Effect of the Grape Polyphenol Concentrate with Stevia on Antioxidant Status under the Experimental Diabetes Mellitus

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Diabetes mellitus (DM), especially DM type II, takes one of the leading places among the non-infectious diseases and what is more important – the number of diabetic patients is steadily increasing. According to the World Health Organization (WHO) currently near 350 million people perish from diabetes mellitus. Free radical reactions and further ROS formation are closely linked with the development of diabetic retinopathy, nephropathy and atherosclerosis accompanying diabetes, both of the first and second type [3]. Because of the high reactivity ROS interact with the lipid component of cell membranes or organelles, reacting with polyunsaturated fatty acids (FA). They not only caused the damage of the structural or functional integrity, but also generate a number of FA radicals, which subsequently react with other lipids, proteins, nucleic acids, thereby triggering a cascade of electron transfer that results in damage of these structures - from enhanced permeability to cell lysis [2]. Thereby, lipid peroxidation plays an important role in normal cell activity, as well as in the pathological process development. The long-term evidence has proved that the plant polyphenols are the potent antioxidants and the perspective creation of new drugs with antioxidant activity is of the great interest [4].

The Wistar rats with body weight 140–200 g were taken for experiment, they were kept in standard vivarium conditions. The experiment was conducted to study the effect of grape polyphenol concentrate with stevia extract edition (GPC) on prooxidant and antioxidant status under experimental DM type I (DMI) and (DMII). DMI was caused by the single intraperitoneal injection of streptozotocin solution (STZ) ("Sigma", USA) in dose 55 mg/kg body weight. In order to modulate DMII animals were kept on high-calorie diet (45% saturated fats) with fructose (2 g per 100 g body weight for the day) during 4 weeks. The treatment was beginning from the 7-th day after streptozotocin injection and from the 14-th day of the high-calorie diet. The rats were administered by GPC intra-gaster in the dose recounted for the polyphenol content of 9 mg/100 g body weight. After 4 weeks rats were decapitated and the samples of blood were taken to determine in blood serum the intermediate products of lipid peroxidation: TBA-reactive products (TBARS) (*Владимиров Ю.А.., Арчаков А.И., 1972*); reduced glutathione (GSH) *("Sigma", USA*) and catalase activity (*Королюк М.А., 1988*).

The expected activation of the free-radical oxidation was proved under DMI – the TBARS level was increased by 36%, GSH content decreased almost twice, catalase activity increased by 20% [1]. At the same time in healthy animals from control group,

which administered GPC, the studied indices were not significantly different in comparison with intact group. The GPC administration to animals with DMI significantly influence on lipid peroxidation. Thus, TBARS level was lower in treated group than in control pathology group (59.53±3.95 and 88.64±3.91 mkmol/g respectively). The GSN content increased almost to the same in intact animals (45.21±4.41 EU), although catalase activity remained increased (3.18±0.31 mkat/l) compared with intact animals (2.71±0.22 mkat/l).

The increased TBARS level, dramatically lowering of GSH content and catalase activation in blood serum indicated the oxidative stress development in animals with modeled DMII. GPC administration, like in above described pathology, significantly reduced the consequences of oxidative stress. Thus, intensity of lipid peroxidation was significantly lower in animals treated by GPC under the DMII then in ones from control pathology group that was proved by the changes in studied indices.

So, the GPC administration normalized the oxidative balance indicators in animals with experimental DMI and DMII. Making the conclusions, we can suggest that the the studied GPC reveals high antioxidant activity that is obviously achieved because of grape polyphenol compounds. It is also possible that the biologically active components of stevia contribute into the described effects.

References

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