HAYYAN JOURNAL
Vol. 2 No. 1, February 2025, page. 64-68
ISSN: 3046-6679

Assessing Toxic Levels in Facial Creams from Burung-Burung Traditional Market, Gowa

Subakir Salnus[1*]

[1]Department of Chemistry, Faculty of Mathematics and Natural Science, Universitas Negeri Makassar, Makassar, Daeng Tata Raya, 90244, Indonesia

Corresponding Address: : subakir.salnus@unm.ac.id

Received: December 22, 2024 *Accepted: January 11, 2025* *Online Published: February 05, 2025*

ABSTRACT

Facial cream is a skin care product that is widely used to improve appearance and overcome various skin problems. However, some unregistered products, especially those sold in traditional markets, can contain hazardous materials such as mercury. This study aims to identify the presence and levels of mercury in unregistered facial whitening creams sold in the Burung-Burung Traditional Market, Pattallassang District, Gowa Regency. Samples were analyzed using the Atomic Absorption Spectrophotometry (AAS) method. The results showed that five of the eight samples contained mercury exceeding the threshold set by BPOM RI, which is 1 mg/kg. This finding emphasizes the need for stricter regulation and supervision of cosmetic products to protect public health.

Keywords: Mercury, Whitening Cream, Cosmetics, Traditional Market, Skin Health, Regulation

I. INTRODUCTION

The use of facial creams has become increasingly prevalent in modern society, driven by the desire to enhance appearance and address various skin concerns. The pursuit of soft, bright, and healthy skin has fueled the growth of the cosmetic industry, with companies constantly innovating and releasing new skincare products (Katerina et al., 2023). This growing demand has led to a proliferation of cosmetic products in the market, ranging from high-end brands to more affordable options available in traditional markets. Traditional markets, while offering accessible and budget-friendly alternatives, often lack stringent quality control measures, raising concerns about the safety and composition of the products sold (Dwijayanti & Susanti, 2018).

Cosmetic products, particularly facial creams, are intended to improve skin health and appearance, but some may contain harmful substances such as mercury (Nurfadhilah et al., 2019). Mercury (Hg) is a heavy metal that is often misused in facial whitening creams because of its ability to inhibit melanin. However, its use is prohibited by BPOM RI and internationally due to serious health impacts such as nephropathy, neurotoxicity, and skin irritation. Previous studies in several areas, such as Banjarnegara (Harimurti et al., 2023) and Palu (Dwijayanti & Susanti, 2018), reported mercury content of up to thousands of µg/g in traditional facial creams.

Mercury exposure through whitening cosmetics is a profound global problem. A systematic study in 2022 showed that of 787 skin whitening products tested, the median mercury level reached 0.49 µg/g (IQR range: 0.02–5.9 µg/g), with human biomarker waste from users indicating continued exposure

(Bastiansz et al., 2022). These findings confirm that mercury is still common as an active ingredient in cosmetics even though it has been banned in various countries.

In the context of regulation, the Minamata Convention sets a maximum limit of 1 ppm (1 µg/g) for mercury in cosmetics. However, the ZMWG report in 2019–2021 noted that more than 56% of 166 skin lightening cream samples exceeded the safe limit (Zero Mercury Working Group, 2021). A similar situation was recorded in developing countries, including in Southeast Asia, where there are illegal cream distribution channels both through traditional and online markets.

In terms of health impacts, mercury used in whitening cosmetics is absorbed through the skin and can accumulate in the body, including in the kidneys, liver, and central nervous system. A recent review linked chronic exposure to neurological disorders, nephrotoxicity, and other behaviors such as tremors, memory loss, and skin irritation. Cases in pregnant women also showed high risks to the fetus, including fetal neurodevelopmental disorders.

Furthermore, global research reveals that rogue cosmetic manufacturers are still actively inserting mercury compounds into creams. A 2023 investigation uncovered the export of "ammoniated mercury" from suppliers in Europe and South Asia to illegal cosmetic manufacturers, despite awareness of related regulations (Environmental Investigation Agency, 2023). This indicates that the mercury supply chain for night cosmetics and herpes creams is still running despite being illegal.

Finally, socio-economic views also exacerbate the consumption of mercury-containing cosmetics. Cultural pressure factors—especially colorism—encourage the use of whitening creams that promise quick results. In fact, the side effects last a long time with serious consequences for the health and quality of life of users. Therefore, this study focuses on describing the levels of mercury in traditional facial creams at the Pattallassang Bu'rung Bu'rung Market, Gowa, as one of the important local geographic representations in the national context.

The purpose of this study is to present a description of the levels of mercury in 8 samples of facial creams taken from the Bu'rung Bu'rung Traditional Market in Gowa Regency.

III. METHODS

Materials and Equipment

This study employed a laboratory experimental method to examine the levels of the heavy metal mercury (Hg) in facial whitening creams available in the traditional Bu'rung Bu'rung Market, Pattallassang, Gowa Regency, using Atomic Absorption Spectrophotometry (AAS).

Research Design

Qualitative Analysis

The prepared sample, 3 drops, put each sample into a well bowl and add 2 drops of K_2CrO_4, then stir with a stirring rod slowly. Observe the color formed. The result (+) forms a yellow-orange color and (-) does not form a yellow-orange color.

Quantitative Analysis

Making a Standard Mercury (Hg) Solution

A 1000 mg/L mercury stock solution is made by weighing 1.3539 g of anhydrous $HgCl_2$, dissolving it in 1 M HCl and diluting it to the limit mark. Then it is diluted to 100 ppm. The standard solution is made from a 100 mg/L mercury stock solution by dipping 1 mL of the 100 ppm Hg stock solution. Then put it into a 100 mL measuring flask, and add distilled water to the limit mark. This solution contains a 1000 ppb mercury solution. Then from this stock solution, 1 mL was pipetted and put into a 10 mL measuring flask. The solution was adjusted with distilled water to the boundary mark. This solution contains 100 ppb mercury solution. Serial dilution into standard mercury solution with concentrations (ppb): 0: 10.00; 20.00 and 30.00 by pipetting each (mL) 0.00; 0.10; 0.20 and 0.30 of 100 ppb mercury solution. Then each was put into a 10 mL measuring flask and adjusted to the boundary mark with distilled water. This solution was then poured into a test tube and 0.1 mL of 5% $KMnO_4$ was added, shaken, another 0.1 mL of 10% hydroxylamine hydrochloride was added, shaken, and 0.5 mL of 10% $SnCl_2$ was added. Each of these solutions was then measured for absorbance at a wavelength of 253.7 nm with AAS.

Sample Preparation and Determination of Mercury (Hg) in Samples

Each whitening cream sample was weighed as much as 2 grams, then put into a 50 mL measuring flask. The measuring flask containing the sample was then heated using an electric bath at a temperature of 300 ° C until the cream was completely dissolved. After dissolving, 5 mL of concentrated nitric acid (HNO_3) was added to each sample, then the flask was closed and shaken slowly by inverting it to make it homogeneous. Next, 5 mL of concentrated hydrochloric acid (HCl) was added and homogenized again. The mixture was heated again using an electric bath for 2 hours at a temperature of 300 ° C. After the heating process was complete, the solution was filtered using Whatman filter paper no. 40. The filtrate obtained was then added with 20% nitric acid. The prepared samples were then analyzed using atomic absorption spectrophotometry at a wavelength of 253.7 nm.

IV. RESULTS AND DISCUSSION

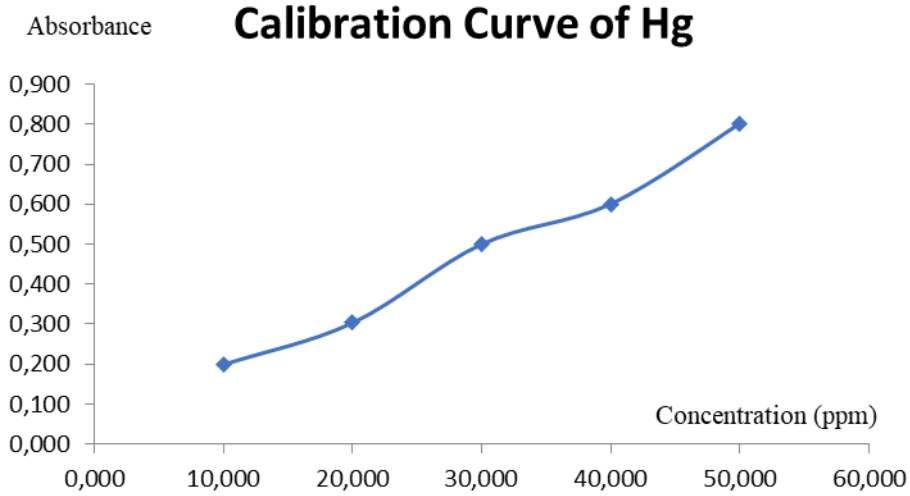
Qualitative analysis was carried out using potassium chromate reagent (K_2CrO_4), which produces a yellow-orange precipitate. This reaction shows that when mercury (Hg) reacts with K_2CrO_4, a yellow-orange precipitate of $HgCrO_4$ will form. All samples of facial whitening cream analyzed showed positive results for this reaction, so it can be concluded that the samples contain mercury (Hg). Therefore, further quantitative analysis is needed to determine the levels of mercury contained in the samples. The visualization of the samples analyzed can be seen in Figure 1.

Figure 1. Sample of facial cream after preparation

The cream sample was destructed using concentrated acid solvent HNO_3, then heated until the precipitate disappeared and the solution appeared clear. After that, the solution was cooled and diluted with distilled water, then filtered. The destruct method used was wet destruction, because this method allows the determination of elements with low concentrations more accurately. Furthermore, standard mercury solutions were prepared with concentrations of 10 ppm, 20 ppm, 30 ppm, 40 ppm, and 50 ppm, and their absorbance was measured using an Atomic Absorption Spectrophotometer (AAS). The calibration curve of the standard solution at these concentrations produced a linear regression equation $y = 0.01552x + 0.01944$ with a correlation coefficient (r) value of 0.9988. This value indicates that there is a very strong linear relationship between concentration and absorbance, so that the measurement method can be said to be valid (Table 1).

Table 1. The calibration curve of the standard solution at varians concentrations

Concentration	Absorbance
0.0000	0.0013
10.0000	0.1823
20.0000	0.3428
30.0000	0.5015
40.0000	0.6279
50.0000	0.7884



Picture 2. Calibration curve of Hg

The results of the sample tests showed the presence of mercury compounds in the cream tested, as shown in Table 2. In sample code X1, the mercury content was calculated based on the concentration obtained from the instrument reading, which was -0.3053. In 0.5207 grams of sample X1, a mercury content of 0.0586 µg/g or equivalent to 5×10^{-11} mg/kg was found. In sample code X2, the instrument reading concentration was 0.6935, and in 0.5502 grams of sample, a mercury content of 0.1260 µg/g or 1.26×10^{-9} mg/kg was detected. Furthermore, in sample code X3, the instrument reading concentration was recorded at 14.5363, and in 0.5536 grams of sample, a mercury content of 2.6257 µg/g or 2×10^{-9} mg/kg was found. Sample code X4 shows a device concentration of 6.5129, with a mercury content in 0.5382 grams of sample of 1.2101 µg/g or 1×10^{-9} mg/kg.
In sample code X5, the device concentration is 0.3971, and in 0.5795 grams of sample a mercury content of 0.0685 µg/g or 6×10^{-1} mg/kg was found. For sample X6, with a device concentration of 3.8771 and using a dilution factor of 200 times, in 0.5833 grams of sample a mercury content of 132.9367 µg/g or 1.32×10^{-7} mg/kg was detected. Sample code X7 shows a device concentration of 36.6796, and with the same dilution factor, in 0.5482 grams of sample, a mercury content of 1338.1831 µg/g or 1.33×10^{-6} mg/kg was found. Finally, in sample code X8 with a device concentration of 48.2667, in 0.5102 grams of sample, a mercury content of 9.4603 µg/g or 9×10^{-9} mg/kg was found.

Sample code	Sample weight	Instrument Concentration	Mercury level (µg/g)	Description
X_1	0.5207	-0.3053	0.0586	Qualify
X_2	0.5502	0.6935	0.1260	Qualify
X_3	0.5536	14.5363	2.6257	Not eligible
X_4	0.5382	6.5129	1.2101	Not eligible
X_5	0.5795	0.3971	0.0685	Qualify
X_6	0.5833	3.8771	132.9367	Not eligible
X_7	0.5482	36.6796	1338.1831	Not eligible
X_8	0.5102	48.2667	9.4603	Not eligible

Based on the Regulation of the Food and Drug Supervisory Agency of the Republic of Indonesia Number HK.03.01.23.07.11.6662 of 2011, the requirement for the level of heavy metal mercury (Hg) in cosmetic products is no more than 1 mg/kg or 1 mg/L (1 ppm). The decision of the Indonesian government to limit the use of this active ingredient is based on safety considerations, considering that whitening creams containing mercury can cause toxicity to various organs of the body. Based on the data presented in Table 4.1, of the eight whitening cream samples examined, there were three samples that met the requirements, namely with codes X1, X2, and X5, because their mercury levels did not

exceed the maximum limit set. Meanwhile, the other five samples, namely X3, X4, X6, X7, and X8, had mercury levels that exceeded the threshold permitted according to BPOM standards. Therefore, the five samples were declared ineligible and unfit for use.

V. CONCLUSION

The study found that of the eight facial cream samples tested, five of them contained mercury exceeding the limits permitted by BPOM RI. This fact shows the need for stricter supervision of the distribution of cosmetic products in traditional markets. The public also needs to be educated about the dangers of mercury in skincare products to prevent long-term health risks.

VI. REFERENCES

Abbas, H. H., Sakakibara, M., Sera, K., Nurgahayu, & Andayanie, E. (2020). Mercury Exposure and Health Problems of the Students Using Skin-Lightening Cosmetic Products in Makassar, South Sulawesi, Indonesia. *Cosmetics, 7*(3), 58. https://doi.org/10.3390/cosmetics7030058.

Bamidele, O.D., Kayode, B.A., Eniayewu, O.I. *et al.* Quality assessment of hydroquinone, mercury, and arsenic in skin-lightening cosmetics marketed in Ilorin, Nigeria. *Sci Rep* **13**, 20992 (2023). https://doi.org/10.1038/s41598-023-47160-2

Bastiansz, A., Ewald, J., Rodríguez Saldaña, V., Santa-Rios, A., & Basu, N. (2022). A Systematic Review of Mercury Exposures from Skin-Lightening Products. Environ Health Perspect. *Environmental Health Perspectives*, 130(11), 116002. doi: 10.1289/EHP10808.

Dwijayanti, Endah & Susanti, Susanti. (2018). Analysis of Mercury (Hg) in Whitening Cream Distributed in Palu City by Atomic Absorption Spectroscopy. *Journal of Applied Chemical Science*: 5. 430-433. 10.22341/jacs.on.00501p430.

Environmental Investigation Agency. (2023). *Mercury in skin-lightening products: Supply chain analysis*. EIA Report. eia.org

Harimurti, S., Deriyanti, A. M. I. S., Widada, H., Primasari, D., & Sukamdi. (2023). *The Analytical Survey of Mercury Content in Whitening Cream Sold in Banjarnegara Regency's Traditional Market*. Journal of the Turkish Chemical Society Section A: Chemistry, 10(1), 39–46. https://doi.org/10.18596/jotcsa.1151307

Katerina, Angel & Simanjuntak, Anisa & Terenggana, Candra & Tyra, Maria. (2023). The effect of brand awareness and brand image on purchasing decisions for Scarlett whitening products. *Journal of Business and Information System*: 5. 11-18. 10.36067/jbis.v5i1.167.

Nurfadhilah, N., Wahyu, A., & Abbas, H. H. (2019). Pengaruh Penggunaan Kosmetik (Whitening Cream) Terhadap Kadar Merkuri (Hg) Pada Perawat Magang Program Studi Profesi Ners Universitas Muslim Indonesia. *Window of Health : Jurnal Kesehatan*, *2*(3), 206-217. https://doi.org/10.33096/woh.v2i3.643

Qudus, H. I., Purwadi, P., Holilah, I., & Hadi, S. (2021). *Analysis of Mercury in Skin Lightening Cream by Microwave Plasma Atomic Emission Spectroscopy (MP-AES)*. *Molecules*, 26(11), 3130. https://doi.org/10.3390/molecules26113130 mdpi.com+1pmc.ncbi.nlm.nih.gov+1

Sulaiman, R., Umboh, J. M. L., & Maddusa, S. S. (2020). *Analisis Kadar Merkuri pada Kosmetik Pemutih Wajah di Pasar Karombasan, Manado*. *Kesmas: Jurnal Kesehatan Masyarakat*, 9(5). ejournal.unsrat.ac.id+1journal.uta45jakarta.ac.id+1

Zero Mercury Working Group. (2021). *Mercury findings in skin-lightening products: Global survey*. ZMWG Report. zeromercury.org+1eeb.org+1

Wirtu, Y.D., (2024) A review of environmental and health effects of synthetic cosmetics. *Front. Environ. Sci.* 12:1402893. doi: 10.3389/fenvs.2024.1402893