Format: Abstract

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Erythrocyte defenses against hydrogen peroxide: the role of ascorbic acid.

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Abstract

Ascorbate has been reported to increase intracellular hydrogen peroxide (H2O2) generation in human erythrocytes. In the present work, the basis for this prooxidant effect of the vitamin was investigated in the context of erythrocyte defenses against H2O2. Ascorbate added to erythrocytes caused a dose-dependent increase in intracellular H2O2, which was measured as inactivation of endogenous catalase in the presence of 3-amino-1,2,4-triazole (aminotriazole). Ascorbate-induced catalase inactivation was not observed when only the intracellular ascorbate concentration was increased, when cells were incubated with ascorbate in plasma, or when extracellular Fe3+ was chelated. Together, these results suggest that the observed ascorbate-induced H2O2 generation is due to Fe3+-catalyzed oxidation of extracellular, as opposed to intracellular, ascorbate by molecular oxygen. Rather than generate an oxidant stress in erythrocytes, ascorbate was one of the most sensitive intracellular antioxidants to H2O2 coming from outside the cells. On the other hand, intracellular ascorbate contributed little to the detoxification of H2O2, which was found to be mediated by both catalase and by the GSH system.

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