Amino Acid Writeup

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1 Aspartic Acid

Aspartic Acid (standard codons GAC and GAU) [1] is a non-essential amino acid [3].[1] Its chemical formula is $HOOCCH(NH_2)CH_2COOH$. It is polar, which means it is hydrophilic [2] and generally ends up on the surface of proteins. Aspartic Acid is small compared to other amino acids. It is usually found in the protein active sites.

It is one of two negatively charged amino acids, so its use in protein structure stems from the ability of the carboxylate ($RCOO^-$) to bind with positively charged amino acids. This particular binding forms hydrogen bonds and keeps the protein's structure stable. The negative charge also allows Aspartic acid to interact with positive atoms.

2 Phenylalanine

Phenylalanine (standard codons UUC and UUU) [1] is a hydrophobic, non-polar amino acid [2]. Phenylalanine is an essential amino acid and cannot be synthesized [3]. Phenylalanine generally ends up in the hydrophobic core of the protein since it itself is hydrophobic.

The chemical formula for Phenylalanine is $C_6H_5CH_2CH(NH_2)COOH$ and has a non-reactive benzyl side chain. This means Phenylalanine does not generally impact protein function, but since the side chain is aromatic (meaning the electrons of the ring are shared with the whole ring), it will stack with other aromatic amino acids such as Tryptophan.

References

[1] Betts, M. J., Russell, R. B., and Barnes, M. Amino acid properties and consequences of substitutions.

[2] Petitjean, A., Mathe, E., Kato, S., Ishioka, C., Tavtigian, S. V., Hainaut, P., and Olivier, M. Impact of mutant p53 functional properties on tp53 mutation patterns and tumor phenotype: lessons from recent

[1] A highly misleading attribute name.

developments in the iarc tp53 database. *Human mutation 28*, 6 (2007), 622–629.

[3] YOUNG, V. R. Adult amino acid requirements: the case for a major revision in current recommendations. *The Journal of nutrition 124*, 8 Suppl (1994), 1517S–1523S.