

Mercury added in skin-lightening products

Toxicological note

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Introduction

Skin-bleaching cosmetics with inorganic mercury have been used to suppress melanin production. Over the counter bleaching products recommended for fading discolorations due to melasma (hyperpigmentation), burns, and acne scars have been reportedly used in the whole face, with the purpose of fading skin tone. It is a practice with increasing prevalence around the globe, most notably in African countries and Afro-diaspora regions such as the Caribbean. Reports have also noted availability of products in several parts of the world (Copan et al., 2015).

This issue came to our attention during the workshop entitled: “Health Sector in the Implementation of the Minamata Convention”, held in Kingston, Jamaica, held on 18-19 October 2016, organized by the Sustainable Development and Health Equity PAHO Program. During the workshop, the use and associated health concerns of mercury-containing skin lightening products in the Caribbean were brought into discussion. This issue prompted the development of this note, which follows up from the WHO (2011) factsheet on skin lightening products.

In accordance with the World Health Assembly Resolution 67.11 on the “Public health impacts of exposure to mercury and mercury compounds: the role of WHO and ministries of public health in the implementation of the Minamata Convention”, PAHO recognizes the importance of mercury content investigation in skin lightening products in the region, especially to protect the population at risk and to promote mercury exposure reduction.

The purpose of this note is to raise awareness and to promote actions to further investigate current mercury content in skin lightening products acquired in the Caribbean region, pending availability of resources and projects. This note also aims to provide guidance to monitor and reduce exposures from this mercury source.

Potential collaboration among PAHO, the United Nations Industrial Development Organization (UNIDO), United Nations Environment Programme (UNEP) and other stakeholders could support the investigation of mercury content, particularly taking in consideration ongoing mercury inventory activities being developed through the Global Environment Facility (GEF) MIA Project in the Caribbean (Trinidad and Tobago, Jamaica, St Kitts and Nevis, St Lucia). It is possible to conduct the investigation of mercury content in skin lightening products using nuclear techniques of non-destructive analysis with the use of handheld XRF equipment, potentially available for that purpose.

Skin lightning products as source of exposure to inorganic mercury

Routes of mercury exposure associated with the use of skin lightening products may involve skin absorption and also inhalation of mercury vapors, particularly with prolonged use (WHO, 1991). Thus, these products may potentially affect not only the user, but also members of the household, who might be at risk of exposure through the direct contact with contaminated items or inhalation of mercury vapors released from the products (Copan et al. 2015).

Inorganic mercury-containing products have been found in the form of creams, serums, masks, toners, lotions, emulsions, gels, liquids, powders, deodorants, oils, soaps and sticks (Copan et al., 2015; Hamann et al., 2014). The products may be available through different channels, such as the internet, stores, swap meets and ethnic markets (Hamann et al., 2014). Studies showing high mercury concentration levels in these products have been published elsewhere (Table 1). Although the Food Drug Administration and the European Union limits are 1 and 70 ppm, respectively (Hamann et al., 2014), these studies have shown several mercury-containing products with levels well above these limits.

It is noteworthy that in the context of dermal absorption, exposure intake assessment is influenced by several factors including physicochemical characteristics of the compounds under consideration; considering solvents in use; amount of product available on the skin; and consequently the kinetics of absorption; skin sensitization; efficiency of skin washing, and user behavior, i.e., frequency, duration and intensity of product use. Thus, the precise rate of dermal absorption of skin lightening products is influenced by too many different factors, making inorganic mercury intake estimate through dermal route difficult to assess (WHO, 2014).

In a study conducted by the New York City Department of Health and Mental Hygiene, urine specimens from 1,840 adults were found to be at a geometric mean mercury concentration of 0.73 µg/L, with 13 women presenting concentrations between 20 µg/L and 50 µg/L. In comparison, the reported U.S. population average of mercury urine concentration is referred as 0.5 µg/L (Washam C., 2011).

Table 1: Mercury concentration in skin lighting products from different countries and publications.

Source	Mercury level range (ppm)	Origin
Minnesota Department of Health. 2011.	31-33,000	Unknown (products found available for purchase in the U.S.)
Peregrino CP, Moreno MV, Miranda SV, Rubio AD, Leal LO. 2011	878-35,824	Mexico
Hamann CR, Boonchai W, Wen L, Sakanashi EN, Chu CY, Hamann K, et al. 2014.	1729-42,875	China Jamaica Japan Philippines Thailand
Copan L, Fowles J, Barreau T, McGee N. 2015.	38,000-210,000	Mexico (products found available for purchase in the U.S.)

Health effects associated with inorganic mercury exposures

The use of skin lightening products with inorganic mercury can be harmful, as mercury can be easily absorbed through the skin. Inorganic mercury toxicity may lead to nephrotic syndrome, decreased renal output, renal failure, and other severe health effects, affecting different parts of the nervous, digestive, and immune systems, and organs, such as lungs, kidney, skin and eyes (WHO, 2003).

Onset and severity of health effects are associated with different exposure factors, such as level of mercury concentration in product, product compounds affecting solubility, skin characteristics, time length of exposures and others,; all affecting mercury distribution in the body. Thus, mercury poisoning symptoms do not follow a precise standard pattern, posing an additional challenge for appropriate diagnosis.

The renal system is critically affected following inorganic mercury exposure. Several cases have been reported of decreased renal function after prolonged use (between 2 months and 18 years) of products containing ammoniated mercuric chloride. Nephrotic syndrome has also been reported in users averaging 13 months of use, with a certain degree of remission after discontinued use (WHO, 2003).

The following cases were reported in California, between 2010 and 2014 (Copan et al. 2015):

- 20-month old child diagnosed with mercury poisoning presented a 52 µg/g mercury urine level, presenting symptoms such as refusal to walk, irritability, difficulty sleeping, and poor appetite. Contamination occurred through the mother, who used a skin lightening cream found to contain 38,000 ppm of mercury.
- A teenager presented levels of 208 µg/g creatinine from a 24-h urine. The patient presented symptoms such as weakness in legs, twitching of lower extremities, tongue, and lips; unsteady gait, delirium, agitation, sleep disturbances, profuse sweating, persistent tachycardia, and hypertension. Nine family members who were non-users also had elevated mercury levels. The cream used was found to contain 96,000-210,000 ppm.
- 39 year old woman presenting 482 µg/g creatinine; her 4 year old child had 107 µg/g creatinine. The cream used was analyzed, and found to contain 20,000 ppm-57,000 ppm.

Reference values and biomarkers

The Non-Observable Adverse Effects Levels (NOAEL) can be used for risk assessment. Adjusting from NOAEL for renal effects of 0.23 mg/kg body weight and dosing pattern to daily exposure, the tolerable intake for inorganic mercury compounds has been set to 2 µg/kg body weight per day (WHO, 2003). In persons not exposed to elemental or inorganic mercury, urine concentrations rarely exceed 5.0 µg/g creatinine (WHO, 2010). In a study quoted by Peregrino et al., 2011, mercury concentrations in urine greater than 20 µg/L were observed in association with symptoms of mercury poisoning. Observed symptoms included fatigue, weakness, insomnia, myalgias of extremities, and severe headache.

Social relevance

The use of mercury-containing skin-lightening products is a multi-faceted issue with potential severe implications. Perceived severity of early symptoms by health practitioners and exposed individuals may affect the development of exposure investigations, adding another barrier to proper diagnosis. Other implications of skin-bleaching are tied to cultural and psychosocial factors.

The historic colonialism and enslavement, idealization of European beauty standards, and barriers of social and economic mobility are reasons that could explain the phenomenon (James et al. 2015). In addition, the practice of skin bleaching is more prevalent among women, who aim to gain acceptance by the opposite sex by mirroring the European ideals of beauty. James et al. (2015) also describes the use of skin-lightening creams in association with trauma and childhood physical and sexual abuse, especially among women, which are often under vulnerable conditions and prone to depression and traumatic experiences.

Recommendations

Protection measures such as the regulation of manufacturing, import and export of mercury-containing skin lightening products, with appropriate label should be implemented and enforced. Regulatory measures with adequate enforcement will assist on mitigating this source of mercury exposure. Furthermore, analysis and regular testing of skin lightening products to monitor mercury levels to ensure compliance with adequate legislation and safety is recommended.

Awareness raising among consumers and health practitioners on the potential health hazards of skin lightening products may decrease the risk of inorganic mercury poisoning and ameliorate adverse health effects, in addition to improve diagnosis and exposure assessments. These measures are especially important to be taken where these products are widely used.

References and documents

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