Rooting out skin creams that contain toxic mercury

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As countries try to rid themselves of toxic mercury pollution, some people are slathering and even injecting creams containing the metal onto or under their skin to lighten it, putting themselves and others at risk for serious health problems. To find those most at risk, scientists are reporting today that they can now identify these creams and intervene much faster than before. They're speaking at the 248th National Meeting & Exposition of the American Chemical Society (ACS).

"In the U.S., the limit on mercury in products is 1 part per million," says Gordon Vrdoljak, Ph.D., of the California Department of Public Health. "In some of these creams, we've been finding levels as high as 210,000 parts per million—really substantial amounts of mercury. If people are using the product quite regularly, their hands will exude it, it will get in their food, on their countertops, on the sheets their kids sleep on."

Identifying the toxic products has been a slow process, however. So, Vrdoljak turned to an instrument that uses a technique called total reflection x-ray fluorescence. He found that the machine can screen product samples for mercury content far more efficiently, and just as accurately, as its well-established but time-consuming counterpart. That means the team he works with and others around the country will be able to identify the sources of mercury poisoning and help those affected much faster than before.

"Testing one product using the old technique could take days," he said. "Using the new instrument, I can run through 20 or 30 samples in a day

quite easily. By identifying those products that contain mercury, we can direct people to remove them and clean up their households."

Although the metal does lighten skin, dark spots and even acne, research has shown that the silvery liquid can cause a number of health problems, including lower cognitive functioning, kidney damage, headaches, fatigue, hand tremors, depression and other symptoms. As a result, the U.S. and many other countries have set low limits on or have banned mercury in consumer products.

But demand is high among certain populations for these skin-lightening products. People bring them into the U.S. in their personal luggage from other regions where the creams are popular, including Asia, Central America, the Middle East and Africa, Vrdoljak explains. Then they distribute the creams to friends and families or sell them through small ethnic stores—off the regulatory radar.

When cream users start noticing hand shaking, headaches and other symptoms, they visit their doctors. Through a urine test, they can find out whether they have high levels of mercury. In these cases, Vrdoljak says his team can step in. They analyze dozens of bottles and containers from the patients' homes to root out the products that contain mercury. Their work has led to two product recalls earlier this year, but often, they find the cosmetics are homemade and come in unmarked containers.

"In the U.S., it's hard to gauge how much of these products are being used," Vrdoljak says. "But at least with this new technique, we can identify them much faster and help more people than before."

More information: Title: Comparison of XRF, TXRF, and ICP-MS Methods for Determination of Mercury in Face Cream

Abstract

A number of reports by various regulators, media, and watchdog groups have identified numerous face cream products containing percent levels of mercury that are far in excess of the FDA regulatory limit of 1 ppm. The mercury is added to provide skin bleaching properties to the face cream, and poses a serious health risk to consumer through dermal exposure as well as inhalation of volatile forms of mercury in some of these products. This study describes the development of several different XRF and TXRF methods for determination of mercury in several face cream products containing non-detectable to percent levels of mercury, as well as a critical evaluation of each method and comparison of results to those from the more widely accepted ICP-MS method. For screening and identifying such products in the field, XRF is the method of choice as it involves direct analysis of the sample with analysis times on the order of one minute or less, and can readily detect the presence of mercury down to single ppm levels. Although calibration of the XRF analyzer using authentic standards yielded results that compared well to those from ICP-MS for homogeneous products, the results were more variable for products containing small crystals or chunks of inorganic mercury salts. For these products, more accurate quantification of mercury requires more time-consuming sample preparation with microwave digestion to provide a representative subsample for analysis, followed by either TXRF and ICP-MS analysis. The TXRF method uses an internal standard and requires no additional calibration, and gave results that compared well to those from ICP-MS. Although ICP-MS is often the method of choice for trace level determination of a variety of elements, it is the most expensive of all of these methods, has detection limits which are orders of magnitude lower than necessary for this application, involved the use of dilution factors on the order of 1,000,000, and gave erroneous results for two samples due to either cross contamination or carryover. Moreover, the inadvertent analysis of samples containing high levels of mercury via ICP-MS may lead to contamination of this equipment which is often used for trace level analysis. Given the prevalence of these products and their sale and use in

third world countries, it is recommended that portable XRF be used to screen for such products and XRF or TXRF methods

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