EFFECT OF SUPEROXIDE DISMUTASE ON THE ANTIOXIDANT ACTIVITY OF NITROXYL RADICALS DURING THE OXIDATION OF METHYL LINOLEATE IN MICELLES

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Objectives:
- Experimental research of the kinetics of methyl linoleate oxidation inhibited by nitroxyl radicals in micelles;
- Determination of the mechanism of this process and analysis of the role of hydroperoxy radical.

Materials

- Methyl linoleate (LH), oxidation substrate
- Superoxide dismutase (SOD): lyophilized powder, 3,500 units/mg protein

Methods
- Monitoring of oxygen consumption (YSI 5300A Biological Oxygen Monitor)
- ESR spectroscopy (CMS 8400 ESR Spectrometer, Adani, Belarus)
- Calculation of octanol-water log P values (CLogP method)

Experimental conditions
LH (0.02 M) in Triton X-100 micelles (0.05 M), air saturation, pH 7.4, 37°C. [AAPH] = 0.004 M, rate of initiation $W_i = 3.8 \times 10^{-9} \text{M}^{-1} \text{s}^{-1}$ [SOD] = 0 or 100 U/mL.

Calculation of inhibition coefficients ($f$)
$$ f = \frac{\tau_{ml} W_i}{[\text{NO} \cdot]} $$

Basic regularities
1. Antioxidant activity of $\text{NO} \cdot$ depends on log P values. More lipophilic antioxidants inhibit oxidation in micelles more effectively.
2. One $\text{NO} \cdot$ radical breaks 2–3 kinetics chains, i.e., $\text{NO} \cdot$ is regenerating during the oxidation. Probably reason is $\text{HO}_2^-$ formation during the oxidation of LH in micelles (V. Roginsky, T. Barsukova, Chem. Phys. Lipids, 2001, 111, 87).
3. In the presence of SOD $\text{NO} \cdot$ reduces the rate of oxidation in the lower extent. The process is characterized by lower values of inhibition coefficients. These results demonstrate the important role of hydroperoxyl radical in the mechanism of the process.

Proposed mechanism of $\text{NO} \cdot$ regeneration

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