CHAPTER

2

THE RATIONALE OF RECENT INGREDIENTS IN CONTRIVING AGE-REVERSING PRODUCT

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2.1 INTRODUCTION

Cumulative effects of intrinsic and extrinsic factors are the most commonly reported causes of skin aging. Aging skin appears to have sagging, wrinkles, pigmentation, fragility, and a loss of elasticity. Specifically, skin age caused by intrinsic factors commonly demonstrates skin cell loss, fine lines, wrinkles, and a thinned epidermis. Meanwhile, extrinsically aged skin appeared with coarse wrinkling and hyperpigmentation. This factor is usually related to excessive exposure to ultraviolet (UV) radiation (ultraviolet A (UVA) and ultraviolet B (UVB)), pollution, bad eating habits, smoking, stress, and sleep deprivation (Michalak, 2022).

Collagen breakdown can cause the most visible skin aging, wrinkles. During the aging process, an enzyme induced by UV radiation called matrix metalloproteinases (MMPs) causes the skin collagen fibers to be broken down. Besides skin induction with the MMPs, the accumulation of reactive oxygen species (ROS) can result in skin aging. This leads to

fragmented collagen fibers accumulating and preventing normal collagen formation (Michalak, 2022).

Both extrinsic and intrinsic factors are influenced by excessive production of oxidative stress, which happens when the biologically antioxidant function of the skin is affected by ROS. Oxidative stress is developed by overwhelming the body's endogenous system with the body's antioxidant requirements. ROS consists of oxygen molecules with unpaired electrons, or in the situation called "excited state". If left unchecked, ROS can increase skin melanogenesis, which can contribute to pigmentation formation that is mechanistically produced from increased tyrosinase and tyrosinase-related protein-1 (Merecz-Sadowska et al., 2021). Furthermore, the excited state oxygen leads to lipid peroxidation and accelerates the expression of MMPs-1 and MMPs-3, which possess to breakdown collagen (as stated previously). Hence, these phenomena can be referred to as biological skin function alteration effects.

Skin aging in women is usually correlated with a decrease in estrogen levels. Some of the visible signs of skin aging are counteracted by compounds stimulating estrogen receptors. Women are mostly experiencing estrogen deficiency during their post-menopausal state, which may increase oxidative stress production. The skin of post-menopausal women is reported to be reduced in collagen Type I and II levels. Additionally, intrinsic skin aging is caused by the decline of 17 β-estradiol hormonal serum (Na et al., 2023).

The current global anti-aging market was estimated at USD60.42 billion in 2021 and is expected to increase to around USD119.6 billion by 2030 with a cumulative annual growth of 7.9%. Innovative premium quality and highly efficient anti-aging ingredients are the most preferred factors considered by consumers in the selection of their age-reversing skin care regimes.

Antioxidants, vitamin A-retinoids, vitamin B, beta-glucan, alpha-hydroxy acids (AHAs), and hyaluronic acids are the most recent ingredients used in commercialized anti-aging skin care products. Some brands highlight these compounds as their products' unit selling proposition (USP) since the compounds are currently trending.

2.2 RECENT AGE-REVERSING ACTIVE INGREDIENT FOR SKIN CARE

Currently, there are some ingredients used as active components to reduce aging skin symptoms that possess antioxidant properties. Below are the lists of the age-reversing ingredients being reviewed and discussed:

2.2.1 Vitamin C

Vitamin C is a hydrophilic antioxidant constituent that plays a vital role in collagen generation and photoprotection. The human body is unable to biologically produce vitamin C, therefore, it should be consumed through diet and oral health supplements. Likewise, focusing on the photoprotection function of vitamin C, topical administration is preferred, as is reducing any signs of skin aging (Afonso et al., 2019).

The human body's vitamin C level decreased with age, smoking habits, and excessive exposure to UV. Specifically, for those frequently exposed to UV, their vitamin C levels can decrease dramatically and age fast. Vitamin C is reported to work synergistically with vitamin E to enhance its photoprotective properties. This reinforces the advantage of combining antioxidants in sun protection products as an added value of anti-aging ingredients (Gref et al., 2020).

Through collagen synthesis, vitamin C plays an essential role as an essential cofactor for the lysin and proline hydroxylation processes, an important step in collagen production. An in vivo study reported that collagen was secreted in fibroblasts in cell culture as vitamin C was added in a dose-dependent manner. The anti-aging therapeutic effects after topical application of vitamin C are skin-firming and wrinkle-reducing, prior to increasing collagen production. Besides, vitamin C is also reported to level up MMP-1 tissue inhibitors that cause collagen degradation and is successfully reported to reduce photoaging signs (Afonso et al., 2019).