

THE IMPACT OF PHOTOAGING ON SKIN: A SYSTEMATIC REVIEW ANALYSIS

Muhammad Shanani^{1*}, Dedy Syahrizal², Nirwana Lazuardi Sary³, Fauzul Husna⁴

¹*Magister of Biomedical Science Syiah Kuala University*

²*Departement of Biochemistry, Syiah Kuala University*

³*Departement of Physiology, Syiah Kuala University*

⁴*Departement of Pharmacology, Syiah Kuala University*

* shanan_az@yahoo.com

ABSTRACT

Aging of the skin is a complex biological process. The process of skin aging can be divided into two categories namely intrinsic and extrinsic aging. Intrinsic skin aging or natural aging is caused by changes in skin elasticity that occur with age. This type of aging cannot be prevented. While extrinsic skin aging is caused by environmental factors such as exposure to solar radiation (photoaging). In this study, the type of research approach used is a type of qualitative research through a literature review. The type of data used is the type of secondary data. Secondary data is a type of data obtained from certain parties or media indirectly, meaning that certain parties become intermediaries where they obtain and record these data beforehand. The aging process of the skin is influenced by intrinsic and extrinsic factors. The extrinsic factor that most influences the aging process of the skin is chronic sun exposure which is called photoaging. Sunlight contains 96% UVA and has the most significant biological effect compared to UVB and UVC. Several factors that affect photodamage are skin type, pigmentation, and acclimatization. Skin changes that occur in photoaging include the presence of vesicles in the epidermis, reduced Langerhans cells, and enlarged and pale epidermal cells; in the dermis, there is an elastic mass; pigment changes in the form of dotted (irregular pigmentation) and hyperpigmentation.

Keywords: *skin aging, photoaging, ultraviolet*

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INTRODUCTION

Skin aging is a complex biological process with two categories: extrinsic aging and intrinsic aging. Aging of the skin is caused by changes in skin elasticity that the body experiences with age. Although aging cannot be stopped, photoaging caused by exposure to ultraviolet light can be reduced by changing a person's environment. Changes in connective tissue and cell composition through the formation of lipid peroxides lead to extrinsic aging. In addition, changes in enzyme activity and ROS levels cause physical changes in the skin (Jenkins, 2002).

Collagen is the main component of the extracellular matrix of the skin, which causes photoaging when it breaks down. This process changes the connective tissue of the skin, making the skin sagging and quickly wrinkled. According to a study by Hwang et al, collagen damage causes functional and structural changes in other parts of the matrix such as degradation of elastin fibers which causes significant changes in the skin. The ideal of beauty and health of the Indonesian people today is tight and wrinkle-free skin. This has many negative effects on adolescents' self-confidence about their appearance. One of the causes is the environmental effect of aging skin damage due to sunlight known as photoaging (Durai et al., 2012).

People naturally age due to factors such as genetics, hormones, and race. In addition, the aging process is caused by natural physiological processes in the body. Age-related skin

changes are inevitable, due to genetic predisposition. Genes play a role in determining a person's skin type, which affects the development of skin aging. For example, dry skin types show signs of premature aging (Blume-Peytavi et al., 2016).

There are four races in the world, each with a different skin structure. These are the Mongoloid race, the Negroid race, the Caucasoid race, and the Polynesian race. Melanin pigment protects the body against environmental factors such as sunlight and ultraviolet light (Helfrich et al., 2008). People of color age more slowly than Caucasians. This is because they are not as flammable as caucasian races when exposed to sunlight. They are also more likely to develop skin symptoms related to premature aging and more likely to develop malignant or precancerous lesions (Helfrich et al., 2008).

As a woman grows older, the influence of hormones becomes more and more noticeable. This is because aging causes physiological aging, which is often seen in men and women who are at puberty. When a woman enters menopause, her ovarian hormones decrease. As a result, estrogen in his body decreases; leading to reduced elasticity of the skin (Yaar & Gilchrest, 2007).

Sun exposure plays an important role in skin aging. The natural aging process is often not comparable to the effect of sunlight on the skin. Excessive sun exposure can cause damage to the skin due to the photobiological effects of UV rays on the skin. These include causing DNA mutations and a decrease in the immune system (Pinnell, 2003).

Exposure to heights or mountains can cause dry skin; This is because the moisture on the skin quickly disappears when exposed to cold temperatures or wind. By being in an air-conditioned room, people with dry skin can speed up the aging process (Durai et al., 2012).

METHOD

The study employs a qualitative research approach, specifically through a comprehensive literature review. This approach enables a thorough exploration of existing information and insights relevant to the research topic. The primary data source for this investigation is secondary data, which is information acquired indirectly from various sources or intermediaries. This type of data relies on the efforts of specific parties who gather and document the information before making it available for analysis. Secondary data, in this context, serves as a valuable resource for the study, allowing the researchers to draw upon pre-existing information to gain deeper insights and formulate a comprehensive understanding of the subject matter. This approach enhances the validity and reliability of the study's findings, as it builds upon the cumulative knowledge gathered from various sources.

RESULTS AND DISCUSSION

Definition of Aging

Aging is present in every human being on the planet. However, aging can be slowed down or stopped through advances in science and technology. As the body ages, its ability to maintain structural integrity and repair damage slowly decreases. As a result, people age because they lose their network's ability to improve themselves or recruit new members (Chung et al., 2003). As the body ages, its various systems - including the heart, lungs, kidneys, ovaries, brain, and other internal organs - age. In addition to this primary aging process, the outermost and widest parts of the body are affected by natural aging: skin and fat (Yaar & Gilchrest, 2007).

Human Skin

In an adult human, the skin protects his entire body. It weighs approximately 5 kg or 70 kg of meat; weight can reach 5 kg of fat (McGrath, 2010). The skin is an organ consisting of 4 basic tissues: the epidermis, dermis, blood, and sweat glands. Each weighs about 0.5 kg, 0.75 kg, 1 kg, and 1.25 kg. Thus, the total skin weight is 5kg, 7kg, or 10kg (Kolarsick et al., 2011).

1. The epithelium is usually a stratified squamous epithelium with a layer of horns. Skin glands are referred to as epidermal glands; They are lined with endothelium. In contrast, the blood vessels that flow through the dermis are called the dermal vascular system, or DVS.
2. In addition to collagen and elastin fibers, the dermis contains fat cells. It is the connective tissue that forms the extracellular matrix of the skin.
3. Muscle tissue can be found under the dermis, in the form of ordinary and ribbed muscle fibers. It can also be found on the walls of blood vessels, as well as in the muscles that control facial expressions.
4. Free nerve endings and nodules of the nervous body can be found on the skin as nerve tissue. These sensory receptors facilitate the interaction between the nervous system and the outside world (Kolarsick et al., 2011).

Skin Aging Process

The skin plays many important roles; it serves as the main barrier of the body that protects internal organs from external threats, regulates body temperature, maintains electrolyte balance, and provides various receptors such as tactile, pain, and pressure receptors. One of the dermatological problems that concern the general public is skin aging. This is because the skin is the part of the body that first appears when a person interacts with other people. In addition, it is the main body parts that are most often exposed to external factors. As a result, skin aging especially in women can reduce their trust in other individuals (Rubinstein & Canham, 2009).

Aging causes aging of the skin; it is the result of many causes, referred to as multifactorial (Farage et al., 2008). This cause can be intrinsic aging or photoaging(Helfrich et al., 2008) chronological aging, or intrinsic aging. Factors that age the skin at an intrinsic level in addition to external factors include the natural aging process and damage from external sources. It is difficult to distinguish the two, making it difficult to treat intrinsic skin aging (Helfrich et al., 2008).

The natural aging process occurs over time, starting in the late thirties. Called intrinsic aging, this process is slow which causes various changes in the skin tissue. Changes occur simultaneously due to different mechanisms (Durai et al., 2012). Changes in the epidermis include changes in the shape and texture of the skin. In the dermis, biochemical changes cause the skin to grow and change. In addition, other changes occur in subdermal organs such as sweat glands, oil glands, and hair (Thakur, 2008; Thakur et al., 2009).

Although the skin is aging intrinsically, its surface appears paler, more transparent, and more fragile. Fine wrinkles appear on the surface of the skin; It becomes atrophic and thinner in the coating. The skin also itches and is drier. Aging of the skin leads to the loss of subcutaneous fat in certain areas. These include facial fat, which causes firm under-eye and facial pockets. Additional factors contributing to skin aging include racial inheritance, other anatomical variations on the skin, and the hormonal status of the body (Poljšak et al., 2012).

Aging leads to a decrease in the skin's ability to produce collagen, as well as a decrease in the synthesis of the surrounding extracellular matrix. In addition, skin enzymes more often degrade collagen in the layers of the dermis than younger people. Skin cells – such as melanocyte cells, fibroblasts, and keratin – have lower reproduction rates with age. This is because many cells die due to a lack of replication, which decreases collagen synthesis in the dermis layer (Hwang et al., 2011).

As the skin ages, collagen production in the layers of the dermis decreases, resulting in further wrinkles and age spots (Poljšak et al., 2012). This is due to a decrease in the proliferation of skin fibroblast cells, and an increase in the activity of the enzyme MMP. Increased activity of the MMP enzyme causes an increase in collagen degradation in the layers of the dermis (Jenkins, 2002). Skin aging is also caused by an imbalance between ROS production, the effectiveness of free radical cleansing systems, and the body's natural repair. The aging process is caused by the loss of moisture, protein, and DNA in the cells. The main cause of this cell damage is mitochondria, but non-mitochondrial cells also play a role. This damage will cause the skin to age faster and even damage the cell membranes containing lipids (Hwang et al., 2011).

Factors outside the skin naturally affect her age. The more extrinsic factors a person experiences, the faster his skin ages. These include gravity, lifestyle choices such as smoking, UV exposure, sleeping position, and facial expressions. Intrinsic skin aging caused by natural factors is offset by such exogenous factors. Taylor states that this is due to the acceleration of intrinsic aging due to several external influences. Chronic or acute exposure to ultraviolet radiation leads to DNA damage, immunosuppression, drooping of the eyelids, and lengthening of the auricle, and nostrils. Further consequences of gravity include the protrusion of the lower lip and shrinkage of the nostrils. In addition, exposure to gravity causes the upper lip to disappear (Xie et al., 2015).

Photoaging, or extrinsic skin aging, is the result of exposure to UV rays. Its incidence increases over the years and is most common in younger people; About 72% of men between the ages of 30 and 39 and 42% of women between the ages of 20 and 29 have experienced photoaging. There are several studies on the incidence of photoaging; one in Australia by Green estimates that 72% of men and 42% of women under the age of 30 have experienced photoaging. People with darker skin or frequent sunbathing have a higher risk of photoaging. This is because UV radiation damages the skin when it hits these people. In addition, farmers and fishermen have a higher risk of UV damage than office employees. Taylor, 2005 found that this was due to exposure to sunlight and its rays. Unexpectedly, the face, neck, upper chest, hands, and forearms are more susceptible to UV damage than covered skin areas such as gluteus medius. This is because exposed skin is more susceptible to UV damage such as UV rays on the face, neck, chest, and upper arms. In contrast to photoaging which is easier to find in areas of skin covered by intrinsic aging usually found in gluteal skin (Knaggs, 2009).

Ultraviolet rays come from the sun as the main source. This light contributes significantly to photoaging through the UVB, UVC, and UVA wavelengths it contains. Individuals with light skin who have a lower Fitzpatrick skin type are more susceptible to photoaging compared to dark skin. This is because UVB rays can penetrate deeper into the skin layer and cause more severe damage (Pandel et al., 2013). In contrast, people with light skin are more exposed to UVA rays than people with darker skin (del Rosso, 2017).

Photoaging

Clinically aging and histologically aging skin that is chronically exposed to sunlight. It is caused by dermatoheliosis and heliodermatitis, which cause the skin to discolor, be damaged, and appear old. People with this condition have soft, bruised skin, purple spots, telangiectasis, and collagen degeneration. In addition, they experience fibrotic depigmentation, reduced skin elasticity, and the development of premalignant or malignant tumors on the face, neck, or hands (del Rosso, 2017).

Skin photoaging shows a variety of symptoms, with some listed below. These include thickened and atrophic skin and hyperplastic skin cells. In pigmentation, people with photoaging experience changes in the epidermis, lentiginosities, and depigmentation areas. Melanocytes are usually found under the base membrane and move more erratically than those protected from the sun. The number of Langerhans cells is significantly reduced when compared to areas protected from sunlight (del Rosso, 2017).

The extracellular matrix appears discolored and elastic in photoaging histological preparations. These changes indicate that the skin has suffered damage from direct ultraviolet rays. As a result, the skin produces abnormal elastin fibers called osmotic elastin. Additional indicators of photoaging include collagen thickening and fibrosis; both processes contribute to the formation of granular osmotic elastin fibers (Knaggs, 2009).

Skin aging is an unavoidable physiological process. This is a concern for the public because the skin is usually exposed to environmental factors. People will first notice the aging of their skin when they interact with others; this will greatly affect their quality of life (Xie et al., 2015). Aging that occurs in individuals is a combination of intrinsic skin aging and extrinsic skin aging. Skin aging is the result of intrinsic and extrinsic aging processes. Extrinsic aging accelerates the normal aging process and causes clinically visible signs of aging. In intrinsic aging, it slows down and has no visible signs (Poljšak et al., 2012).

Skin aging is caused by a combination of extrinsic and intrinsic skin aging. The main cause of skin aging is exposure to ultraviolet rays, which cause DNA damage, inflammation, and immunosuppression of the outer layer of the skin. In addition, DNA damage leads to clinical manifestations of skin aging. With age, their skin cells lose the ability to grow and increase the production of free radicals. In addition, the extracellular matrix that maintains structural integrity is degraded and replaced with lower quality. In addition to these factors that cause clinical signs of skin aging, intrinsic skin aging leads to increased free radical production, decreased synthesis, higher degradation of the extracellular matrix, and increased damage to the outermost layer of the skin (Dodds et al., 2014). An alternative cause of skin aging based on the oxygen-free radical theory is that older people have more free radicals in their tissues than younger people. In addition, skin aging both intrinsic and extrinsic is caused by other factors that cause cell and tissue damage to the layers and subcutaneous tissues of the skin (Jenkins, 2002). Such factors cause visible signs of aging such as wrinkles and degenerative changes in the outer layer of the skin (Noblesse et al., 2006).

Blume explains that a decrease in skin moisture, an increase in TEWL, changes in sweat and sebum production, as well as changes in factors that keep skin moist all lead to xerosis of the skin and senile pruritus. It occurs as a result of reduced potential proliferation of skin cells and reduced physiological functions (Pinnell, 2003). In the end, aging skin results in wrinkles, lack of elasticity, and sagging. Changes in collagen synthesis and degradation cause the most

visible changes in aging skin. DNA damage and decreased ability to repair damaged cells lead to mutations in skin cells. Mutations can cause lentigo solaris, actinic keratosis, seborrheic keratosis, and even skin cancer (Berneburg et al., 2000).

Understanding the underlying pathophysiology and clinical picture of skin aging will prove beneficial in determining how to prevent and treat skin aging. This is especially beneficial for photoaging, which has significant implications for the quality of life of those affected by it. Prevention is much more effective and cost-effective than medication. Effective strategies to protect the skin include wearing a photoprotector against UV rays, protecting the skin from drying out with the right moisturizer, and drinking plenty of water. Getting the right skin care from infancy can provide lifelong protection against harmful environmental influences. It can help babies develop healthy bodies and mental systems that can lead to positive social interactions (Berneburg et al., 2000).

CONCLUSION

Chronic sun exposure, also known as photoaging, dramatically ages the skin. Solar UV rays—including UVC, UVA, and UVB—have significant biological effects on the body. In comparison, low levels of UVB and UVA have minimal effects on the body. Skin changes in aging skin include the sclerotic dermis and epidermis, as well as irregularly pigmented or hyperpigmented skin. In individuals with acclimatization or darker skin, there are often more Langerhans cells and fewer flat epidermal cells. Aging skin also has vesicles in the dermis and collagen deposits in the subcutaneous tissue.

More research is needed to understand the results presented above. This is because many questions have gone unanswered due to lack of information. For example, how the decrease in the number of Langerhans cells due to photoaging affects wound healing. The effect of sun exposure on skin mitosis should be further studied. Also, how long it takes for the skin to age from normal skin should be determined

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