

THE MEDICAL IMPORTANCE OF SULFUR-CONTAINING α -AMINO ACIDS

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Abstract: This article provides information about amino acids that are highly important for the organism. It mainly covers the medical significance of sulfur-containing α -amino acids, their properties, processes occurring through them, and their role and significance in the body. Additionally, the biologically important reactions of α -amino acids are discussed. Foods that contain both exchangeable and non-exchangeable α -amino acids, as well as the changes that occur in the human body due to their deficiency, are also analyzed.

Keywords: Sulfur-containing amino acids, cysteine, methionine, taurine, antioxidant properties, immune system strengthening, cardiovascular health, cystine.

Amino acids form the basis of all plant and animal proteins. They exist in the form of peptides and proteins, or combined with other compounds. Amino acids can be viewed as substances in which the hydrogen atom in the carboxyl group radical is replaced by an amino group. Amino acids, as heterofunctional compounds, contain two different functional groups—amino and carboxyl groups—simultaneously.

Amino acids are classified according to the nature of their radical:

1. **Aliphatic;**
2. **Aromatic;**
3. **Heterocyclic.**

Amino acids with an aliphatic radical include alanine, valine, and leucine. Aromatic and heterocyclic α -amino acids have an aromatic or heterocyclic ring, which is separated from the main fragment of the α -amino acid by a single methylene group.

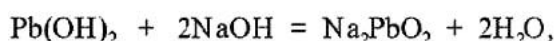
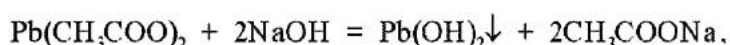
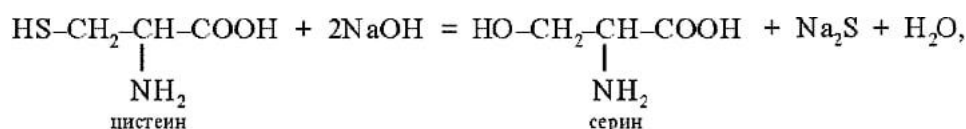
There are also amino acids that retain other functional groups in their aliphatic radical. These include:

1. Serine and threonine, which retain an OH group;
2. Cystine, cysteine, and methionine, which retain S-S, -SH, and -S-CH groups;
3. Asparagine and glutamine acids, which retain an additional -COOH group;

4. Lysine, which retains an additional -NH group;
5. Asparagine and glutamine, which retain an amide group.

Amino acids can be classified as either exchangeable or non-exchangeable based on their ability to be synthesized in the organism. The number of essential amino acids in proteins is 20. Some of these amino acids are not synthesized in the body and are called non-exchangeable amino acids. Non-exchangeable amino acids enter the body through dietary intake. These include valine, leucine, isoleucine, threonine, lysine, methionine, phenylalanine, and tryptophan. Amino acids synthesized in the body are called exchangeable amino acids. These include glycine, alanine, serine, asparagine, glutamic acid, cysteine, tyrosine, histidine, and proline. The 20 amino acids present in human proteins differ by their R group. For example, alanine has a methyl group in place of the R radical. If the positive and negative charges in an amino acid are balanced, the overall charge will be "0," corresponding to a specific pH value known as the isoelectric point (pI). The R group of amino acids determines their properties in aqueous solutions. Non-polar amino acids have R groups that are hydrogen, alkyl, or aromatic, making them hydrophobic (water-repellent), while polar amino acids have R groups that can interact with water, making them hydrophilic (water-attracting).

Sulfur-containing amino acids, such as cysteine, methionine, and taurine, play a significant role in various physiological processes in the body. For example, cysteine can form disulfide bonds that stabilize protein structures.



The Medical Importance of Sulfur-Containing α -Amino Acids:

Cystinuria: Cystine is primarily excreted through urine. If cystine metabolism is disrupted, it can accumulate in the urine, leading to the formation of cystine stones, known as cystine lithiasis. This can cause kidney problems, including pain, difficulty urinating, and kidney failure.

Antioxidant Properties: Cystine acts as an antioxidant and helps neutralize free radicals and toxins in the body.

Collagen Synthesis: Cystine is involved in collagen production, which is essential for skin, hair, nails, and connective tissues. Cystine deficiency can affect the health of these tissues.

Medical Use: Cystine is used in certain medicinal supplements to reduce oxidative stress, strengthen the immune system, and aid in the healing of damaged tissues. Sulfur-containing α -amino acids, such as cysteine, methionine, and taurine, are crucial in various physiological processes, including detoxification, antioxidant protection, immune system strengthening, and supporting cardiovascular and neurological health. Their medicinal significance is multifaceted and contributes to physical and psychological health.

Their Role and Importance in the Body:

Detoxification and Antioxidant Properties: Cysteine and taurine act as antioxidants. Cysteine, in particular, is a major component in the production of glutathione, a powerful antioxidant that neutralizes free radicals and oxidative stress, while also playing a key role in detoxifying the liver. This helps protect the body from harmful substances and toxins.

Protection During Crisis and Liver Protection: Methionine and cysteine participate in detoxifying harmful toxins, such as ammonia, by supporting the methylation process. Methionine also produces a compound called S-adenosylmethionine (SAME), which helps protect the liver and supports its metabolism.

Kidney and Urinary System Health: Cysteine and taurine play important roles in kidney function. A deficiency in cysteine can lead to the formation of cystine stones in the kidneys, which causes urinary system diseases, including cystinuria (the formation of cystine stones). Taurine also supports normal urinary system function.

Immune System Strengthening: Cysteine and taurine help strengthen the immune system. They support the effective function of white blood cells, helping the body fight infections and diseases. Cysteine also supports the production of glutathione, which protects the body from immunosuppression and oxidative stress.

Physical Activity and Muscle Mass: Methionine and cysteine assist in muscle recovery, especially after intense physical activity or trauma. These amino acids support protein synthesis in muscles and accelerate the recovery of damaged tissues.

Neurological Health: Taurine and cysteine have beneficial effects on the nervous system. Taurine supports the normal functioning of neurons, stabilizes the nervous system, and reduces hyperactivity. Cysteine protects brain activity by supporting glutathione production, shielding it from oxidative processes.

Cardiovascular Health: Taurine is beneficial in supporting cardiovascular health. It helps lower blood pressure, normalize heart rate, and prevent cardiovascular diseases. Taurine's

cardioprotective properties are especially shown in heart muscles and blood vessels.

Hair and Skin Health: Methionine and cysteine also play an important role in hair and skin health. Methionine is involved in producing keratin, which is necessary for healthy hair and skin. Cysteine and methionine ensure the strength, health, and growth of hair.

Sulfur-containing α -amino acids play a critical role in various systems in the body, especially in detoxification, antioxidant protection, immune system strengthening, and supporting cardiovascular and neurological health. Their medical significance is expressed in their multifaceted properties, which help improve both physical and psychological health, and they can be used as supportive additions in healthcare.

References:

1. Tibbiy Kimyo (Alimxodjayeva N. T. , Tadjiyeva X.S. , Arifjonov S.Z. , Ayxodjaev B.K. ; 2019-yilgi nashr; 270-303-b).
2. Biorganik kimyo. (E.O. Oripov, A.O. Nasrullayev) 2012-nashr, 272b
3. Fayzullayev N., Akmalaiuly K., Karjavov A. Catalytic synthesis of a line by acetylene hydration //Известия НАН РК. Серия химии и технологии. –2020.
4. Karjavov A. R., Fayzullaev N. Determination of technological parameters of producing vinylchloride from acetylene //AIP Conference Proceedings. –AIP Publishing, 2024.
5. Fayzullaev N. I., Akmalaev K. A., Karjavov A. Catalytic synthesis of acetone from acetylene //The American Journal of Applied sciences. –2020.
6. Mustafiev A. I. et al. TECHNOLOGICAL FEATURES OF THE SELECTION OF LOCAL RAW MATERIALS TO BE PREPARED ON THE BASIS OF A LARGE SOLAR DEVICE //Journal of Academic Research and Trends in Educational Sciences. –2023.
7. Fayzullaev N., Paradaeva S. B. Cleaning of natural gas from sulphur preservative compounds //AIP Conference Proceedings. –AIP Publishing, 2024.
8. Fayzullaev N. I., Karjavov A. R., Yusupova S. S. Catalytic Synthesis of Acetone Direct Acetylene Hydration //International Journal of Advanced Science and Technology. –2020. –T. 29. –No. 05. –C. 4507-4514.