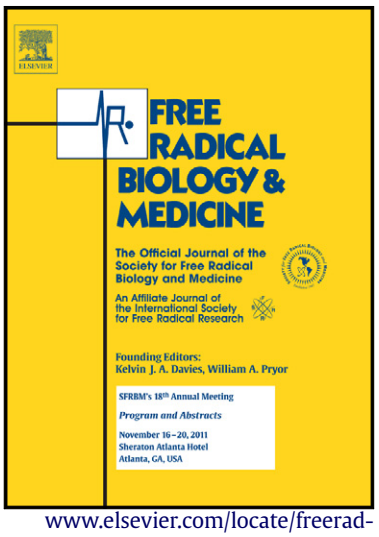

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Protein thiyl radical reactions and product formation: a kinetic simulation

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Thiyl radicals, hydrogen atom transfer, carbon-centered radicals, D-amino acids, glutathione

Abstract

Protein thiyl radicals are important intermediates generated in redox processes of thiols and disulfides. Thiyl radicals efficiently react with glutathione and ascorbate, and the common notion is that these reactions serve to eliminate thiyl radicals before they can enter potentially hazardous processes. However, over the past years increasing evidence has been provided for rather efficient intramolecular hydrogen transfer processes of thiyl radicals in proteins and peptides. Based on rate constants published for these processes, we have performed kinetic simulations of protein thiyl radical reactivity. Our simulations suggest that protein thiyl radicals enter *intra*molecular hydrogen transfer reactions to a significant extent even under physiologic conditions, i.e. in the presence of 30 μM oxygen, 1 mM ascorbate and 10 mM glutathione. At lower concentrations of ascorbate and glutathione, frequently observed when tissue is exposed to oxidative stress, the extent of irreversible protein thiyl radical-dependent protein modification increases.