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Reoxidation of the reduced nitroxide radical spin label TEMPONE: involvement of oxygen and oxygen-derived active forms

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The ability of molecular oxygen and oxygen-derived active forms to reoxidize chemically and photochemically-reduced nitroxide radical spin label: 1-oxyl-2,2,6,6-tetramethyl-4-piperidone (TEMPONE) was examined using electron spin resonance spectroscopy. Two active forms of oxygen, superoxide radical and hydroxyl radical were shown to be effective reoxidizers of TEMPONE, while molecular oxygen, singlet oxygen and hydrogen peroxide were not effective in the reoxidation process. Nitroxide radicals posses not only superoxide dismutase-like activity (as was shown by Mitchel, Samuni, Krishna, Degraff, Ahn, Samuni and Russo (1990) Biochemistry 29, 2802-2807) but also could detoxify another toxic oxygen-derived species, hydroxyl radical. They should be active not only in the aqueous phase, but also in such hydrophobic environments as membranes.