ABSTRACT

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QUAD AMINO ACIDS

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The 20 commonly occurring alpha amino acids are: Alanine, Arginine, Asparagine, Aspartic Acid, Cysteine, Glutamine, Glutamic Acid, Glycine, Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Proline, Serine, Threonine, Tryptophan,Tyrosine, and Valine. The amino acids, except for Glycine, are all chiral, existing as two enantiomers, L or D, which are mirror images of each other. Such chirality depends on the absolute spatial configuration of the four chemical groups tetrahedrally bonded to the α-carbon of the amino acid. Fischer projections of the L and D amino acids, where the amino and carboxyl groups extend out of the paper, and where the hydrogen and various side groups $R_{1\text{-}20}$ extend into the paper, are shown below:

L Amino Acid $\begin{matrix} R_{1\text{-}20} \\ H_2N{+}CO_2H \\ H \end{matrix}$ D Amino Acid $\begin{matrix} H \\ H_2N{+}CO_2H \\ R_{1\text{-}20} \end{matrix}$

While biological organisms overwhelmingly employ L amino acids, they still make use of D amino acids (see references).

Amino acids are usually thought of as trifunctional reagents which possess an amino group, a carboxyl group, and a side group as the three functional groups. If the remaining hydrogen atom attached to the α-carbon of the amino acid is replaced by a second side group, it would be possible to synthesize quadfunctional amino acids, shown below:

Quad Amino Acid $\begin{matrix} R_{1\text{-}20} \\ H_2N{+}CO_2H \\ R_{1\text{-}20} \end{matrix}$

There are 20 x 20 = 400 possible quad amino acids and they might have potential biological uses.

References

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