

# Consumer Reports Test Methodology: Heavy Metals and Volatile Organic Compounds in Artificial Braiding Hair

## STUDY OBJECTIVES

The objectives of this study were to 1) determine the levels of heavy metals and volatile organic compounds (VOCs) in artificial braiding hair; 2) compare the exposure estimates from the analyses with both the available tolerable daily intake levels and identified levels of concerns in research; 3) use this information to inform the public about the occurrence and risks of these contaminants in artificial braiding hair; and 4) urge regulatory agencies to act to reduce heavy metal and VOC contamination in these products and the resulting human exposure.

## TESTED PRODUCTS

We tested 10 artificial braiding hair products and a total of 20 samples. We selected the products based on available marketplace data indicating availability and being among the most widely sold products. We purchased two or three samples of each product online at Amazon.com, Ebonyline.com, Sallybeauty.com, and Walmart.com.

## TEST APPROACH AND METHODOLOGY

Each sample was blind-coded and shipped to an independent, accredited laboratory for heavy metal and VOC analysis.

The samples were prepared and analyzed for VOCs in accordance with the following method:

- Environmental Protection Agency method 8260C was used for VOC analyses; sample prep included weighing out 0.5-1 g synthetic hair and placing the sample in a VOA vial with a stir bar and 5 ml VOA-free water, then were sealed. Samples were then placed in a 100° C (212° F) hot water bath for 10 minutes. Vials were then removed and cooled to room temperature. Analysis of the water was then completed by method 8260C.
- The samples were prepared and analyzed for heavy metals (arsenic, cadmium, and lead) in accordance with the following method: 1 g of sample was digested with repeated additions of nitric acid and hydrogen peroxide. Hydrochloric acid was added to the digestate, and the

sample was refluxed prior to dilution to a final volume of 100 ml.

- Heavy metals were analyzed following EPA method 6020B using inductively coupled plasma mass spectrometry (ICP-MS).

The testing conformed to the quality control criteria and performance requirements set in the cited official methods, as well as those in ISO 17025.

## DATA ANALYSES

We reported the average of the two samples tested of a product where two data points were available.

If VOCs or heavy metals were detectable but below the method limit of quantitation or LOQ, we recorded the result but assigned a positive designation for that sample. If VOCs or heavy metals were not measurable in any of the samples tested of the product, we assumed a concentration of zero for all the samples of that product for VOCs or heavy metals.

## RISK ASSESSMENT

We estimated the intake of VOCs or heavy metals for a U.S. adult over 24 hours of exposure to each product and, where appropriate and applicable, compared the intake estimates with the exposure limits in the table below.<sup>1,2</sup>

**TABLE: Health-Based Exposure Limits Selected for Risk Assessment**

Chemical		
Lead	OEHHA MADL ug/d	0.5
Acetone	ASTDR MRL	0.6 mg/kg/d

OEHHA MADL = Office of Environmental Health Hazard Assessment Maximum Allowable Dose Level; ASTDR MRL = Agency for Toxic Substances and Disease Registry Minimum Risk Levels.

<sup>1</sup> Xue, J.; Zartarian, V.; Wang, S.; et al., "Probabilistic Modeling of Dietary Arsenic Exposure and Dose and Evaluation with 2003-2004 NHANES Data," *Environmental Health Perspectives*, 118, no. 3 (2010): 345-35.

<sup>2</sup> "Regional Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments," *Environmental Protection Agency*, <https://www.epa.gov/risk/regional-guidance-handling-chemical-concentration-data-near-detection-limit-risk-assessments>.