CHAPTER 1: INTRODUCTION

1.1   Background

As the largest organ of the human body, skin consists of three different layers: the epidermis, dermis, and hypodermis. With its function as the human first line of defense, the epidermis that has stratum corneum (SC) on the outermost layer plays an important role as the protective shield against the environment to maintain skin hydration and prevent transepidermal water loss (TEWL) (Murphrey et al., 2021). The epidermis will undergo a continuous regeneration process known as cornification or keratinization. The process starts with keratinocytes on the basal layer of the skin, moving upward and migrating to the upper layers, ultimately resulting in the formation of the outermost layer, the cornified layer. During the epidermal differentiation process, lipids produced by keratinocytes will be extruded to the extracellular space. The lipids will then form extracellular lipid-enriched layers. A lipid called omega (ω) hydroxy-ceramides will covalently bind to the cornified envelope (CE). This interaction will result in the formation of a backbone that will add additional free ceramides, cholesterol, or fatty acid to the cornified layer. The protein content of CE includes *filaggrin* (*FLG*), *involucrin* (*IVL*), and *loricrin* (*LOR*) that will cross-link together; a process which will be catalyzed by *transglutaminase-1* (*TGM-1*) to form the CE (Kim & Leung, 2018; Kömüves et al., 2000; Yousef, Alhajj & Sharma, 2021).

If there is any improvement of the skin barrier as the expression of *FLG*, *IVL*, *LOR*, and *TGM-1* increases due to the moisturizer usage, the results from the tewameter will show a lower or decreased value, since the moisturizer will "trap" the water content in the skin, thus decreasing the loss of water content. On the other hand, the hydration level may show an increased or higher value since the water content was increased by the moisturizer (Constantin et al., 2014). In this study, the effect of a skin moisturizer product called Moisturizer M01 was evaluated through instrumental analysis using two different instruments: the tewameter and corneometer. Additionally, the gene expression of *FLG*, *IVL*, *LOR*, and *TGM-1* was observed using Quantitative Real-Time Polymerase Chain Reaction (qRT-PCR).

1.2 Objective and Importance of the Study

1.2.1 Objective of the Study

The objective of this study includes:

- To evaluate the effectiveness of the skin moisturizer product called Moisturizer M01 before and after use for 1 month.

- To measure and compare the expression of *FLG*, *IVL*, *LOR*, and *TGM-1* genes before and after Moisturizer M01 treatment using qRT-PCR.

- To examine the water loss rate and hydration rate on dry skin before and after Moisturizer M01 treatment using instrumental analysis with tewameter and corneometer.

1.2.2 Importance of the Study

This study aims to evaluate the method that has been developed for the skincare product Moisturizer M01 in seven subjects during four weeks of usage. The method and results of this study will be used as a collaboration between Indonesia International Institute for Life Sciences (i3L) with PT. Skinproof Derma Lab Asia, as the sponsor for this study.

Moreover, since Moisturizer M01 has only undergone clinical evaluation using instrumental analysis, thus, in this study, the effectiveness of Moisturizer M01 was evaluated using qRT-PCR to see the molecular effect after four weeks of treatment.

1.3   Scope of Activity

The scope of activity in this study includes:

- Wet-lab-based study using qRT-PCR combined with instrumental analysis, using a corneometer and tewameter to assess the water loss rate and hydration level of the skin.

- A literature review was followed to correlate the results from qRT-PCR with the results from the instrumental analysis.

The wet-lab experiment was done in i3L Laboratory from February 2022 until May 2022, while the instrumental analysis was done in PT. Skinproof Derma Lab Asia from February 2022 until April 2022.

1.4   Hypothesis of the Study

The hypothesis for this study includes:

- There is an increasing value of skin hydration and humidity levels in the treated area after four weeks of Moisturizer M01 treatment.

- There is a significant difference in the expression of *FLG*, *IVL*, *LOR*, and *TGM-1* genes between the untreated area and the treated area.