

The Effect of Bisphenol A and Its Selected Analogues on Antioxidant Enzymes Activity in Human Erythrocytes

Authors : Aneta Maćczak, Bożena Bukowska, Jaromir Michałowicz

Abstract : Bisphenols are one of the most widely used chemical compounds worldwide. They are used in the manufacturing of polycarbonates, epoxy resins and thermal paper which are applied in plastic containers, bottles, cans, newspapers, receipt and other products. Among these compounds, bisphenol A (BPA) is produced in the highest amounts. There are concerns about endocrine impact of BPA and its other toxic effects including hepatotoxicity, neurotoxicity and carcinogenicity on human organism. Moreover, BPA is supposed to increase the incidence the obesity, diabetes and heart disease. For this reason the use of BPA in the production of plastic infant feeding bottles and some other consumers products has been restricted in the European Union and the United States. Nowadays, BPA analogues like bisphenol F (BPF) and bisphenol S (BPS) have been developed as alternative compounds. The replacement of BPA with other bisphenols contributed to the increase of the exposure of human population to these substances. Toxicological studies have mainly focused on BPA. In opposite, a small number of studies concerning toxic effects of BPA analogues have been realized, which makes impossible to state whether those substituents are safe for human health. Up to now, the mechanism of bisphenols action on the erythrocytes has not been elucidated. That is why, the aim of this study was to assess the effect of BPA and its selected analogues such as BPF and BPS on the activity of antioxidant enzymes, i.e. catalase (EC 1.11.1.6.), glutathione peroxidase (E.C.1.11.1.9) and superoxide dismutase (EC.1.15.1.1) in human erythrocytes. Red blood cells in respect to their function (transport of oxygen) and very well developed enzymatic and non-enzymatic antioxidative system, are useful cellular model to assess changes in redox balance. Erythrocytes were incubated with BPA, BPF and BPS in the concentration ranging from 0.5 to 100 µg/ml for 24 h. The activity of catalase was determined by the method of Aebi (1984). The activity of glutathione peroxidase was measured according to the method described by Rice-Evans et al. (1991), while the activity of superoxide dismutase (EC.1.15.1.1) was determined by the method of Misra and Fridovich (1972). The results showed that BPA and BPF caused changes in the antioxidative enzymes activities. BPA decreased the activity of examined enzymes in the concentration of 100 µg/ml. We also noted that BPF decreased the activity of catalase (5-100 µg/ml), glutathione peroxidase (50-100 µg/ml) and superoxide dismutase (25-100 µg/ml), while BPS did not cause statistically significant changes in investigated parameters. The obtained results suggest that BPA and BPF disrupt redox balance in human erythrocytes but the observed changes may occur in human organism only during occupational or subacute exposure to these substances.

Keywords : antioxidant enzymes, bisphenol A, bisphenol a analogues, human erythrocytes

Conference Title : ICLSBBE 2015 : International Conference on Life Science, Biomedical and Biological Engineering

Conference Location : Rome, Italy

Conference Dates : December 03-04, 2015