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Nitroxyl radicals as antioxidants against lipid peroxidation: An *in vitro* study

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Nitroxyl radicals (>NO•) exhibit a set of unique properties (ease of single-electron transfer, paramagnetic properties, cell permeability, antioxidant activity), which makes them attractive for use as drug components. It is known that >NO• catalytically dismute the superoxide anion, inhibit the oxidation of lipids, protect DNA from radicals. We investigated the mechanism of antioxidant action of nitroxyl radicals using a simplified model of lipid membrane (methyl linoleate (LH) in micelles). It has been established that >NO• effectively inhibits azo-initiated LH oxidation even at concentrations of →10–6 M. Antioxidant activity of >NO• increases with increasing its lipophilicity. Each >NO• radical breaks 2-5 oxidation chains, i.e. the regeneration of antioxidant takes place. This effect is explained by the reaction >NO• + HO2• → >NOH + O2, while HO2• radical is formed upon the LH oxidation in micelles. This conclusion is confirmed by the results of superoxide dismutase enzyme effect on the kinetics of the process: the antioxidant activity of >NO• decreases, and one >NO• radical terminates one oxidation chain, since the >NO• and HO2• interaction is eliminated. The piperidine-based radicals with a low reduction potential of the oxoammonium cation/nitroxyl radical pair, in particular 2,2,6,6-tetramethylpiperidine-1-oxyl (TEMPO), have the greatest antioxidant activity during the oxidation of LH in the presence of a source of O2•–/HO2• radicals. This result can be useful for the selection of >NO• structures for testing as drug components to protect against the oxidative stress.

Biography

Ivan Tikhonov has completed his PhD at P G Demidov Yaroslavl State University. He is the Senior Lecturer in P G Demidov Yaroslavl State University and has published more than 10 papers in reputed journals.

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