

## MIGRATION OF TOLUENE INTO ARTIFICIAL SALIVA FROM NATURAL RUBBER LATEX BALLOONS MARKETED IN SRI LANKA

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Among organic hazardous substances, toluene is recognized for its hazard potential due to its ability to cause reproductive defects, neurological damage and act as a central nervous system depressant. Toluene contamination has been reported in many consumer products, including children's toys and childcare articles. Since balloons are one of the most popular toy items used by children, a detailed scientific study was done to uncover the toluene contamination in balloons. In the current study, eight different brands of natural rubber latex balloons available in the Sri Lankan market were analysed under three categories; imported, local large scale and local small scale manufactured balloons. Each brand was assessed for the presence of toluene by carrying out migrations using an artificial saliva solution at pH 6.8. The resulting solution was repeatedly extracted with dichloromethane, concentrated and subsequently analysed by the gas chromatography-mass spectrometry technique (GC-MS).

The migration of toluene was observed in six out of the eight brands utilized for the study. A point of interest was that toluene migration was almost restricted to local small scale manufactured brands and imported brands of balloons. In almost all cases, the level of toluene exceeded the maximum migratory limit of 2 mg/litre of aqueous migrate, set by the EN 71-9 standard. This corresponded to a variation of toluene level between 0.15 to 0.37 mg/g of the balloon.

Factors affecting the level of toluene migration from the balloon samples were evaluated. They were, the effect of part of the balloon mouthed, storage time of balloons, effect of mouthing conditions and colourants added to balloons. Toluene migration from the neck of the balloons was approximately two times higher than a sample of whole balloons of equivalent weight. It was also observed that the top one inch portion of a balloon contributes approximately to one-third of the toluene migration from the entire balloon. The migratory level decreased as the balloons were stored for a longer time period from the date of manufacture. At the end of an eight month period, the toluene level decreased by more than half of the initial amount. A higher level of toluene migration was observed when the balloons were subjected to mechanical agitation, in order to mimic active mouthing conditions. The observed levels were approximately two times higher than the values observed under stationary conditions. Kruskal-Wallis tests were performed using the MINITAB 14.0 statistical software for toluene levels corresponding to each test criterion; agitated vs. stationary conditions, whole balloon vs. neck of the balloon and at two month intervals. The tests indicated that the values being compared varied significantly under the different conditions employed ( $p \leq 0.05$ ). Another principal revelation of the study was the absence of toluene in colourant free balloon samples, when coloured and non-coloured balloon samples from the same batch of production were subjected to analysis. The results indicated that the presence of toluene can be linked to various solvent based colourants used during balloon manufacturing.