The effect of some transition metal ions on the ascorbate radical observed in blood of patients with acute lymphatic leukemia.

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Recently we observed an electron spin resonance (ESR) signal at about g = 2.005 and an increase in spin concentration in blood of patients with acute lymphatic leukemia. We could show that this signal is due to the semidehydroascorbate (SDA) radical. Furthermore, we could demonstrate that addition of ascorbate oxidase to these biological samples resulted in a reduction of the SDA signal and in the spin concentration restoring, thus, the original ESR pattern present in blood of healthy individuals. Since ascorbate oxidase is a copper containing enzyme the effect of Cu^{2+} on ESR spectra of biological and of model systems exhibiting the SDA peak was investigated. The spin concentration increases first followed by a decrease with increasing Cu^{2+} concentrations. At constant Cu^{2+}- and varying ascorbic acid-concentrations, a similar pattern was observed: the spin concentration increased first followed by a decrease. Next, the effect of Fe-ions was studied. In this case, there is a rapid decrease in spin concentration and a concomittant disappearance of the SDA peak with increasing Fe-concentrations. Since this effect is very similar to the one obtained with ascorbate oxidase, it might be assumed that Fe-ions are a constituent of the enzyme. Atomic absorption studies revealed that 1 mg of the enzyme contains 0.319 µg Cu and 0.008 µg Fe. From this it might be concluded that the interaction between ascorbate oxidase and vitamin C might be mediated by the Fe ions present in the enzyme. Polarographic studies revealed a value of about -0.65 V for the half-wave potential of the ascorbic acid-Fe^{3+} complex.