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Protection of vascular wall from oxidative injury with supramolecular conjugate of antioxidant enzymes

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For antioxidant protection of vascular wall the bienzyme covalent conjugate was obtained by binding superoxide dismutase (SOD) with catalase (CAT) via endothelial glycocalyx glycosaminoglycan – chondroitin sulfate (SOD-CHS-CAT).
The SOD-CHS-CAT was assayed with respect to its vasoprotective activity in interaction with platelets, and the rat arterial ring, and in normalization of the hemodynamic parameters in rats and rabbits pathologically altered by exposure to hydrogen peroxide to simulate the development of oxidative stress. The SOD-CHS-CAT has antiplatelet potential owing to the antiaggregatory effect of the combined enzymatic activities (as compared with selectively inactivated forms of bienzyme conjugate) and its acquired supramolecular structure.
In latter case (when the traditional inducer is ADP) the bienzyme conjugate becomes as nanoparticle, because native SOD or CAT, free CHS have not such effect quite. The effect of SOD and CAT on arterial ring tonus was equivalent for both their native and conjugated forms. The normalizing effect of the SOD-CHS-CAT on blood arterial pressure and heart rate (after their perturbation by hydrogen peroxide) in rats and rabbits was significantly more effective than the control values. The study demonstrates the possibility of using the SOD-CHS-CAT in chronic prophylactic therapy.
There is the model of septic shock of animals due to administration of bacterial lipopolysaccharide (LPS, from Salmonella enterica serotype Typhimurium) them as provoking infectious agent. The therapeutic effect of SOD-CHS-CAT has special research interest associated with activity of conjugate after preventive and medicative administration (i.e. before and after LPS administration, respectively). The effect of conjugate administered in medicative regime had increased the survival of rats for endotoxin shock. It was the expressive efficacy of medicinal employment of SOD-CHS-CAT conjugate.
The level of NO in liver, lung, kidney, heart of rats was enhanced during endotoxin shock progress and there were not significant alterations of NO level after conjugate administration intravenously. The changes of urea and creatinine in blood samples have been evidenced the protective action of conjugate in respect to kidney function. Diversity of other index alterations have been hampered the forming agreed conclusions about state of other organs. Taken together these date indicated the other protective effects of this conjugate (besides NO preservation) and importance of its action mechanism investigation on animal model with continuous development of injury and involvement of other vasoactive derivatives (NO-independent progress of therapeutic effect). It is significantly highly the study of combined use of bienzyme conjugate with other therapeutic agents for protection of circulation.