

Diabetes-associated structural and molecular alterations in capillaries supplying the myenteric plexus in rats

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We have recently demonstrated different susceptibilities of nitrergic neurones located in different intestinal segments to diabetic damage. Their different levels of responsiveness to insulin treatment have also been revealed indicating the importance of the neuronal microenvironment in the pathogenesis of diabetic nitrergic neuropathy. Although the myenteric ganglia are not vascularized, blood vessels closely related to the ganglia play a key role in creating the proper microenvironment for the ganglia.

Recent data confirm that the loss of the modulatory role of the endothelium may be a critical initiating factor in the development of diabetic vascular diseases. The reduction of the endothelium-dependent vasodilatation is mainly induced by a decreased bioavailability of the endothelium-dependent vasodilator nitric oxide and an increase in the activity of toxic oxygen free radical.

To understand the cellular and molecular background of the diabetes related myenteric neuropathy we investigated the capillaries close to the myenteric plexus and raised two main questions; 1. Is there any difference between controls and streptozotocin-induced diabetic rats in the thickness of the basal lamina surrounding these blood vessels? 2. Is there a direct linkage between the quantitative features of Caveolin-1, which is the major negative regulatory protein for endothelial nitric oxide synthase (eNOS), caveolae and eNOS in the endothelium of these vessels.

In this study a streptozotocin-induced chronic diabetic rat model was used. The rats were divided into three groups: controls, streptozotocin-induced diabetics and insulin-treated diabetic rats. Ten weeks after the onset of diabetes the rats were killed by cervical dislocation, and samples of different gut segments were processed for electronmicroscopical investigations. We measured the thickness of basal lamina by the help of electronmicroscopic morphometry. Postembedding immunohistochemistry was used to study the eNOS and Caveolin-1 expression and interaction in capillary endothels in the vicinity of the myenteric plexus. To evaluate the effects of streptozotocin-treatment and insulin replacement statistical analysis was performed, the probability of $P < 0.05$ was set as the level of significance.

In diabetic rats, the endothelial basal lamina what plays a key role in permeability and transendothelial transport was significantly thicker than in the controls. The amount of eNOS and its negative regulator protein, Caveolin-1 was increased in diabetic rats. Immediate insulin replacement significantly prevented the thickening of the basal lamina, and overexpression of eNOS and Caveolin-1.

These results indicate a close relationship between vascular dysfunction and diabetic nitrergic neuropathy, suggesting that endothelial dysfunction in the intestine can be a good prognostic factor for developing enteric neuropathy.

Antioxidant properties of home-made fruit concentrate

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Enhanced oxidative stress develops when production and elimination of reactive oxygen derived compounds (ROS) does not balanced. Enhanced ROS production plays role in development of several diseases. In physiological circumstances elevated ROS production can be decreased by enzymes such as superoxide dismutase, catalase, glutathione reductase, and non-enzymatic ways. One part of the non-enzymatic antioxidants are formed in our body – like serum albumin, coruloplasmine, bilirubin, biliverdin etc. – and other part came from the diet.

During the last decades, several clinical and experimental studies were performed to determine the effects of antioxidant supplementation on health and diseases. However, contradiction in the results considering health prevention were found. Moreover, more and more evidences suggest the pro-oxidant or other disadvantageous properties of mega dose antioxidant supplementation. On these basis, one can assume that the most effective sources of antioxidant are natural origin e.g. the diet itself, and consumption of fresh fruit and vegetables to ensure optimal antioxidant, trace element state mostly advised.

In our country consumption of fresh fruit and vegetables are periodic, therefore, effects of conservation on antioxidant content and properties of products must have been studied. In this study we compared antioxidant properties of several conventional home-made fruit concentrates e.g. jams, and some fruit concentrate made by use of gelatin, which shortened preparation time – and was supposed to keep intact antioxidants and vitamins. We determined in water and methanol extracts of jams the total polyphenol, flavonoid and tocopherol content, and measured capability of fruit concentrate to stabilize DPPH radical (H-donor activity), reduce ferric ion, and inhibit xanthin oxidase activity, which produces superoxide anion.

Dry matter content varied between 30-70%, and gelatinized fruit concentrates had 30-50%. Total-phenol content varied between 0.02-0.15 mg/mg in both water and methanol extract, and flavonoid content was between 0.1-0.8 ug/mg, and was significantly higher in methanol than in water extracts. DPPH stabilization was between 0.02-0.8 ug/mg, ferric ion reduction between 0.17-0.34 ug/mg (both expressed in Trolox equivalent). Inhibition of xanthin oxidase activity was negligible in spite of high flavonoid content. Tocopherol concentration varied within a wide range (alpha-toc: 0-5.9 umol/mg; gamma-toc: 0-0.04 umol/mg; delta-toc: 0-0.2 umol/mg). Ascorbic acid content was not determined. Significant relationship was found between total-phenol content and H-donor activity in both water and methanol extracts. The gelatinized products had the lowest values considering all determined parameter, and traditional plum jam proved to be the best.

In conclusion, traditional method for fruit concentrate (jams) preparation requires long time, however, this method preserved antioxidant content and antioxidant properties of jams, since it ensure relative low temperature during the whole process. Artificial gelatinization had disadvantageous effect in all studied parameter.

Connection between different raising system and antioxidant parameters in geese

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The profitability of animal production largely depends on how efficiently the animals utilize the feedstuffs for maintenance and production. This is markedly influenced by nutritional and keeping systems during the rearing period of animals. The energy and crude protein contents of the diets, and stocking density have great influence on metabolic processes, hormonal status and the redox system of the animals.

The physiological effect of different management techniques used in geese production is scarcely investigated. Several reports have been presented recently describing the biochemical effect of stocking density, however no literature data have been published concerning the influence of stocking density on antioxidant system of geese. The objective of this study was to investigate the connection between different nutritional and management technologies and antioxidant parameters of geese determining two plasma parameters.

540 Gourmaud liver type hybrids (representing both sexes) were included in the experiment, from 1 day to 64 day of age. At the start of the experiment two different stocking densities were used: 2.5 geese/m² (12 geese/cage) and 1.5 times higher, 3.8 geese/m² (18 geese/cage). Geese were fed with experimental diets with 11, 12 and 13 MJ/kg ME (low, medium and high) each contained 18, 20 and 22% CP in the starter, 16, 17.5 and 19% CP in the grower and 14, 15 and 16% CP in the finisher. Blood samples were taken from wing vein at the end of trial (9 wk of age). The tested plasma parameters for antioxidant status of geese were chemiluminescent intensity (CI) and radical scavenging capacity (RSC). Chemiluminescence assay in plasma was carried out by the method of Blázovics et al. (1999). Radical scavenging capacity of feed samples was determined in the presence of 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical as described Blois (1958).

The dietary metabolizable energy content had significant effect on antioxidant system of geese. Geese fed diet with highest energy content had increased radical scavenging capacity and the value of chemiluminescent intensity was the best. There was no connection between dietary crude protein content and the measured antioxidant parameters. The redox parameters were similar in male and female geese, there was no sexual differences. The stocking density had significant effect on radical scavenging capacity, however chemiluminescent intensity did not differ. At a stocking density rate of 12 birds per pen plasma radical scavenging capacity was significantly higher, 0.352 mmol/l, compared to 0.299 mmol/l value found in pen with 18 birds.