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Screening cytotoxic potential of henna based hair dyes using human red blood cells

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Intensive usage of commercial hair dyes all over the world may lead to wide variety of health and environmental problems. Direct contact of hair dyes with the human skin may initiate toxic effects on human cells. Commercially available 'henna based hair dyes' are considered as less toxic but scientifically based studies on assessing toxicity of these dyes are limited. The present study was conducted to screen potential cytotoxicity of three selected henna based hair dyes on human red blood cells (RBC) *in vitro* using hemolysis assay. Mostly used henna based commercial hair dyes were purchased from the market. The hemolysis assay was performed by separating serum of the centrifuged blood samples and diluting the RBCs to 20% by adding phosphate buffered saline solution (pH 7.4). The diluted red blood cell suspensions were mixed with commercial hair dye solutions (final dye concentrations 0, 0.05, 0.1, 0.2, 0.4, 1.0 mg/mL) and the mixtures were incubated at 37^{O}C. The incubated RBC samples were centrifuged and the absorbance of supernatants were measured at 540 nm to determine percentage hemolysis. The potential associations between dye concentration and hemolysis potential were analyzed using Pearson's correlation test ($P < 0.05$). Triton X -100 (0.1%) and phosphate buffer solution (pH 7.4) were used as the positive control and the negative control respectively. Results showed significant positive correlations ($P < 0.05$) between hemolysis (%) and the hair dye concentration in all three hair dyes indicating concentration dependent cytotoxic response on red blood cells. The results may indicate potential health impacts associated with these henna based commercial hair dyes during direct applications at high doses. Further toxicity assessments especially in relation to cytogenetic effects are warranted considering human health.

Keywords: Cytotoxicity, Hemolysis assay, Henna hair dyes