The chlorination of amino acids

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Hypochlorous acid is a well-known oxidizing and disinfecting agent. It is formed *in vivo* as part of the defense mechanisms against invading pathogens. Amino acids, peptides, proteins are in excess over HOCl in living organisms and their reactions typically generate *N*-monochloro derivatives. These species and their metabolites may have adversary effects on healthy cells, e.g., the penetration of *N*-chloroamino acids into the cells induces oxidative stress and leads to necrosis or apoptosis. In water treatment technologies, breakpoint chlorination is used to remove dissolved ammonia from source waters. However, the reactions of HOCl with the organic constituents often generate *N*-dichloro derivatives of amino acids. The transformation of these compounds into toxic products is a primary concern.

Earlier studies have addressed various aspects of the reactions of HOCl with amino acids, but the very details of these processes have not been explored and some of the results are controversial. In recent years, we have performed systematic kinetic studies in these systems. Our primary goal is to develop detailed mechanisms for the interpretation of the observations and gain insight into the formation of antagonistic products. The presentation will cover the reactions of the simplest amino acids, essential branched-chain amino acids and *N*-methylamino acids with HOCl. It will be discussed in detail, how the substituents affect the stoichiometry, the kinetics and the formation the final products in these systems. It will be demonstrated that the chlorination of glycine shows distinct features compared to the other reactions regardless of which reactant is used in excess. This is clearly the consequence of the lack of alkyl substituent(s) in this amino acid. The results are expected to improve our understanding of the consequences of chlorination in both biological systems and water treatment technologies.

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