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ONOOH does not react with H₂: Potential beneficial effects of H₂ as an antioxidant by selective reaction with hydroxyl radicals and peroxyxynitrite

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Abstract

H₂ has been suggested to act as an antioxidant when administered just before the reperfusion phase of induced oxidative stress. These effects have been reported, for example, for the heart, brain, and liver. It is hypothesized that this beneficial effect may be due to selective scavenging of HO(·) and ONOOH by H₂. The reaction of H₂ with HO(·) has been studied by pulse radiolysis in the past and is too slow to be physiologically relevant, not to mention that the reaction yields the reactive H(·) radical. We therefore investigated whether H₂ reacts with ONOOH and whether the presence of H₂ influences the yield of nitration of tyrosine by ONOOH. With only negative results, we entertained the notion that H₂ may possibly exert its beneficial effects by reducing Fe(III) centers, oxidized during oxidative stress. However, neither hemes nor iron-sulfur clusters were reduced.

Keywords: Free radicals; Hydrogen; Peroxynitrite; Scavenger; Stopped-flow kinetics; Thermodynamics.

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