Genotypic, seasonal and maturity stage variability in antioxidant capacity of stone fruits

N Papp[1], B Szilvássy[1], P Pfeiffer[2], E Balogh[1], T Szabó[3], Z Szabó[4], J Nyéki[4], É Stefanovits-Bányai[1], A Hegedűs[2]

[1]Department of Applied Chemistry, Corvinus University of Budapest, Budapest, Hungary, [2]Department of Genetics and Plant Breeding, Corvinus University of Budapest, Budapest, Hungary, [3]Research and Extension Centre for Fruit Growing, Újfehértó, Hungary, [4]Institute for Extension and Development, University of Debrecen, Debrecen, Hungary

In Hungary, nutrition-related diseases (heart and vascular attacks, different types of cancer) are among the main causes of mortality. Several epidemiological studies suggested that consumption of fruits and vegetables can help in the prevention of these degenerative diseases. However, the statistics show that Hungarian people do not eat enough fruits and vegetables. One of the possible solutions would be the consumption of fruits with enhanced functional properties and higher levels of the required bioactive compounds. Although berry fruits are generally considered to contain outstanding levels of antioxidants, stone fruits are less known from this aspect. The aim of our examinations was to characterize the antioxidant capacity of stone fruits and to clarify the influencing effect of the genotype, ripening status and cultivation plot. In addition, we wanted to assess how the anthocyanin and vitamin C contents contribute to the antioxidant capacity of sour cherries.

In the present study, the antioxidant capacity was measured with ferric reducing ability of plasma (FRAP) and a photochemiluminescence method (ACW) in 11 sour cherry, 19 sweet cherry, 20 Japanese plum, 6 cherry plum and 6 apricot cultivars. In addition, the content of total phenolics (TPC), carbohydrate, vitamin C, monomeric anthocyanins and nutrient elements were also determined.

Cultivar averaged mean values of FRAP and TPC results were the highest in sour cherry, and the lowest in cherry plum. Variations between species were the highest in case of sour cherry and sweet cherry. Most of the sour cherries reached the FRAP values of raspberries, which characteristically contain high antioxidant capacity (5-6 mmol AS/L). A sour cherry cultivar reached the outstanding water-soluble antioxidant capacity value of blackberries and elderberries. This attracts attention to the alluring perspectives of this genotype. Correlations between the FRAP and ACW values were close ($r = 0,78$). In average, the sour cherry cultivars contained the highest amounts from several nutrient elements (e.g. Al, Cu, Fe, Mn etc.). The lowest element quantities were detected for Japanese plum cultivars. Levels of Al and K were outstanding in cherry plums. In case of some neurodegenerative diseases, patients should eat such fruits with lower contents of redox active metals (e.g. Japanese plums), because these patients should avoid these metals. We measured the glucose and fructose contents of sour cherries. The highest values of these two monosaccharides were detected in 'Cigány C404' and in 'Cigány 59' cultivars, while VN-07 contained the lowest levels from these sugars. The highest anthocyanin values were observed in fruits of cultivar candidates. Our analysis revealed a small difference between the lowest and highest vitamin C contents. Genetic background of cultivars forms the decisive factor in determining fruits' antioxidant capacity, although the cultivation plot and season may have also considerable modifying effects. Based on our results we can conclude that functional food products can be established from stone fruits.

This work was financed by the NKTH-OTKA K68921 grant.

Possible role of reactive oxygen species in the development of immunological tolerance

K Pazmandi, Z Magyarics, A Csillag, E Rajnavolgyi, A Bacsi

Institute of Immunology, University of Debrecen, Medical and Health Science Center, Debrecen, Hungary

Since plasmacytoid dendritic cells (pDCs) are professional antigen-presenting cells, they have an important role in the polarization of the adaptive immune responses toward inflammation or antibody production. As professional interferon type I producing cells, the pDCs also possess a significant antiviral function. Previously, the pDCs were thought to be found only in bone marrow, lymphoid organs and blood; however, recent studies have indicated that they can also be detected in inflamed tissues. The pDCs leaving blood circulation and entering peripheral tissues are affected by - in addition to many other factors - the reactive oxygen species produced by inflammatory reactions. The effects of oxidative stress on the functions of pDCs have not been examined yet.

Our goal was to investigate how oxidative stress can influence the viability, phenotypic characteristics and cytokine production of non-activated pDCs or those activated by Toll-like receptor 9 (TLR9) agonists. We also studied how the experimental oxidative stress conditions, which were used for pDCs, change the viability of other lymphoid and myeloid cells.

Cells were isolated from peripheral blood of healthy donors by the method of magnetic separation. The xanthine oxidase/xanthine (enzyme-substrate) system and hydrogen peroxide were used to create the conditions of oxidative stress. After treatment, the alterations in viability and the phenotypic changes of cells were detected by four-color flow cytometry. The levels of IFN-ĐIL-6 and TNF-α cytokines were measured in the supernatants of cell cultures by ELISA.

Our data demonstrate that pDCs are very sensitive to oxidative stress, because exposure to reactive oxygen species significantly decreases their viability, lowers the expression of all examined surface antigens (BDCA-2, HLA-DQ, BDCA-4) and reduces their cytokine production. Our results also indicate that oxidative stress eliminates the activating effects of TLR9 agonists on pDCs. We found that there are significant differences in the sensitivity of lymphoid and myeloid cells to oxidative stress. The lymphoid cells, similarly to pDCs, showed strong responses to oxidative stress, whereas myeloid cells did not.

Lowered expression of cell surface molecules and decreased cytokine production suggest that pDCs exposed to reactive oxygen species produced by inflammatory cells may induce immunological tolerance instead of adaptive immune response upon interaction with naive T-cells. This phenomenon may provide an opportunity for a new, dendritic cell based therapy, in which pDCs treated with reactive oxygen species *in vitro* can be used to create immunological tolerance to a certain antigen *in vivo*, for example in the treatment of autoimmune diseases or severe allergic inflammations.

Measurement of redox parameters in the blood plasma of dogs with renal disease

M Pétsch[1], P Ribiczeyné Szabó[1], T Gaál[1], B Szabó[2], J Jakus[2]

[1]Faculty of Veterinary Science, Szent István University, Budapest, Hungary, [2]Chemical Research Center, Hungarian Academy of Sciences, Budapest, Hungary

Renal disease is common in older dogs and cats, which can lead to cirrhosis and kidney failure. The symptoms appear several months after the onset of the disease when about 66-75% of the kidney tissue is irreversibly damaged. Many old dogs carry some degree of kidney disease, but its progress can be slowed down with an appropriate treatment. Correct diagnosis and therapy require the knowledge of the mechanism of the development of kidney disease and of the parameters, which may play important role during an effective treatment. In addition to previously described medical parameters, little is known about the molecules leading to oxidative stress in canine kidney failure.

Based on literature data, find redox parameters that can be useful during the treatment of kidney diseases. Methods: Blood samples of 60 healthy and 81 dogs with kidney disease (blood plasma creatinine concentration >140 μmol/L) were used to determine different redox and routinely measured laboratory parameters. Whole blood stationary free radical concentration was determined using electron spin resonance (ESR) spectroscopy. Malondialdehyde and hydroxynonenal were measured as markers of lipid peroxidation, while protein oxidation was assessed by production of carbonylated proteins. Some antioxidant parameters relevant in kidney disease were also determined: glutathione ratio, enzymatic activity of SOD, as well as FRAP (ferric reducing ability of plasma) and TAS (total antioxidant status).

Free radical concentration of whole blood was significantly higher in samples taken from dogs with kidney disease compared to those taken from healthy animals. Malondialdehyde on its own showed no differences between the two groups, only when measured together with hydroxynonenal, a significant raise in lipid peroxidation was observed in renal disease. Plasma protein carbonylation was significantly higher in the group presenting kidney disease. Within the measured antioxidants reduced glutathione showed differences between the two groups as its levels were higher in diseased dogs compared to their healthy counterparts, and the activity of SOD increased in the same samples as well.

Concentration of free radicals in the blood of dogs with kidney disease is higher than in healthy animals. Lipid peroxidation increased in blood plasma of dogs with kidney disease. Levels of protein carbonyls also increased in blood plasma of dogs with kidney ailment. An induction of the antioxidant mechanism was seen in the blood plasma of sick dogs.

Markers of oxidative stress could be observed in the blood samples of dogs with kidney disease. Question: in addition to an antioxidant rich diet, what other recommendations can be made to slow down the progression of kidney failure and to allow dogs to live as close to normal life as possible under the given circumstances?

This work has been supported by grants of the Hungarian Research Foundation OTKA 61566 and 49753.