

IDENTIFICATION OF MERCURY AND HYDROQUINONE CONTENT IN HANDBODY PRODUCTS CIRCULATING IN GORONTALO CITY

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ABSTRACT

This study aims to determine the presence of dangerous chemical compounds, namely mercury and hydroquinone in hand body preparations circulating in Gorontalo City. The method used in this study uses descriptive research with an observational approach and qualitative laboratory tests.

From the research results, 12 samples were tested for mercury (using NaOH and KI), 4 positive samples contained mercury and 8 negative samples contained mercury. 4 samples were marked by a yellow color change in the NaOH solution and a red color in KI solution and the 8 negative samples did not change color so that these samples did not contain harmful chemicals in the handbody.

From the results of the 12 samples that were subjected to the hydroquinone test (using FeCl₃) the results obtained were 2 positive samples containing hydroquinone and 10 samples not containing hydroquinone. The 2 positive samples were marked by a change in green color and had precipitate in the sample, whereas in the 10 samples the results obtained had no color change and had no precipitate in the sample tested.

Keywords: Handbody, Mercury, Hydroquinone

INTRODUCTION

The skin is the outermost organ that covers the human body which has many functions, including protecting the body from various things that can be harmful, as a sense of touch, and regulating body temperature. In general, people do skin care through the use of skincare. Currently, the type of skincare that is widely used by the public, especially women, is handbody products which are used as skin softeners so that the skin looks brighter and looks whiter, however, currently there are many skincare products circulating that contain heavy

metals [8]. Cosmetics are now an important need for humans. Cosmetics are not only used for aesthetic functions, but play a role in healing and skin care. Although not a primary need, however, cosmetics is a product that is used routinely and continuously by the public. Therefore, it is necessary to pay attention to the safety of cosmetics from hazardous ingredients, cosmetics are products that are formulated from various active ingredients and chemicals that will react when applied to skin tissue [4].

Cosmetics on the market today are made with various types of basic

ingredients and processing methods. According to the materials used and the method of processing, cosmetics can be divided into 2 (two) major groups, namely traditional cosmetics and modern cosmetics [2].

Cosmetics are any ingredients or preparations intended for use on the outside of the human body (epidermis, hair, nails, lips and external genitalia) or teeth and oral mucosa to clean, change appearance, protect and maintain the body in good condition. 1].

According to the records of the World Health Organization (WHO) presentation on the use of chemicals in 2019, there were 39 types of skincare which included 25 local product brands and 14 imported product brands that contained dangerous chemicals that could cause skin diseases caused by hand body skincare products which contained hazardous chemicals [2].

The main purposes of using cosmetics in modern society are for personal hygiene, to increase attractiveness through make-up, to increase self-confidence and feelings of calm, to protect the skin from ultraviolet rays, pollution and other environmental factors, to prevent aging, and in general to help a person become more youthful. enjoy and appreciate life [6].

If the basis of beauty is health, then the appearance of healthy skin is the part that we can see right away because the skin is the outermost organ of the body and functions as a covering for the body. Thus the use of appropriate cosmetics for the maintenance and care of the skin, make-up or decorative will be beneficial for health. Maintenance means to prevent the occurrence of abnormalities or the causes of these disorders, maintenance efforts mean to maintain the current good condition so that it does not turn bad. Maintenance and care cosmetics consist

of cleaning, moisturizing, protective, thinning, make-up or decorative, perfumery, and medical cosmetics [8].

The skin is the first organ to be polluted by substances found in our environment, including drenchic services (microbes) that grow and live in the natural world. Therefore, after humans are born, their skin is immediately contaminated by various drenchic acid. Many drenchic services live and live on the surface of human skin because of the suitable living conditions, be it temperature, humidity, or acidity (pH), or the food that drenchic services need comes from loose keratin cells (containing protein), fat on the surface of the skin which produced by the skin's palit glands (containing lipids) or water, salt, and sugar derived from eccrine or apocrine sweat glands [1].

Someone who uses cosmetic products is of course because of the attractiveness of the cosmetics they buy, for example the interest in the function of these cosmetics, the practicality of use, and the impact caused by using these cosmetics. Consumers must be selective in choosing cosmetic products so that the negative effects of using cosmetics such as facial skin becomes dull, pale, dry, cracked, and other effects can be avoided [7].

In Indonesia, the Food and Drug Supervisory Agency (BPOM) of the Republic of Indonesia, there are a number of skincare products, namely hand body preparations that contain hazardous chemicals such as mercury and hydroquinone that are not permitted by BPOM. During 2018, BPOM found 112 billion rupiah of illegal cosmetics and/or containing prohibited/hazardous ingredients. The illegal cosmetics found were dominated by skincare products containing mercury, hydroquinone and retinoic acid. Mercury, hydroquinone, and

corticosteroids are reported to be the main active ingredients in skin whitening products used in Indonesia, including handbodies [4].

Handbody can also be defined as a preparation with an aqueous medium that is used on the skin without rubbing. Usually it contains suspended insoluble substances, it can also be in the form of solutions and emulsions where the medium is water. It is usually mixed with glycerin to prevent drying effect, instead it is given alcohol to dry quickly when used and to give a cooling effect [3].

Mercury and hydroquinone materials contained in handbodies can cause changes in skin color, namely the occurrence of black spots on skin color, allergies and skin irritation. Use of mercury and hydroquinone at high doses can cause permanent brain damage and cancer. The mechanism of toxicity when using a handbody containing mercury and hydroquinone is that the material will be absorbed by the body through the skin so that exposure to mercury and hydroquinone will be absorbed by the skin topically.

The absorption of mercury and hydroquinone to the skin will occur through the trans-epidermal (epidermis) and trans-appendageal (sweat glands, sebaceous glands and hair follicles) routes. In trans-epidermal absorption, mercury and hydroquinone pass between cells (intercellular) or through the cell membranes (intracellular) of the stratum corneum. The use of mercury and hydroquinone when mixed into a hand body can cause unwanted side effects.

The side effects that will occur if you use mercury and hydroquinone ingredients in concocted handbodies are that they will have adverse effects on the body such as diarrhea, nausea and vomiting as well as irritation to a person's

skin. If you use a concoction of handbody containing mercury and hydroquinone for a long time, it will cause disturbance and permanent damage to the human kidneys, nerves and brain. [5].

In the Gorontalo City area, based on data obtained in 2022, online sales of hand-made concoctions without a BPOM number have been rampant with sales of 17.95% with various brands and relatively cheap prices. Many cosmetic traders in the Gorontalo area sell concoction handbodies that do not have a registration number or do not have a BPOM number label, so they are concerned that they contain chemicals that do not comply with quality standards or a threshold value of <1 mg/L and if the samples are not branded have levels above the threshold of >1 mg/L which has been set by BPOM in 2018 [1].

Based on this, the authors intend to identify the contents of mercury and hydroquinone in concoction handbody cosmetics circulating in Gorontalo City.

RESEARCH METHODS

In this study, a qualitative approach was used using a descriptive research type with an observational approach and laboratory tests that would examine the presence of mercury and hydroquinone chemicals contained in concoction handbodies circulating in Gorontalo City. Sampling in this study is by purposive sampling.

The population taken was all concoction handbody samples circulating in Gorontalo City.

In this study, the sample to be taken was a sample of concoction handbodies circulating in Gorontalo City using a purposive sampling method by looking at the criteria to be taken.

The tools used in this research were test tubes, tube racks, wooden clamps, beakers, erlenmeyer, measuring cups, dropping pipettes, funnels, stir bars, spatulas, digital scales.

The materials used in this study were handbody samples sold in Gorontalo City, concentrated HNO₃ solution, concentrated HCl solution, Potassium Iodide (KI) solution, NaOH solution, 1% FeCl₃ reagent, distilled water and 96% ethanol.

1. Preparation of wet destruction samples

handbody six samples were prepared, then 2 g of the sample was weighed and dissolved in 25 ml of distilled water, 6.7 ml of concentrated HCl and 3.3 ml of HNO₃ were added and dissolved over a water bath until the sample became almost dry. After the sample looks almost dry, 10 ml of distilled water is added again and redissolved on the water bath for 2 minutes. After the sample becomes dissolved, the sample is filtered using filter paper over an Erlenmeyer glass. The treatment is carried out as many samples as will be studied.

a. Sample testing with NaOH

Take 1 mL of the sample solution and then add 1-2 drops of NaOH solution, see if the color changes. If the results show a precipitate and a yellow color change, the sample is positive for mercury

b. Sample testing using KI reagent

Take 1 mL of sample solution, then put it in a test tube, add 1-2 drops of KI solution, and there is a green precipitate, the sample contains the chemical hydroquinone.

2. Preparation of Hydroquinone Test Solution on Handbody Samples

6 handbody samples were prepared, then 1 gram of each sample was weighed using a porcelain cup, after the samples were weighed, the samples were dissolved in a beaker using 96% ethanol as much as 5 ml, after each sample dissolved, then put into a test tube, after Put into a test tube, each sample is dripped with 4 drops of FeCl₃ reaction solvent. If there is a dark green color change and there is a green precipitate, then the sample contains the chemical hydroquinone.

RESEARCH RESULT

In the handbody samples circulating in Gorontalo City, prior to carrying out a qualitative test on the sample, an organoleptic test was carried out in which the sample was seen from the shape, color and smell produced by the handbody sample. The organoleptic test on the handbody sample was carried out by sight testing using the sense of sight, then carried out by using the sense of smell and using the sense of touch to see the type of handbody which has the characteristics of the o/w emulsion type because it is easily washed off with water.

Based on the results of table 1, the results of the organoleptic test found that the 12 handbody samples had different shapes, colors and smells. Handbody samples 1 and 9 have the same shape, smell the same but have different colors. The handbody samples 2, 3, 5, 6, 7, 8, 10, 11 and 12 have the same shape but the color and smell of the samples are different. In the handbody sample 4 the results of the organoleptic test have a thick and slightly liquid form, the color contained in this sample is cream in color and the odor produced in this sample is fragrant.

Table 1 :Organoleptic Test Results On

Hand body preparations

No.	Sampl e	Smell	Color	Form
1.	HBS 1	Liquid	White	Fragrant
2.	HBS 2	Thick	Pale yellow	Fragrant, pungent
3.	HBS 3	Thick	Light yellow	Fragrant, slightly pungent
4.	HBS 4	Thick, slightly liquid	Cream	Fragrant
5.	HS 5	Thick	Light orange	Fragrant
6.	HBS 6	Thick	Yellow	Fragrant
7.	HS 7	Thick	Slightly yellow	Fragrant
8.	HS 8	Thick	Pale white	Fragrant
9.	HBS 9	Liquid	Yellow	Fragrant
10.	HS 10	Thick	Cream	Fragrant, pungent
11.	HR 11	Thick	Light orange	Fragrant
12.	HS 12	Thick	Cream	Fragrant

Source: Data processed, 2022

Qualitative test results for handbody samples

In the handbody samples circulating in Gorontalo City, a qualitative test was carried out on samples containing mercury by wet digestion using 6.7 ml of concentrated HCl solution and 3.3 ml of HNO₃ solution and 25 ml of distilled water was added, then the samples and The solution is put into a beaker and heated using a hot plate until the sample becomes almost dry. After the sample became almost dry, 10 ml of distilled water was added again, then heated again and then homogenized. After the sample was heated again, the sample was filtered using Erlenmeyer and Whattman No.42 filter paper. After filtering the sample, pipette as much as 4 drops and put it in a test tube.

Put 2 N NaOH solution and 0.5 N KI solution as much as 2 drops into the test tube which already contains the sample solution. The results obtained if the

sample contains the chemical mercury sample will produce a yellow color change using NaOH solution and if using KI solution the sample will produce a red color change, if there is a color change then the sample contains positive mercury chemicals.

The results of the qualitative test table on the handbody sample

Table 2 :The results of the qualitative test table on hand samples contains mercury

No.	Sample	NaOH	KI	Results
1.	Hgb 1	Turns yellow	Turns red	+
2.	Hgb 2	Turns pale yellow	Turns red	+
3.	Hgb 3	Turns yellow	Changed red color	+
4.	Hgb 4	Does not change color	Does not change color	-
5.	Hgb 5	Does not change color	Does not change color	-
6.	Hgb 6	Turns yellow, and has a yellow precipitate	Turns red	+
7.	Hgb 7	Does not change color	Does not change color	-
8.	Hgb 8	Does not change color	Does not change color	-
9.	Hb 9	Does not change color	Does not change color	-
10.	Hbs 10	Does not change color	Does not change color	-
11.	HP 11	Does not change	Does not change	-

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No.	Sample	NaOH	KI	Results
		color	color	
12.	Hbs 12	Does not change color	Does not change color	-

Source: Data processed, 2022

Based on the results of table 2. the results of the table produced in testing mercury chemicals using NaOH and KI solutions have different color changes. Handbody samples 1,2,3, and 6 which used NaOH solution showed a yellow discoloration but in the handbody sample 2 the resulting color change was pale yellow and in the handbody sample 6 it had a yellow precipitate.

In the KI solution for handbody samples 1, 2, 3, 4, and 6 there was a red color change, so the sample that had a color change tested positive for containing the chemical mercury in the hand body studied.

Handbody samples 7-12 in this study did not change color so that the results obtained were negative for mercury or the samples did not contain mercury.

Results Table Hydroquinone qualitative test

Table 3: Hydroquinone Qualitative Test Results

No.	Sample	FeCl3	Results
1.	Hgb 1	Does not change color	-
2.	Hgb 2	Does not change color	-
3.	Hgb 3	Does not change color	-
4.	Hgb 4	Does not change color	-
5.	Hgb 5	Does not change color	-
6.	Hgb 6	Does not change color	-

7.	Hgb 7	Does not change color	-
8.	Hgb 8	Does not change color	-
9.	Hb 9	Does not change color	-
10.	Hbs 10	Does not change color	-
11.	HP 11	Changed red to green	+
12.	Hbs 12	Turns green and has a precipitate	+

Source: Data processed, 2022

Based on the results of table 3, the results of the table produced in testing handbody samples containing the chemical hydroquinone using a FeCl3 solution had a color change, namely a green color change.

In the handbody samples 11 and 12 the resulting color change was green and had precipitate, so the sample tested positive for the chemical hydroquinone in the handbody studied. Handbody samples 1-10 did not change color so the results obtained were negative handbody samples containing mercury hydroquinone or these samples did not contain hydroquinone mercury.

DISCUSSION

In the study of identification of handbody preparations circulating in the city of Gorontalo, he conducted research at the Laboratory of Bina Mandiri University, Gorontalo. At this stage of the research process, it begins with taking handbody samples circulating in Gorontalo City using the random sampling method, namely 12 handbody samples taken randomly by looking at different sample brands and handbody

sample prices that are sold at 35,000-50,000. The handbody sample taken did not have a BPOM number, did not have the composition written on the handbody, did not have an expired date and was not registered as a notification with BPOM. Handbody samples taken were carried out by purchasing these samples online circulating on social media.

In the next stage, carry out organoleptic testing which begins with testing as many as 12 handbody samples by looking at the samples obtained that are not registered and do not have a BPOM number and are carried out by physically looking at the sample using the sense of sight if the color of the handbody obtained has a different color. then another organoleptic test is carried out by using the sense of smell which has a fragrant and slightly pungent odor and by using the sense of touch, namely using the skin and seeing whether the handbody sample obtained has a skin reaction when used.

The purpose of this organoleptic test is to see whether the preparations taken are in accordance with the desired sample and criteria. Organoleptic test is a method of testing using the human senses as the main tool for measuring the acceptability of a product. Organoleptic testing has an important role in an application of quality [1].

The next step is to carry out the wet destruction process on the handbody sample. The goal in wet digestion is to decompose the sample with strong acids, either singly or mixed, and then oxidize it using an oxidizing agent.

At this stage 6 handbody samples were weighed as much as 2 grams each then 6 samples were put into each beaker and 25 ml of aquadest solution was added, 10 ml of concentrated HCl solution and HNO₃ were added with a ratio of 3: 1

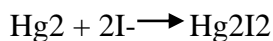
then the samples were stirred slowly then evaporated using a hotplate until almost dry, after the sample is almost dry, 10 ml of distilled water is added again, then heated briefly and then filtered (done 12 times) [21].

Solvents that can be used for wet digestion include concentrated HCl and HNO₃ [11]. The destruction process is a treatment to dissolve or change the sample into a measurable form of matter so that the content in the form of elements in it can be analyzed. Completeness of wet digestion is indicated by obtaining a clear solution in the destruction solution, which indicates that all the constituents present have completely dissolved or the decomposition of organic compounds has gone well.

In the next stage, a qualitative test phase was carried out, using the results of wet destruction on the handbody samples using the NaOH and KI solution tests to see the color change in the handbody samples circulating in Gorontalo City. Observations on the color change were made by adding NaOH solution to the sample slowly through a test tube so that the results obtained were 4 samples that changed color and a yellow precipitate occurred and the results obtained were positive for mercury. This reaction indicates that the test solution positively contains mercury, because this solution can separate mercury from the test solution by adding dilute sodium hydroxide solution and a yellow precipitate forms, and a reaction occurs, namely:

Observations were also made on the test solution, namely adding potassium iodide solution to the test sample slowly through the test tube wall so that the results obtained were that 4 samples had a color change indicating a reaction, namely the formation of a red precipitate in the

sample tested so that the results obtained were positive. contains mercury, because when potassium iodide is added slowly to the sample solution a red precipitate/mercury(II) iodide will form, indicating the result of the reaction.



In this study the next qualitative analysis method was used to determine whether or not a handbody sample contained hydroquinone, namely using the color reaction test method using FeCl₃ reagent, which would produce a green to bluish color in samples that positively contained the hydroquinone compound [11].

The first step in this study was started with the preparation of 6 samples of handbody which had been marked with a label. First, 1 gram of handbody sample was weighed, then the sample was dissolved in 5 ml of 96% ethanol, carried out 6 times, then homogenized until the sample dissolved. The addition of 96% ethanol aims to dissolve hydroquinone because 96% ethanol is polar so it can dissolve hydroquinone which is polar. Furthermore, it is filtered which aims to filter out the possibility of small particles being carried along so that they can affect the separation process. The solution obtained from this filtering is used as a test solution or sample solution.

After the sample dissolved, the handbody sample was transferred into 6 test tubes and dripped with 4 drops of FeCl₃ reagent solution. The results of the study found that 2 handbody samples produced a green discoloration and had sediment. In the identification of handbody samples using FeCl₃ as a

reagent indicator, that is due to the presence of hydroxyl groups in the sample using FeCl₃ reagent so that complex compounds will form.

This complex compound will be in the form of elemental O. FeCl₃ is used to identify handbody samples containing the chemical hydroquinone, because the FeCl₃ reagent functions to bind hydroquinone resulting in a color change in samples containing hazardous chemicals. In hydroquinone handbody samples containing the chemical hydroquinone will produce a green reaction which has a precipitate.

The use of Hydroquinone on the skin will affect the skin color making it whiter or blacker than our normal skin color. It is a skin are changes in skin color to become whiter, blacker, or brown, compared to normal skin color. Although the basis for the occurrence of these color changes varies greatly.

The results of this study are different from the samples examined by the analysis of hydroquinone identification on handbodies conducted at the phytochemical laboratory of the pharmaceutical department of the Medan Ministry of Health Polytechnic, where to find out the hydroquinone content mentioned above can be analyzed by identification using FeCl₃ solvent as a reagent to see the color changes that occur . If the spots on the reference standard are parallel to the sample, then the sample contains hydroquinone, whereas if you use FeCl₃ solvent and there is a color change in the handbody sample, the sample is positive for the chemical hydroquinone [13].

CONCLUSION

In accordance with the observational data that was carried out during the research, the results obtained were that there were 4 samples containing the chemical mercury which were seen to have a yellow color change using NaOH solution, and using KI solution which was seen to have a brick red color change and on the handbody sample the results obtained namely 2 handbody samples containing the chemical hydroquinone which was seen as a green color change which had a precipitate using the FeCl₃ reaction solvent.

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