Comparative study of oxidative stress parameters in critically ill patients

J Lantos[1], Cs Csontos[2], D Mühl[2], B Sütő[2], V Földi[2], B Rézmán[2], Gy Wéber[1], E Rőth[1]

[1]Department of Surgical Research and Techniques, University of Pécs, Medical School, Pécs, Hungary, [2]Department of Anaesthesia and Intensive Care, University of Pécs, Medical School, Pécs, Hungary

Free radical reactions play an important role in the pathohysiological changes in critically ill patients, but there are only few data available regarding to the dynamism of oxidative stress during treatment of critically ill patients. The purpose of this study was to follow and to compare the time course of oxidative stress during treatment of ICU patients.

Patients with burn injury (n=26), sepsis (n=14), polytrauma (PT) (n=13), and acute lung injury (ALI) (n=22) were involved in the study. Blood samples were taken from patient on admission, and on the following 3-5 days. Concentration of malondialdehyde (MDA), reduced gluthation (GSH), protein sulfhydril (PSH) groups, the activities of superoxide dismutase (SOD), catalase (CAT) and myeloperoxidase (MPO) enzymes were measured spectrophotometrically. Production of reactive oxygen species (ROS) in whole blood was measured by luminol dependent chemiluminescence following phorbol-myristate-acetate stimulation. Blood samples from healthy volunteers (n=9) served as the control.

While the white blood cell count significantly decreased in burned patients during the treatment, it remained on high level in the other groups. Marked granulocytosis and lymphocytopenia was observed initially in all groups that started to normalize only in burned patients from the day 4. ROS production was significantly elevated in septic and ALI patients from admission, but in burned and PT patients it rose significantly from day 3. Plasma MDA level significantly exceeded the control values, peaking on the days 2 and 3 in all groups. Plasma MPO level was significantly elevated in burned, septic and ALI patients from admission, but in PT patients it rose significantly from day 4. PSH level was significantly reduced in septic patients from admission, and in burned and PT patients from the day 2 and 3. GSH level significantly decreased in burned, PT and ALI patients from the day 2 and 3, while in septic patients it stagnated on a low level during the observation period. SOD enzyme activity was below the level of healthy population in most of the patients group, while catalase enzyme activity significantly exceeded it in all groups.

Significantly elevated levels of pro-oxidant markers with parallel decrease in endogenous antioxidants confirmed the presence of marked oxidative stress in critically ill patients. Time course of changes in oxidative stress parameters diverged markedly in critically ill patients mirroring the pathohysiological changes in different diseases. The significant differences in some oxidative stress parameters in survivor and non-survivor patients may have prognostic value.

The work was supported by the OTKA K060227 grant.

Fatty acid composition of human milk in Hungary with special attention to trans fatty acids

V K Lebovics, M Kontraszti, A Lugasi

National Institute for Food Hygiene and Nutrition, Budapest, Hungary

Survey of fatty acid composition of 66 human milks obtained from 19 counties and Budapest, Hungary was performed in a research project supported by the Scientific Council for Health, Hungary. The selection of pregnant women was met all the requirements of WHO/GEMS Food representative sampling protocol, which was performed by the National Institute for Food and Nutrition Science (NIFNS) with the cooperation of health visitors on the basis of several hundred questionnaires. Human milk samples were collected from mothers below 30 years having first partum and had been living for 5 years in the same place. Country representative samples were collected within 2-8 weeks following the delivery with the help of health visitors and were transported to laboratory of NIFNS. The analysis of fatty acid composition, included trans-fatty acids was performed by gas chromatography.

In Hungary, this kind of monitoring was the first one. The total fat content of the samples was in the range of 0.3-6.2 g/100 g. 10 samples were close to the average fat content (4 g/100g) published in the Hungarian food composition table. Fifty-four samples had lower while two samples had higher fat content. The range of saturated fatty acids (SFA) (C8:0, C10:0, C12:0,

C14:0, C16:0, C17:0, C18:0) in total fatty acids was between 37.5-78.3%. In eleven counties six samples had 2-16% more saturated fatty acids than the average 44% published in Hungarian food composition table.

The percentage of the monounsaturated fatty acids (MUFA) as C14:1, C16:1, and C18:1 was in the range of 13.2 and 43.5. The ratio of polyunsaturated fatty acids (PUFA) including C18:2n-6, C18:3n-3, C18:3n-6, C20:3n-6, and C20:4n-6 was between 6.9 and 25.5%. The level of essential linoleic acid showed a very wide range as 6.9 and 23.7% in total fatty acids while the ratio of linolenic acid was in the range of 0-1.3%.

Among the trans fatty acids (TFA) elaidic acid (C18:1n-9t) originated from the hydrogenated vegetable oils and the linoleic-acid isomers as C18:2t9,t12, C18:2c9,t12, C18:2t9,c12 of ruminant origin could be identified. The ratio of elaidic acid in total fatty acids was 0.07-5.04% that means 0-150 mg elaidic acid in 100 g milk fat calculated on the base on fat content. In one sample 174 mg elaidic acid in 100 g milk was measured. The ratio of C18:2 isomers in total fatty acids was below 0.7%.

During the lactation, the fat composition of the human milk is highly influenced by the fatty acid composition of the diet. Data of this survey shows that the much higher level of SFA, the lower values of MUFA and PUFA, as well as the essential fatty acids in the human milk are due to unhealthy diet. The appearance of TFA in human milk is due to the consumption of foods containing hydrogenated vegetable oils one day before sample collecting. According to a national survey done by NIFNS TFAs present in many industrially produced foodstuffs in Hungary, as well. The TFAs have adverse physiological effects on the development of new-borns; these fatty acids can cause irreversible metabolic changes. The TFAs are able to inhibit the formation of long chain PUFAs as arachidonic and docosahexanoic acids which are inevitable during the brain development of the new-borns, as well as in the metabolic pathway of prostaglandins and thromboxans, the main responsible factors in balancing the blood viscosity and the formation of thrombus.

The research was supported by the Ministry of Health, Hungary (ETT 107/2006).

What do we know today about lycopene?

A Lugasi[1], Z Pék[2], S Brandt[1,3], Gy Györéné Kis[1,4], J Hóvári[1], L Helyes[2]

[1]National Institute for Food and Nutrition Science, Budapest, Hungary, [2]Szent István University, Institute of Horticultural Technology, Gödöllő, Hungary, [3]Szent István University, PhD School of Biology, Gödöllő, Hungary, [4]Szent István University, PhD School of Environmental Science, Gödöllő, Hungary

Lycopene is an acyclic carotenoid molecule that does not take part in the synthesis of beta-carotene because of the lack of beta rings. Lycopene is a very powerful antioxidant *in vitro* and *in vivo*, as well. Lycopene shows a marked preventive effect against certain cancer and cardiovascular diseases partly thanking to its antioxidant characteristics. Main dietary sources of lycopene are tomato and foods prepared with tomato, watermelon, red grapefruit and some other exotic fruits. Scientific observations have proved that agricultural practices and food industrial processes significantly determine the lycopene content of fresh or prepared foods. In the frame of a 10 years' cooperation with Szent István University Department of Horticultural Technology the National Institute for Food and Nutrition Science (NIFNS) have measured the lycopene content of at least two dozen tomato varieties, and investigated the effects of horticultural techniques and weather conditions on lycopene level of tomato fruits. It was also studied how food industrial processes and dish preparing techniques determine the lycopene level of food products, finally a functional food with increased lycopene level was prepared with the use of by-products of tomato industry. Dietary lycopene intake was estimated in two small groups of Hungarian population and based on the representative nutrition survey done by NIFNS in 2003-2004, a population based intake was also calculated.

It was proved that lycopene accumulates in the tomato fruit during ripening, the correlation between the colour index and lycopene content can be drawn by a second order equation. Since the optimal temperature for lycopene synthesis is between 16-21°C, significantly lower level of lycopene by 25-30% could be detected in fruits directly exposed to sunlight having higher surface temperature than in that being in the shadow of leaves and having lower surface temperature. Significantly different lycopene levels were observed in different tomato varieties, the highest level (9,55-13,4 mg/100 g) was observed in industrial cultivars, middle values were in fruits of eating varieties harvested in green house (7,0-8,3 mg/100 g), while the lowest levels (4,90-8,02 mg/100 g) could be detected in tomato cultivars for fresh consumption harvested in open air. It was established that several factors including harvesting date or more punctually the weather conditions 5-10 days before the harvesting, the water-stress, the increased CO_2 level, and the grafting significantly modify the lycopene level of berries. Based on the consumption data the lycopene intake was estimated in a children's (n=502) and an adult's (n=205) group as 2.98±4.71 mg/capita/day, and 4.24±8.47 mg/capita/day, respectively. Data showed very big differences among subjects. Using the data