Nowadays, the human population is exposed to many xenoestrogens including endocrine disrupting compounds. These substances are not naturally occurring in the environment and are capable of disrupting metabolism or hormone biosynthesis. The increase of human exposure to these compounds results from progressive urbanization and industry development. Among these chemicals we can distinguish group of brominated flame retardants (BFRs). These compounds are applied in many branches of industry such as electronics, electrical engineering, construction, mining, furniture, transport and textile. Brominated flame retardants represent 25% of global demand of flame retardants. In this group, tetrabromobisphenol A (TBBPA) is used in the highest amount. It was estimated that in 2004 the annual production of TBBPA reached 170 thousand tonnes. Nowadays, the production of other flame retardants such as tetrabromobisphenol S (TBBPS) is realized as an alternative to TBBPA, as well as production of BFRs such as bromphenols, including 2,4-dibromophenol (2,4-DBP), 2,4,6-tribromophenol (2,4,6-TBP) and pentabromophenol (PBP). The production of 2,4,6-TBP was estimated to be 9.5 thousand tones in 2001, while there is lack of data concerning production of other above mention compounds. Among discussed BFRs, TBBPA is the best studied. It is considered that this compound has adverse effects on the environment and living organisms.

The negative impact of brominated flame retardants is related to the possibility of migration of these compound from the products, in which they were used into the environment. TBBPA has been identified in environmental samples such as soil, water and air. In addition, the presence of TBBPA has been noticed in humans and animals. These data indicate the widespread exposure of humans to BFRs, what have been confirmed by numerous studies showing the presence of TBBPA in breast milk, adipose tissue or serum of both environmentally and occupationally exposed individuals.

The Applicant's preliminary results suggest that these compounds cause hemolysis of human erythrocytes and oxidize hemoglobin. It has been observed that the compounds studied change the activity of antioxidative enzymes such as catalase, superoxide dismutase and the level of low molecular weight antioxidant - reduced glutathione.

The project consists of 10 basic experiments to determine the mechanism of damage to the structure and function of the cell membrane, including assessment changes in membrane fluidity at various depths, examination of conformational changes of proteins by determining the W/S parameter (EPR) and changes in the secondary protein structure using circular dichroism of the selected protein, assessing the osmotic resistance and internal viscosity of the cell, the level of thiol groups, oxidative damage to proteins and lipids, Na^+/K^+ ATPase activity and intracellular ATP level.

The aim of the project is to investigate how selected brominated flame retardants affect the structure and function of the human erythrocyte membrane. The cell membrane is the first barrier that has to be overcome by xenobiotics entering the cell. Changes in the properties of cell membranes may be involved in the development of many diseases including anemia, diabetes, heart disease or cancer. It has been proven that some of the compounds discussed, i.e. TBBPA, may lead to cancer induction, therefore understanding the mechanism of action of the brominated flame retardants on erythrocytes membrane, which is a very good research model appears to be fully justified. The obtained results will contribute to the assessment of BFRs cytotoxicity, which due to their wide use and the lack of a sufficient number of toxicological studies is crucial to demonstrate the safety (or not) of using of the discussed chemicals and the justification within the results obtained in the recent studies for the replacement of TBBBA with another retardant, i.e. TBBBS.