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Oxidative modification of LDL and antioxidant enzymes in diabetes mellitus and atherosclerosis

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Diabetes mellitus is a risk factor for the development of vascular diseases. Modification of low-density lipoproteins (LDL) plays an important role in atherosclerosis. Natural dicarbonyls formed in oxidative glucose metabolism in diabetes mellitus patients (predominantly glyoxal and methylglyoxal) or by oxidative stress in patients with atherosclerosis (malondialdehyde [MDA]), can probably modify LDL particles. Oxidative modification of LDL enhances their accumulation in vascular walls. Oxidized LDL level in blood plasma is higher in diabetes patients with decompensated carbohydrate metabolism in comparison with atherosclerosis patients, moreover, glucose stimulates free radical oxidation of LDL *in vitro*. Normalization of blood glucose level decreases oxidized LDL level. Aldehydes can travel across cell membrane and modify not only LDL, but also blood proteins, including erythrocytic enzymes. There is a decrease in superoxide dismutase (SOD) and glutathione peroxidase (GPx) activity in diabetes patients compared to the control group (age-matched patients without lipid or carbohydrate metabolic disturbances). Glucose-lowering therapy with sulfonylurea derivatives or metformin significantly increased erythrocyte Cu,Zn-SOD activity in diabetes patients. Metformin-treated patients had significantly higher levels of enzyme activity likely due to its enhanced utilization of methylglyoxal. All three dicarbonyl compounds rapidly changed the kinetic properties of GPx at physiological temperature and pH. The marked inhibition of antioxidant enzyme activity observed after incubation with dicarbonyls can result from modification of their amino and SH groups during interaction with the aldehyde groups. Based on these reactions, we hypothesized that there is a common mechanism underlying vascular wall damage in patients with atherosclerosis and type 2 diabetes mellitus.

Biography

Maria Grechnikova graduated from Lomonosov Moscow State University, Faculty of Biology in 2013 and got a Diploma with Honour. She is working for her PhD thesis in Laboratory of Free Radical Oxidation, Biochemistry in Russian Cardiology Research and Production Complex studying the fundamental processes of atherosclerosis development and its connection to other diseases. She learned Bioinformatics and Statistics in Moscow Bioinformatics School. During this period, she got some interesting results that are already published or going to be published after some additional work in near future.

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