Tryptophan

Valine

Non-Essential

Alanine

Arginine

Asparagine

Aspartic acid

Cysteine

Glutamic acid

Glutamine

Glycine

Proline



Serine

Tyrosine

Essential amino acids

1. Phenylalanine

- Main constituent of artificial sweetener used in soft drinks.
- Associated with inhibition melanin synthesis resulting hypopigmentation.
- Rise of Phe level in blood lowers serotonin level that finally increases hunger.

2. Leucine

- Muscle building and maintenance.
- Regulate blood sugar level.
- Stimulate wound healing and stimulate growth hormone.

3. Isoleucine

- Stimulate rate of protein synthesis and Muscle development.
- Stimulate pancreas to secrete insulin.
- Enhances glucose consumption.

4. **Valine**

- Important amino acid during fasting as it is involved in energy production.
- Stimulation muscle growth and regeneration of muscles.

5. **Lysine**

- Production of L carnitine (high energy ammonium compound) and aid in fat metabolism.
- Constituent of collagen and play a vital role in cell division.
- Fixation of Calcium in bones.
- Development of blood vessels in wound site (fast angiogenesis).

6. **Methionine**

- Synthesis of carnitine, phosphatidylcholine.
- Act as powerful acidifier in urine.
- Shows lipolytic activity.
- Promote tissue growth and absorption of Zn & Se, vital mineral for body growth.

7. Histidine

- Precursor of histamine which aid in inflammatory response as well as neurotransmitter in CNS.
- Play role in formation of RBC and WBC
- Important for maintenance of myelin sheath of neurons.

8. Threonine

- Promote digestive functions.
- Lower the blood cholesterol level preventing diseases such as fatty liver.
- Principal part of collagen and elastin that are component of skin and connective tissue.
- Prevent fatty liver condition.

9. Tryptophan

- Precursor of serotonin a neurotransmitter and melatonin that regulate sleep-wake cycle. Used in drugs
- Increase pain tolerance.

Non-essential amino acid:

1. Glycine

- One of the main ingredients of collagen.
- Act as inhibitory neurotransmitter.
- Shows anti-inflammatory activity.
- Act as an antioxidant.
- Improve sleeping activity.
- Help in wound healing process.
- High level of glycine may cause fatigue.

2. Alanine

- Associated with the removal of toxic compounds during excessive exercises.
- Alanine plays important role in energy production from glucose.
- Rise in Alanine level increases fatigue.

3. Arginine

- Essential amino acid in newborn.
- Associated in the Urea cycle.
- Aid in the wound healing process.
- Maintain immune system functioning.
- Increase formation of nitric oxide that increases blood flow and lower blood pressure.
- Important for T-cell production.

4. Proline

- Derived from glutamate.
- Important for production of cartilage and collagen.
- Associated with intracellular signaling process.
- Important for intracellular cell signalling.

5. Asparagine

- Involved in the development and proper function of the brain.
- Balances emotion and maintains CNS.
- Role in the synthesis of ammonia

6. Aspartic acid

- Neurotransmitter of the spinal cord as well as post-synaptic neurotransmitter.
- Associated with the urea cycle and citric acid cycle.
- Precursor of Met, Thr, Iso and Lys.

7. Glutamine

- Body fluid Acid-Base balancing factor.
- Synthesis of DNA and RNA.
- Helpful factor during risk of sickle cell anemia.

8. Glutamic acid or glutamate

- Neurotransmitter associated with learning of language and speech.
- Transport and elimination of NH_3 .
- Heal ulcers.
- Control sugar level in the body.

9. Serine

- Transfer of methyl group.
- Precursor of epinephrine.
- Associated in the synthesis of nucleic acid.
- Aid in muscle growth.

10. Tyrosine

- Precursor of thyroid hormone and melanin.
- Precursor of Dopamine, an important neurotransmitter.

11. Cysteine

- Important source of sulfide.
- Precursor of glutathione (antioxidant).
- Ingredient of nail and hair.
- Cure liver damage due to alcohol consumption.
- High level of cysteine causes weakness and vascular disease.

Difference Between Essential and nonessential amino acids	
Essential Amino Acids	Nonessential Amino Acids
Definition	
Essential amino acids are the amino acids which have to be taken in through diet as they "CAN NOT" be produced by the body	Nonessential amino acids need not be taken in through diet as they can be produced by the body
Number of Amino Acids	
9 amino acids out of 20 are thought to be essential	11 of the 20 amino acids are non-essential
Sources	
As the definition implies, essential amino acids have to be acquired through food – such as soy, quinoa, egg, chicken, meat or vegetable protein	Are produced within the body from other amino acids and other components
Role	
Serves to build and repair muscle tissues. Also, it forms precursor molecules for the formation of neurotransmitters in the brain	Removal of toxins, integral in the synthesis of RBC and WBC, promotes brain function and many more.
Deficiency	
Highly probably as these amino acids are acquired through food	Probability of deficiency is rare, but can still occur due to starvation or illness.