On the Origin of Optical Activity in Amino Acids by Metal Ion Catalysis

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Recently it was reported that the rate of oxidation of *R*-cysteine by Fe(III) in aqueous solution is different when the reaction is carried out in the presence of either *S*-alanine or *R*-alanine [1]. Such a difference could be envisaged as arising from different ternary diastereoisomeric complexes of Fe(III) with *R*-cysteine and *S*-alanine or with *R*-cysteine and *R*-alanine.

However, it was claimed [1] that the observations were due to 'differences in complex formation between L-and D-amino acids and iron ions' and that 'the processes of complex formation of Fe(III)–Fe(II) with L- and D-alanine in aqueous solution differ from each other', as deduced from oxidative potential techniques [2]. We wish to point out that this claim is in error. Similarly, the claim that complexes of different compositions form with iron ions and *R*- or *S*-amino acids is also in error. While species distributions will be dependent upon the pH of the solution, exactly the same complexes, but of opposite absolute configuration, will form at a fixed pH value if either *R*- or *S*-alanine is reacted with Fe(II) or Fe(III).

Therefore, such processes cannot be viewed as potential reactions leading to the generation of optical activity in prebiotic systems, as has been suggested [1]. Notwithstanding differences in reaction rates of diastereoisomers of the above ternary complexes, any such reactions must lead to zero overall development of optical activity since both *R*- and *S*-cysteine would have been present in exactly equal amounts. Thus, as other workers have concluded in the past, the generation of optical activity in the prebiotic soup remains somewhat enigmatic [3, 4].

References

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