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Editorial

Editorial Note on Amino acids

Sathvik Arava*

Department of Modern Chemistry, Acharya Nagarjuna University, Guntur, India

EDITORIAL

Any of a collection of organic compounds made up of a basic amino group (NH_2), an acidic carboxyl group (COOH), and a distinct organic R group (or side chain) for each amino acid, a core carbon atom which an amino and carboxyl group are linked. A hydrogen atom and the R group usually fulfil the remaining two bonds of the carbon atom. Proteins are critical for life on Earth to continue to operate properly. The vast majority of chemical reactions in the cell are catalysed by proteins. They offer many of a cell's structural constituents and aid in the fusion of cells into tissues. To allow movement, some proteins operate as contractile components. Others are in charge of moving important materials from the cell's exterior (extracellular) to its interior (intracellular). Proteins, in the form of antibodies, defend animals from sickness, and proteins, in the form of interferon, mount an intracellular onslaught against viruses that have evaded the immune system's defences. Last but not least, proteins regulate gene activity (also known as "gene expression").

This wide range of critical functions is reflected in the enormous variety of known proteins, which differ significantly in size, structure, and charge. By the end of the nineteenth century, scientists had realised that, while there are many distinct forms of proteins in nature, when they are hydrolysed, they all release a class of simpler molecules called amino acids, which are the building blocks of proteins. Glycine is the most basic amino acid, named after its sweet taste (glyco, "sugar"). It was extracted from the protein gelatin in 1820 and was one of the first amino acids to be recognised. Scientists working on explaining the relationship between proteins and genes decided in the mid-1950s that 20 amino acids (known as standard or common amino acids) should be considered the essential building blocks of all proteins. Threonine, the last of them to be discovered, was discovered in 1935.

Amino acids exist in two optically active asymmetric forms (referred to as enantiomers) that are mirror reflections of one another. (This feature is analogous to the spatial relationship between the left and right hands.) One enantiomer is labelled “D”, while the other is labelled “L”. It's worth noting that the L-configuration is virtually always seen in amino acids found in proteins. This is due to the fact that enzymes involved in protein synthesis have evolved to solely use the L-enantiomers. D-amino acids are found in a variety of microorganisms, including bacteria's cell walls and numerous antibiotics. The ribosome, on the other hand, does not produce these. The presence of both a basic and an acidic group at the -carbon is another significant property of free amino acids. Amino acids, for example, are amphoteric compounds because they can act as both an acid and a base. The pKa of the basic amino group is normally between 9 and 10, while the pKa of the acidic -carboxyl group is usually around 2 (a very low value for carboxyls). Any free amino acid, as well as any protein, will exist in the form of a zwitterion at a certain pH.

Another important trait of free amino acids is the presence of both a basic and an acidic group at the -carbon. Amino acids are amphoteric substances because they may function as both an acid and a base. The basic amino group pKa is usually between 9 and 10, the acidic -carboxyl group's pKa is usually around 2 (a very low value for carboxyl). Group's pKa is the pH value of protonated group's concentration equals that of the un-protonated group. Free amino acids are usually found as dipolar ions or "zwitterions" at a healthy pH (about 7–7.4). At a particular pH, any free amino acid, as well as any protein, will exist in the form of a zwitterion. In other words, there is a pH (isoelectric point) at which the molecule has a net zero charge (equal number of positive and negative charges), Amino acids and proteins, in other words, are always in the form of ions and carry charged groups. This finding is critical when studying the biochemistry of amino acids and proteins in depth.

Correspondence to: Sathvik Arava, Department of Modern Chemistry, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India, Tel: +32-466-90-04-51; E-mail: sathvikraj38@gmail.com

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