CHAPTER 1

INTRODUCTION

1.1. Background

Skin is the largest organ found on the human body which comprises subcutaneous, dermis, and epidermis. The epidermis part of the skin is composed of different stages of keratinocyte differentiation and one of them is corneocyte. The corneocytes are terminally differentiated keratinocytes which synthesize the lamellar body and the multilamellar barrier. The skin multilamellar barrier is composed of 50% ceramide, 25% cholesterol and 15% free fatty acids. Disrupted composition of those lipids will result in damaged barriers which lead to trans epidermal water loss (CHA et al., 2016). As the major lipid component of the multilamellar barrier, ceramides have a very important role for the skin barrier function that help hold water in the epidermis's barrier function. Therefore, changes in ceramide profile is generally associated with barrier function impairment and loss of water holding ability. To protect this skin barrier function, moisturizer is usually used to maintain skin's water content by forming a barrier with hydrophobic characteristic and providing water directly to the skin from their water phase, thus blocking trans-epidermal water loss (Purnamawati, Indrastuti, Danarti & Saefudin, 2017).

The skin barrier comprises six different types of ceramides that are produced by an enzyme called the ceramide synthase. CERS1 (ceramides synthase 1), CERS3 (ceramide synthase 3), and CERS4 (ceramide synthase 4) are the key players in skin barrier formation. CERS1 produces ceramide EOS (ceramide 1) which is an important component for creating the lamellar structure and is essential in catalyzing the production of dihydroceramides by the combination of sphingosine base and fatty acid (CHA et al., 2016). Meanwhile, CERS3 genes are crucial for epidermal barrier formation in human skin, and ceramide synthase enzymes production that regulate sphingolipid synthesis.

Similarly, the ceramide EOH (ceramide 4) which produced by the CERS4 also has a crucial role in sphingolipid metabolism and catalyzing the dihydroceramide formation ("CERS4 ceramide synthase 4 [Homo sapiens (human)] - Gene - NCBI", n.d.).

Most of the research regarding the CERS3, CERS4, and CERS1 towards trans epidermal water loss in skin barrier function is researched with no further efficiency testing done. An efficiency test is a crucial step for product development to ensure the efficiency of the product and to prove the eligibility of the research findings and concept. Therefore, this research will focus on determining the role of the 3 most important ceramides composition in skin towards trans epidermal water loss using genetic expression by qRT-PCR as a potent efficiency test method.

Objective of the Study

- To measure the expression and determine the role of CERS3, CERS4, and CERS1 gene in vivo
- To determine the correlation between CERS3, CERS4, and CERS1 gene expression in trans epidermal water loss (TEWL) and skin barrier function
- To analyze the efficacy of moisturizer in repairing the skin barrier function from genetic perspective and clinical study