

Butylparaben induces oxidative stress mediated cytotoxicity in humans: An *in vitro* and *in silico* study

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The present study was designed to elucidate butylparaben; a phenolic preservative exerted cytotoxicity with special emphasis on its pro-oxidant effect as an underlined mechanism in human blood. We hypothesize that oxidation of butylparaben by peroxidases may produce reactive quinone intermediates of the compound which may induce free radical chain reactions triggering deleterious events of cell death. To experimentally address this hypothesis, we treated human blood with various concentrations (50-250 µg/ml) of butylparaben and the levels of lipid peroxidation (LPO) along with glutathione (GSH) content and catalase (CAT) activity were assessed. Butylparaben was found to elevate LPO level by suppressing the antioxidant system (GSH content and CAT activity) significantly ($p < 0.001$) at all the tested concentrations. The stress induced by butylparaben may impart oxidative injury to the biomembranes leading to cytotoxicity which was studied in isolated erythrocytes. We found that, butylparaben exposure induced several morphological abnormalities (Heinz body, echinocyte and ghost membrane formation) and hemolysis in human erythrocytes. An endogenous oxidant of erythrocytes, H_2O_2 was selected to further evaluate the mechanism of butylparaben-induced hemolysis. The results showed that both the compound follows same mechanism of toxicity as the patterns of hemolysis were highly correlated. Along with that increase in blood LPO was also well correlated with the butylparaben-induced hemolysis confirming the role of oxidative stress in the cytotoxicity. Binding modalities of butylparaben with erythrocyte proteins (haemoglobin, catalase and glutathione peroxidase) were inspected using molecular docking tool, which showed presence of various hydrogen bonds and steric interactions of the compound with the proteins.

Biography

Komal Shah is a post-doctoral fellow in the Department of Zoology, Gujarat University, Ahmedabad, Gujarat, India. She has completed her doctoral studies in Life Sciences (specialization-toxicology) at the age of 26 from the same department. She is having six years of research experience in the field of toxicology research. She has number of international publications and won many national and international best paper awards in the same field. She has also been awarded various fellowships for her doctoral and post-doctoral studies.

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