Analysis Of Hydroquinone Content In Hand Body Products Circulating In Palopo City Using Uv-Vis Spectrophotometric Method

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Abstract

This research is experimental research (trial). The place and time of the research was carried out at the Chemistry Laboratory, Pharmacy Department, Faculty of Health Sciences, Palopo Muhammadiyah University on January 24 2024. This research aims to determine the Hydroquinone content in hand bodies circulating in Palopo City and which do not have a BPOM registration number using the UV-Vis Spectrophotometry method. The sample in this study consisted of 11 samples with codes 1,2,3,4,5,6,7,8,9,10,11. The results of the study showed that these 11 samples contained Hydroquinone with levels in each brand sample 1 = 5.2%, 2 = 2%, 3 = 4.2%, 4 = 23%, 5 = 4.4%, 6 = 1.8%, 7 = 3.4%, 8 = 2.4%, I = 4.9, 9 = 1.8%, 10 = 3% and 11 = 16.6%. The highest level of Hydroquinone content was obtained in sample 4 with a Hydroquinone content of 23.5% and overall the Hydroquinone content in each sample used was not allowed to contain any hydroquinone at all. According to BPOM regulation No.23 of 2019, hydroquinone is prohibited from being used as a bleach or brightener in cosmetics. Hydroquinone can only be used for nails at a level of 0.02%, and hair dye oxidizer with a maximum level of 0.3%.

Keywords**:** Hand body, Hydroquinone, UV-Vis Spectrophotometry.

1. Introduction

Skincare has become a trend for modern women and a necessity for women. In tropical countries like Indonesia, the use of hand body lotion is certainly very important because it can provide protection for the skin both during indoor and outdoor activities (Pamungkas, 2016). Therefore, various ways ranging from natural cosmetics to skin care are done without delay, without paying attention to the chemicals contained have harmful effects on the skin or not. One of the cosmetics used is hand body, which is a cosmetic softener consisting of two phases, namely the oil phase and the water phase stabilized by an emulsion system (Sastrawidana, 2016). This preparation has various properties, including: as a source of skin moisturization, providing a layer of oil that is almost the same as soap, whitening hands and body, but not greasy and easy to apply.

Whitening hand body lotion is intended for the purpose of whitening the skin and is sometimes used also to whiten sun-exposed areas or as a treatment of dark spots on the skin. Whitening hand body lotion can inhibit the formation of melanin so that the skin looks brighter, cleaner, and fresher. The whitening ingredients used today are cosmetics that use hydroquinone which exceeds the level of making the skin white faster than natural ingredients. The time required in the whitening process reaches 2-4 weeks, depending on the substance used. If the skin already looks white, hand body lotion must still be used continuously, because if the use is stopped, the skin will return to its original state (Wisesa, 2014). Hand body lotion containing the active substance hydroquinone can change color from white to brown color for 3 - 4 months (Maibach, 2000).

The use and composition of harmful substances contained in lotions need to be considered more carefully. If used continuously, it can damage skin health. One of the well-known and widely used skin whitening ingredients is hydroquinone. Hydroquinone is an aromatic organic compound derived from phenol, with the chemical formula C6H4(OH)2 (Elferjani et al., 2017). This compound, which is used to whiten and prevent pigmentation, works by inhibiting the tyrosinase enzyme which plays a role in skin darkening (Adriani & Safira, 2018).

According to BPOM regulation No.23 of 2019, hydroquinone has been banned from use as a whitener or brightener in cosmetics. The use of hydroquinone can only be used for nails with a level of 0.02%, as well as hair dye oxidizers with a maximum level of 0.3%. The mechanism of hydroquinone in whitening the skin is the toxic effect of hydroquinone on melanocytes, and through inhibition of the melanin formation process. Continuous use of hidskouinon can cause leukodermacontact, a skin disease characterized by loss of skin pigment due to dysfunction or death of melanocytes. (Rahmadani et al, 2021). Based on this, the authors are interested in knowing whether the hand body lotion circulating in Palopo city is safe for us to use either in the long term or short term, even though only on a laboratory scale. This examination was carried out using the UV-Vis Spectrophotometry method.

Hydroquinone is a chemical compound that inhibits melanocyte function and has long been known to have skin whitening effects. According to previous studies, the activity inhibitory effect and specific cell toxicity of melanocytes are known as the mechanism of depigmentation, however, the details of the underlying mechanism are unknown. Arbutin, which is a hydroquinone glycoside, is also known for its activity inhibitory effect and is commonly used as a skin whitening agent (Inoue et al., 2013).

Hydroquinone is an ingredient used in skin lightening and hyper-pigmentation treatment (Joseph et al., 1998). Hydroquinone does not actually whiten the skin but is rather a strong inhibitor of melanin production (Yoshimura et al. 2001). Hydroquinone used for topical application is known to cause serious health hazards when used in excess (Hutson et al. 1999). Hydroquinone toxicity can cause severe side effects such as kidney and liver damage, blood poisoning, nausea, abdominal pain, convulsions and even coma (Agorku et al., 2016).

2. Methodology

This research uses experimental research, which is to determine and describe the presence or absence of hydroquinone levels in hand body circulating in Palopo City. The sampling technique used in this study was quantitative using the UV-Vis spectrophotometric method.

Time and Place of Research

The time this research was conducted was on January 24, 2024. This research was conducted in the Pharmaceutical Chemistry Laboratory, Faculty of Health Sciences, Muhammadiyah University of Palopo.

Tools and materials

Tools and materials in this study are stirring rods, beakers, measuring cups, watch glasses, volumetric flasks, dropper pipettes, volume pipettes, spatulas, UV-visible spectrophotometer, analytical balances. Research Sample (Hand body whitening), hydroquinone, 96% methanol

Research Procedures

The samples used in this study were whitening hand body cosmetic preparations with 11 different brands taken from the Palopo City area, where 11 samples did not have BPOM registration numbers. Samples taken from the Palopo City area came from the central market of Palopo City. Samples were taken by random sampling method.

Sample Preparations

Sample preparation is done through weighing each hand body sample as much as 25 mg and suspended in 50 mL methanol, then shaken until homogeneous.

Preparation of Hydroquinone Standard Solution

Weighed standard Hydroquinone as much as 5 mg dissolved with methanol, then put in a 100 mL volumetric flask and added methanol until exactly 100 mL, then the solution was shaken until homogeneous. So as to obtain a standard concentration of 50 ppm Hydroquinone in methanol. Piped 10 mL of 50 ppm standard solution was included in a 50 mL volumetric flask, added with methanol solution until exactly 50 mL and then shaken until homogeneous. Obtained a solution with a concentration of 10 ppm. Pipetted 0.1; 0.2; 0.3; 0.4; 0.5; 1; 1.5 mL of 10 ppm standard solution put each into a 50 mL volumetric flask add methanol to the mark. Obtained a solution with a concentration of 0.02; 0.04; 0.06; 0.08; 0.10; 0.20; 0.30 ppm.

Determination of Maximum Wavelength

Piped 0.4 mL of 10 ppm standard solution into a 50 mL volumetric flask, diluted with methanol solution until the mark and then shaken until homogeneous and the resulting hydroquinone solution with a concentration of 0.08 ppm. The 0.08 ppm solution was measured at a wavelength of 200-400 nm (produced at a maximum wavelength of 294 nm)..

Hydroquinone Level Measurement of Sample

Hydroquinone levels in the sample were analyzed by UV-Vis spectrophotometry. Measure the absorbance of the sample by ultraviolet spectrophotometry at a wavelength of 294 nm. Meanwhile, to calculate the level of Hydroquinone in the sample, it was calculated using the linear regression equation: $y = bx \pm a$ obtained through the standard curve of Hydroquinone.

$y = a + bx$

3. Result and Discussion

3.1. Research result

The 11 whitening hand body samples were taken in Palopo city. Each was coded 1,2,3,4,5,6,7,8,9,10,11. Samples were pretreated with methanol for subsequent quantitative analysis with a UV-Vis Spectrophotometer. Hydroquinone standard solution was prepared before measuring the samples. Hydroquinone standard solution was prepared for use in determining the maximum wavelength of Hydroquinone and establishing the standard curve of Hydroquinone. A series of standard solutions of Hydroquinone with concentrations of 0.02;

0.04; 0.06; 0.08; 0.10; 0.20; 0.40 ppm were prepared, the standard solution with a concentration of 0.08 ppm was selected as the solution in determining the maximum wavelength. Scanning to determine the wavelength was carried out in the range of 200-400 nm and obtained the maximum wavelength of hydroquinone in this study of 294 nm. This result is in accordance with the research conducted (Utama et al., 2023) which obtained 294 and 290 nm as the maximum wavelength for Hydroquinone.

The following Hydroquinone standard curve was generated by measuring the absorbance of hydroquinone standard solution at the maximum wavelength obtained. The absorbance (y) obtained was then plotted against the concentration of the standard solution (x). The standard curve of concentration against absorbance forms a straight line (linear) and produces a linear regression equation y-0.0431+0.0343 with a correlation coefficient (R) of 0.9368. Determination of sample levels using the linear regression method is a parametric method with independent variables (sample concentration) and dependent variables (sample absorbance) using the standard linear solution curve regression equation. Rephrase The sample concentration can be calculated based on the standard curve equation obtained.

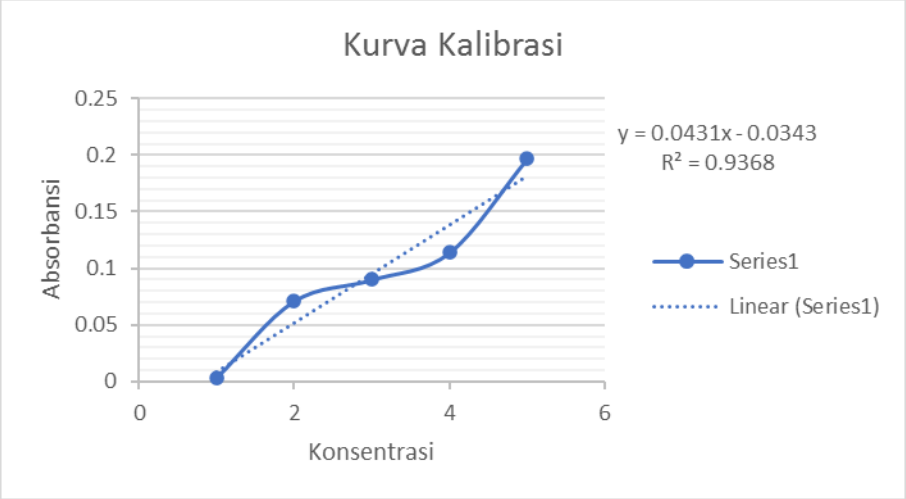

Figure 1. Linear Regression Curve of Hydroquinone Standards

NO	SAMPLE	ABSORBANTS	AVERAGE
1	1	0.192	0.193
		0.192	
		0.195	
2	2	0.073	0.073
		0.073	
		0.074	
3	3	0.149	0.149
		0.149	
		0.148	
4	4	0.962	0.962
		0.963	
		0.961	
5	5	0.160	0.160
		0.159	
		0.160	
		0.050	

6	6	0.049	0.049
		0.049	
7	7	0.113	0.113
		0.114	
		0.113	
8	8	0.077	0.076
		0.075	
		0.075	
9	9	0.051	0.051
		0.052	
		0.051	
10	10	0.095	0.095
		0.096	
		0.095	
11	11	0.683	0.683
		0.684	
		0.682	

Table 1. Measurement Results of Hand Body Lotion Samples

Sample	Absorbants	Levels (%)
11		
1	0,194	5,2%
2	0,073	2%
3	0,148	4,2%
4	0,962	23%
5	0,160	4,4%
6	0,049	1,8%
7	0,113	3,4%
8	0,076	2,4%
9	0,051	1,9%
10	0,095	0,3%
11	0,0683	16,6%

Table 2. Quantitative Analysis Result of Hydroquinone Content in whitening hand body

3.2 Discussion

Hydroquinone is a chemical compound that inhibits melanocyte function and has long been known to have skin whitening effects. According to previous studies, the activity inhibitory effect and specific cell toxicity of melanocytes are known as the mechanism of depigmentation, however, the details of the underlying mechanism are unknown. Arbutin which is a glycoside of Hydroquinone, is also known for its activity inhibitory effect and is commonly used as a skin whitening agent. Hydroquinone if more than 2% is a class of hard drugs that must be taken by prescription. Hydroquinone concentrations of more than 5% can cause skin redness. If this aggressive drug is used without medical supervision, it can cause skin irritation, including: skin redness, burning, kidney abnormalities, blood cancer and even liver cancer. Based on a complaint from BPOM No.23 of 2019, hydroquinone has been

banned from use as a whitener or brightener in cosmetics. The use of hydroquinone can only be used for nails with a level of 0.02%, as well as hair dye oxidizers with a maximum level of 0.3%. The mechanism of hydroquinone in whitening the skin is the toxic effect of hydroquinone on melanocytes, and through inhibition of the melanin formation process.

Based on the results of quantitative analysis using UV-Vis spectrophotometry shown in table 2, the resulting levels of hydroquinone in 11 whitening hand body samples with codes 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11, have exceeded the levels of hydroquinone that have been determined. This is in accordance with BPOM regulation No.23 of 2019, regarding the prohibition of the use of hydroquinone as a bleach and skin lightener in cosmetics, The use of hydroquinone can only be used for nails with 0.02% hair, as well as oxidizing hair dyes with a maximum level of 0.3%.

Determination of Hydroquinone concentration in whitening hand body samples is done in the same way by measuring the standard solution, where the sample solution that has been prepared is measured for absorption using a UV-Vis spectrophotometer at a maximum wavelength of 294 nm. The measurement results are shown in Table 2 and Figure 1, obtained absorbance values for samples with codes 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 respectively of 0.194; 0.073; 0.148; 0.962; 0.160; 0.049; 0.113; 0.076; 0.051; 0.095 and 0.0683. This absorption value is then used to calculate the concentration, which is then converted into a percentage (%) so that it can be compared with the Hydroquinone pollution limit set by BPOM RI Number 23 of 2019, which is the level of Hydroquinone contained in whitening cream of 0%. The percentage of hydroquinone content of each sample was obtained as 5.2%; 2%; 4.2%; 23%; 4.4%; 1.8%; 3.4%; 2.4%; 1.9%; 0.3% and 16.6%. Thus the quantitative analysis of Hydroquinone levels in all samples used in this study gave results of Hydroquinone levels in the range of 0.3-23%. The highest hydroquinone level was detected in the sample with code number 4 which was 23%. The results of this study showed that overall the samples that did not have BPOM registration numbers had hydroquinone levels in the cream samples with codes 1, 2, 3, 4, 5, 6, 7, ,8, 9, 10 and 11, still within high limits because the hydroquinone levels detected were more than 0%. It can be concluded that the 11 samples that do not have BPOM distribution permits contain hydroquinone levels which do not meet the requirements of BPOM RI Number 23 of 2019, namely the level of hydroquinone contained in whitening creams of 0%.

4. Conclusion

Based on research conducted on January 24, 2024, on the Analysis of Hydroquinone Content in Whitening Hand Body circulating in Palopo City Using UV-Vis Spectrophotometry, it can be concluded that of the 11 samples none of the samples had levels of Hydroquinone range according to predetermined rules of 0%. Where from the research that has been done obtained the results of Hydroquinone levels in samples with code 1 = 5.2%, 2 = 2%, 3 = 4.2%, 4 = 23%, 5 = 4.4%, 6 = 1.8%, 7 = 3.4%, 8 = 2.4%, 9 = 1.9%, 10 = 0.3% and 11 = 16.6%. Of the 11 samples tested, it was found that the range of hydroquinone was 0.03%-23%, which certainly did not meet the predetermined hydroquinone content requirement of 0%.

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