

Characterization of Formaldehyde Exposure Resulting from the Use of Four Professional Hair Straightening Products.

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Abstract

An exposure simulation study was conducted to characterize potential formaldehyde exposures of salon workers and clients during keratin hair smoothing treatments. Four different hair treatment brands (Brazilian Blowout, Coppola, Global Keratin, and La Brasiliana) were applied to separate human hair wigs mounted on mannequin heads. Short-term (6–16 min) and long-term (41–371 min) personal and area samples (at distances of 0.5 to 3.0 m from the source) were collected during each treatment for the 1-day simulation. A total of 88 personal, area, and clearance samples were collected. Results were analyzed based on task sampling (blow-dry, flat-iron), treatment sampling (per hair product), and time-weighted averages (per hair treatment, four consecutive treatments). Realtime monitoring of tracer gas levels, for determining the air exchange rate, and formaldehyde levels were logged throughout the simulation. Bulk samples of each hair treatment were collected to identify and quantify formaldehyde and other chemical components that may degrade to formaldehyde under excessive heat. Mean airborne concentrations of formaldehyde ranged from 0.08–3.47 ppm during blow-dry and 0.08–1.05 ppm during flat-iron. During each treatment, the mean airborne concentrations ranged from 0.02–1.19 ppm throughout different zones of the salon. Estimated 8-hr time-weighted averages for one treatment per day ranged from 0.02 ppm for La Brasiliana to 0.08–0.16 ppm for Brazilian Blowout. For four treatments per day, means ranged from 0.04–0.05 ppm for La Brasiliana to 0.44–0.75 ppm for Brazilian Blowout. Using all four products in one day resulted in estimated 8-hr time-weighted averages ranging from 0.17–0.29 ppm. Results from bulk sampling reported formaldehyde concentrations of 11.5% in Brazilian Blowout, 8.3% in Global Keratin, 3% in Coppola, and 0% in La Brasiliana. Other products that degrade into formaldehyde were detected in Global Keratin, Coppola, and La Brasiliana. The results of this study show that professional hair smoothing treatments—even those labeled “formaldehyde-free”—have the potential to produce formaldehyde concentrations that meet or exceed current occupational exposure limits.

Keywords: beauty salon, Brazilian Blowout, formaldehyde, hair salon, hair straightening