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Application of an Oxygen Electrode to Evaluate Superoxide Anion-scavenging Ability

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The ability to scavenge superoxide anion radicals ($^{\bullet}O_2^-$) was determined using an oxygen electrode. The method is based on the determination of $^{\bullet}O_2^-$ generated by the reaction of nitrilotriacetatoiron(III) with hydrogen peroxide and a decrease in the concentration of $^{\bullet}O_2^-$ by a scavenging reaction, converting into a change in the generation of oxygen molecules through an electron-transfer reaction from $^{\bullet}O_2^-$ to nitrilotriacetatoiron(III). Oxygen generation, which enhanced proportionally with an increase in the concentration of hydrogen peroxide, was inhibited depending on the concentration of superoxide dismutase. Hence, we applied the present reaction system to evaluate the $^{\bullet}O_2^-$-scavenging abilities of an antioxidant, measuring the degree of inhibition of oxygen generation using an oxygen electrode. A good correlation was obtained between the present method and conventional colorimetry, monitoring the formation of blueformazan by the reaction of nitro blue tetrazolium with $^{\bullet}O_2^-$, to estimate the $^{\bullet}O_2^-$-scavenging activities of antioxidants.

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