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The decomposition of N-chloroglycine in alkaline aqueous solution

N-chlorinated amines are of utmost importance in environmental technologies and physiological processes. They are formed from hypochlorous acid and the corresponding amines in fast reactions. In biological systems, N-chloramines are important intermediates in the degradation of invading pathogens and known regulators of cell metabolism. However, they also contribute to adverse effects in living cells and the derivatives formed from these chlorinated compounds may also have significant biological effects. While earlier studies on the chemistry of N-chloroamino acids recognized the significance of these compounds, the results on the decomposition of these species are controversial. Now we present a detailed study on the kinetics and mechanism of the decomposition of N-chloroglycine. Spectrophotometric as well as systematic ^{1}H and ^{13}C NMR experiments were performed to identify and follow the concentration changes of the reactant, intermediates and products. Our results clarify some of the discrepancies in previous data. It is confirmed that the decomposition kinetics is far more complex than it was proposed before, the kinetic traces feature two well defined first-order processes. The reaction proceeds via various reactive intermediates which may have profound effects in biological systems. Notably, one of these intermediates is *N*-oxalylglycine which inhibits α-ketoglutarate-dependent enzymes. Earlier, formaldehyde was postulated as the final product of the decomposition. In contrast, it is now confirmed that the main product is *N*-formylglycine which may also act as an enzyme inhibitor. Additional studies on the decomposition of *N*-chloro-α-alanine corroborate the results with *N*-chloroglycine although this reaction also exhibits distinct features.

Biography

István Fábián has received his PhD degree from University of Debrecen (the former Kossuth Lajos University) in 1982. Currently, he is the Head of the Department of Inorganic and Analytical Chemistry. His main interest lies in the kinetics and mechanisms of solution phase redox reactions. He has published more than 100 papers in high level scientific journals. Since 2010, he has been serving as Editor-in-Chief of *Reaction Kinetics, Mechanisms and Catalysis* (Springer - Akadémiai Kiadó).

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