

PHOTOCHEMISTRY AND ANTIOXIDANT PROPERTIES OF CERULOPLASMIN

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Ceruloplasmin (Cp) is a copper-containing blue oxidase which can be found in the blood of human beings and animals. The photoactivation of human Cp by low-energy helium-neon laser irradiation (632.8 nm) was demonstrated. This effect was inhibited by NaN₃! The greatest changes which occurred in the irradiated Cp were shown at low range of pH. The photoactivation of Cp, observed in acid medium, was accompanied by elevation of absorption at 608 nm. The oxidase activity of Cp was analysed with p-phenylene diamine (PPD) and epinephrine (E) as substrates. The activity of Cp (pH 5.5), irradiated during 1 and 10 minutes, was elevated about 15% and 40% accordingly in comparison with the initial activity with PPD and about 45% - 50% in comparison with E as substrate. The superoxide dismutase-like (SOD-like) activity of Cp (pH 5.5), irradiated by laser light, resulted in 3% and 30% increase in comparison with the unirradiated Cp. The changes of SOD-like, oxidase activity and absorption at 608 nm, which occur in the irradiated Cp (pH 7.4), were not very prominent. Experimental investigations were carried out to study action of He-Ne laser irradiation applied in diffuse stream onto blood in vitro. Integral SOD activity of plasma, mainly contributed by Cp, was statistically increasing by 16%, beginning from the dose of .14 J'. 'cm⁻³'. SOD activity of erythrocytes was raising only at the dose of .54 J'. 'cm⁻³' (by 27%). Total content of copper in plasma increased by 52% at the dose .27 J'. 'cm⁻³'. The level of oxidase activity of Cp in plasma was getting higher in accordance with the irradiation dose .27 J'. 'cm⁻³' by 15% from the initial level. Beginning from the dose of .85 J'. 'cm⁻³' the haemolysis was observed. Statistically proved decrease was found in stationary level of lipid peroxidation metabolites (dienic conjugates (DC) - 10% - 5% and malonic dialdehydes (MDA) - 33% - 38%) in plasma in the doses of .14 and .27 J'. 'cm⁻³'. It was shown that the promotion of tolerance of lipid fraction of the irradiated (.14 and .27 J'. 'cm⁻³') plasma towards lipoperoxidation, induced by Fe(II) ions (DC was decreasing by 43% - 30% and MDA - 18% - 20%), reflected the increase in total antioxidant status of plasma. The data obtained show that He-Ne laser irradiation of the blood in the doses of .14 - .27 J'. 'cm⁻³' causes bioantioxidant effect which is regarded as one of the positive factors of photo-biological action.

References:

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