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A REVIEW ON ANTI-AGING PROPERTIES OF POLYHYDROXY ACID

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ABSTRACT

Normally the natural antioxidants in our body will attract free radicals. However, large amounts of free radicals reduce antioxidants in the body. Exogenous antioxidants help bind free radicals in the body, so that free radicals do not bind to fats, or other proteins in the cell membrane. The polyhydroxy acids (PHAs) are the next generation of AHAs. They provide the anti-aging, skin-smoothing benefits of the AHAs without the potentially irritating side effects of burning and stinging. PHAs are also protective since most of them contain antioxidant properties. This review article focuses on anti-aging properties of polyhydroxy acid.

KEYWORD: anti-aging, aging, antioxidants, polyhydroxy acid.

INTRODUCTION

The skin is the outermost organ of the human body which functions as the main protector of other human organs. The skin is 10% of the body mass and covers an area of approximately 2 m^2.[1] Because it is the outermost part that is visible to the eye, the skin is the standard measure of human beauty. The skin is the organ most frequently exposed to free radicals. Free radicals are one of the factors that cause skin aging.

Aging is a biological event that cannot be avoided. Aging that occurs causes a person to be insecure because the face look aged due to wrinkled and dry skin. One of the causes of aging is free radicals. Free radicals are produced by the body's metabolism and external factors such as cigarette smoke, UV irradiation, radical triggers in food and other pollutants. Normally the natural antioxidants in our body will attract free radicals. However, large amounts of free radicals reduce antioxidants in the body. As a result of continuous exposure to free radicals can damage cells, through the process of oxidative stress.

Polyhydroxy acids is one of the groups Hydroxy acids (HAs) used in a number of cosmetic and therapeutic formulations in order to achieve a variety of beneficial effects for the skin. Polyhydroxy acids is a new generation of αHAs, provide effects similar to αHAs but with less irritation responses.[2,3] PHAs, such as lactobionic acid, are carboxylic acids with two or more hydroxyl groups attached to carbon atoms or an alicyclic chain.[3] It is essential that at least one hydroxyl group be attached to the α-position. Attaching a sugar molecule to the PHA structure results in a polysaccharide known as bionic acid. PHAs are also protective since most of them contain antioxidant properties.[3]

Theories and mechanism of aging

The theory of aging due to free radicals is explained by Denham Harman in the 1950s.[4] He proposes that organisms age because they accumulate oxidative damage.[4] This damage comes from reactive oxygen species (ROS), which are partially reduced metabolites of molecular oxygen generated as products of metabolic reactions or as by-products of various cellular processes, such as respiration. Many studies have shown that ROS and oxidative damage increase with age.[4]

Reactive oxygen species (ROS) can be divided into two categories. The first category is oxygen molecules which have unpaired electrons such as superoxide anions, hydroxyl radicals, and lipid peroxyl radicals. The second category is nitric oxide radicals and oxygen molecules that are in an excited state.[5]

In the process of aerobic metabolism, reactive oxygen species (ROS), including hydroxyl radicals, superoxide anions, and hydrogen peroxide (H2O2), can be produced in cells.[6] Reactive oxygen species (ROS) will react with the antioxidants in the cells. However, reactive oxygen species (ROS) that exceed the capacity, reactive oxygen species (ROS) will react with lipids, proteins, and nucleic acids in the cell. This reaction will result in oxidation or formation of peroxides. Oxidation and peroxide will damage DNA, cell membrane structure, and so on. The damage will lead to aging.[4]

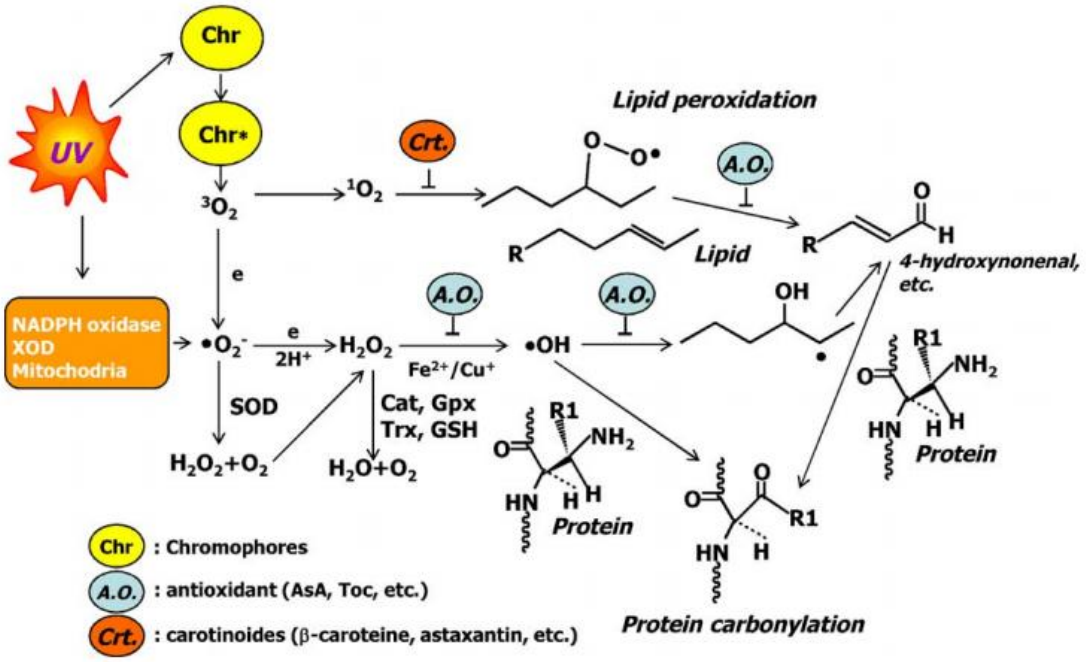

Figure 1: ROS-initiated oxidative chain reactions and scavengers.[5]

Aging and antioxidant

The body's defense mechanism to protect cells from damage caused by reactive oxygen species (ROS) is very important. In this mechanism, endogenous antioxidants are already present in the body. Antioxidants present in the body. namely glutathione peroxidase, catalase, and SOD. If the antioxidants in the body are not able to bind a lot of free radicals, it will cause damage to cells. To avoid this, exogenous antioxidants are needed.[5]

Exogenous antioxidants help bind free radicals in the body, so that free radicals do not bind to fats, or other proteins in the cell membrane. Therefore, antioxidants are able to prevent damage to cell membranes, so that aging caused by cell damage can be prevented with antioxidants.[7]

Anti-aging property of polyhydroxy acid

The polyhydroxy acids (PHAs) are the next generation of AHAs. They provide the anti-aging, skin-smoothing benefits of the AHAs without the potentially irritating side effects of burning and stinging. PHAs include gluconolactone and lactobionic acid, which are structurally larger molecules than AHAs allowing for slower skin penetration and thus fewer side effects. PHAs are also protective since most of them contain antioxidant properties.[3] In addition to the exfoliative benefits of AHAs, PHAs provide additional benefits of enhanced stratum corneum barrier function and moisturization with humectant properties. This makes

for enhanced skin compatibility and use for most skin types, including sensitive skins. PHAs are also protective since most of them contain antioxidant properties.[3] PHA is also known as an antioxidant chelating agent that suppresses the enzymatic activity of the matrix metalloproteinase, helping to protect against further sun damage.[3]

Lactobionic acid, has been shown to provide texture and smooth skin benefits and increase skin thickness through digital caliper measurements, thus providing several antiaging benefits. Lactobionic acid has also been shown to be gentle on the skin without the stinging and irritation associated with some AHAs. Topical lactobionic acid 8% to reduce signs of skin aging on the face and to determine histological changes and dermal thickness of the arms for 12 weeks of controlled use.[8]

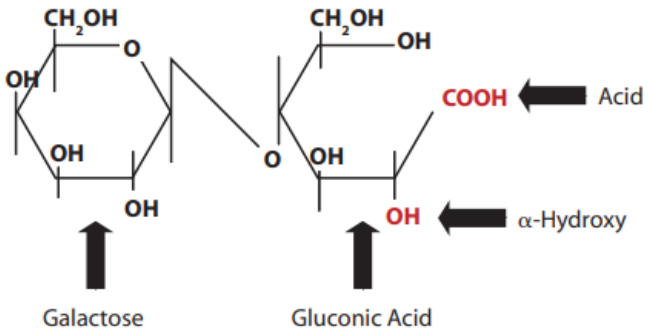

Figure 2: Chemical structure of lactobionic acid.[8]

Gluconolactone has shown efficacy to improve skin moisturization, fine lines and wrinkles, skin laxity, uneven skin tone, roughness, and pore size. Gluconolactone has also been shown to strengthen the skin's protective function against chemical challenges. The results of research by Bernstein et al in the 2004s, gluconolactone provides protection up to 50% against UV radiation, as measured in an in vitro system using the Transgenic Mice Expressing the Human Elastin Promoter method and does not significantly increase sunburned skin cells in human skin.[9]

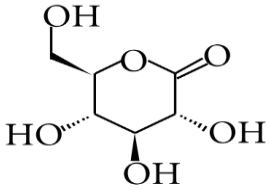

Figure 3: Chemical structure of gluconolactone.[3]

CONCLUSION

The polyhydroxy acids (PHAs) have activities as antioxidants, exfoliating, moisturizing, and are able to protect the skin from UV rays. Potential irritation The polyhydroxy acids (PHA) is less than Alpha Hydroxy Acids (AHA).

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