Identification of non-regulated aromatic amines of toxicological concern which can be cleaved from azo dyes used in clothing textiles.

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Abstract

Azo dyes in textiles may release aromatic amines after enzymatic cleavage by skin bacteria or after dermal absorption and metabolism in the human body. From the 896 azo dyes with known chemical structure in the available textile dyes database, 426 azo dyes (48%) can generate one or more of the 22 regulated aromatic amines in the European Union in Annex XVII of REACH. Another 470 azo dyes (52%) can be cleaved into exclusively non-regulated aromatic amines. In this study, a search for publicly available toxicity data on non-regulated aromatic amines was performed. For a considerable percentage of non-regulated aromatic amines, the toxicity database was found to be insufficient or non-existent. 62 non-regulated aromatic amines with available toxicity data were prioritized by expert judgment with objective criteria according to their potential for carcinogenicity, genotoxicity, and/or skin sensitization. To investigate the occurrence of azo dye cleavage products, 153 random samples of clothing textiles were taken from Swiss retail outlets and analyzed for 22 high priority non-regulated aromatic amines of toxicological concern. Eight of these 22 non-regulated aromatic amines of concern could be detected in 17% of the textile samples. In 9% of the samples, one or more of the aromatic amines of concern could be detected in concentrations >30 mg/kg, in 8% of the samples between 5 and 30 mg/kg. The highest measured concentration was 622 mg/kg textile. There is an obvious need to assess consumer health risks for these non-regulated aromatic amines and to fill this gap in the regulation of clothing textiles.

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