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Exposure to ultraviolet (UV) radiation from sunlight accounts for a global rise in premature skin aging and skin cancer

UV rays are separable into three types through wavelength: UVC is 200–280 nm, UVA is 320–400 nm and 280–320 nm is UVB

Since shorter UV wavelengths bring about more terrific impairment to the human body, the impairment induced by UVC is more pernicious than that caused by UVA and UVB UVC has been mostly absorbed by the ozone layer in the atmosphere. Therefore, UVB is the most dominant UV radiation for resulting in wrinkles, laxity, coarseness, and mottled pigmentation

Acute skin damage due to tanning manifests as sunburn

Melanogenesis, on the other hand, may protect skin from the damages caused by UV irradiation Exposure to UV radiation, keratinocytes secrete an important melanogenesis regulator, α-melanocyte stimulating hormones (α-MSH), which may trigger the microphthalmia-associated transcription factor (MITF) Furthermore, UV damage to the skin triggers inflammation that decreases the expression of genes associated with permeability barrier repair which is thought to be a major factor in the skin barrier, is reduced by sunburn During the past decade, safeguarding against UV radiation has been highly studied and was promoted in lots of public health education programs Researchers have frequently concentrated on how to forbid excessive UV exposure, and seldom pay attention to sunburn repairing, post-basking recovery, and pigmentation mechanisms

Milk, one of the most significant provisions for mammals, is the preferred form of feed supplying nutrients and energy Dairy products have been regarded as a conventional nutrient for the skin and milk bath remains popular. Dairy protein allergy, nevertheless, is the most prevailing food allergy in infants, that often experience crossed sensitivity to the present substitute formulae including sheep, goats, milk hydrolysate, and soya bean milk

Donkey milk as a valid natural substitute for cow milk, is similar to human milk in chemical components and organoleptic characteristics to our knowledge, no allergic reaction to donkey milk has been reported so far. It is said that Cleopatra took donkey milk for a shower to lighten the skin around 3,000 years

ago. Many milk compositions have shown promise in preclinical studies and have been undergoing active clinical trials Donkey milk may benefit overall skin health and cure some skin diseases because donkey milk is rich in vitamin A, vitamin C, niacin, phosphorus, magnesium, zinc, glycine, glutamic acid, ω3-polyunsaturated fatty acids, lipidic prostaglandins, leukotrienes all of which occur in pharmaceuticals and cosmetics.

Until now, the anti-photo damage activities of donkey milk especially skin barrier protection and melanin production inhibitory activities, had not been documented. So, a study was conducted exploring the protective effects of donkey milk on UVB-induced skin barrier damage and melanin pigmentation via in vitro and in vivo studies. In the study, donkey milk was applied topically. The thickness and integrity of these irradiated skin were evaluated at definite time points Besides, the mechanisms of donkey milk on UVB-induced skin barrier damage and melanin pigmentation were evaluated via a network pharmacology method.

In this study, it is suggested that donkey can help the skin restore after UVB exposure. *in vitro* tests conducted revealed that donkey milk helps protected against sunburn and tanning. The whitening effect was mainly reflected in the good inhibitory effect of donkey milk on synthesis of melanin, tyrosinase activity, and related gene expression. Donkey milk could not only prevent UVB-induced adverse effects but also restore skin barrier function by increasing FLG's expression and regulating metabolism procedures such as lipid and steroid metabolism. Hence, donkey milk is desirable for skin care cosmetics against UVB-induced skin barrier damage and melanin pigmentation.

Exposure to UVB has psychological and physical benefits, especially in the synthesis of vitamin D3 and the prevention of diseases like osteoporosis

However, UVB is responsible for photo carcinogenesis and sunburn response.

Recent investigations have disclosed UVB-induced skin injury's pathology, like sunburn, photoaging, and skin cancer utilizing cells, animals, and human studies Previous studies also have shown that UVB affected epidermal morphology, disrupted the skin barrier, increased trans epidermal water loss, and decreased stratum corneum hydration

Initially, melanin pigmentation plays a dual role in skin: it is suggested to render photoprotection from the DNA-damaging effects of UV while leading to acquired hyperpigmentation disorders such as melasma

In the study it was found that donkey milk protected against sunburn and tanning.

Milk has been used to treat skin wounds for thousands of years In the past few years, researchers' attention has been attracted to milk products due to several bioactive components' plenteous presence In this study, HPLC was employed to evaluate the composition of donkey milk A network pharmacology method was used to find out the potential mechanism and active compounds in donkey milk for restoring skin barrier and pigmentation UVB-induced detriment.

By network prediction, we could find that donkey milk was closely related to melanin metabolism. HPLC analysis revealed that donkey milk is rich in cholesterol, fatty acids, vitamins and amino acids.DM is rich in leucine, lysine, glutamic, isoleucine, threonine, tyrosine, serine, and valine. It has been reported that alanine, glycine, phenylalanine, and aspartic acid were shown to have different effects against melanin contents and TYR activity in B16 melanoma cells according to their chemical structures or their combinations

Another study showed glycine hydroxamate downregulated melanin synthesis and TYR activity through activating cAMP/ PKA pathways as a tripeptide component, glutathione serves long as an intravenous anti-pigmentation product by inhibiting TYR activity Moreover, nicotinic acid hydroxamate inhibited the TYR activity and melanogenesis by downregulating the MEK/ ERK and AKT/ GSK3β pathways

Besides, the effect of cholesterol, fatty acids, and microelement in donkey milk on lightening pigmentation has been controversial. Some reports demonstrated that fatty acids are able to regulate the post-Golgi proteasomal degradation in ubiquitinated TYR Briefly, linoleic acid and docosahexaenoic acid (DHA) decrease melanin levels, while palmitic acid (PA) increases melanin levels. In addition, trace elements such as calcium (Ca), magnesium (Mg), copper (Cu) and zinc (Zn) are a kind of important nutrients, which participate in the body's metabolism as the components or activators of enzymes and receptors Additionally, TYR with copper binding is the rate-limiting enzyme in melanin biosynthesis and first catalyses hydroxylation). In the present study, a molecular target network was developed and validated to predict the melanogenesis regulators related to 64 melanin targets. Donkey milk was evaluated for TYR activity and melanogenesis in vitro with experimental validation. Thus, donkey milk was considered to have the potential skin-

whitening effect and may be supposed to develop as a safe potentially depigmented agent.

By network prediction, we could find that the nutritious ingredients of Donkey milk are the indispensable base of skin barrier reconstruction and keratinocytes survival from UVB exposure. The lipid fraction of donkey milk consists of several nutritional significant components, such as phospholipids and polyunsaturated fatty acids. Donkey milk lipids' importance in skin structure and skin barrier function has been revealed by continued research. Donkey milk can restore the skin barrier function by increasing the expression of FLG in keratinocytes and epidermal thickness of after UVB exposure. Changes in epidermal structural proteins like FLG are frequently related to damage to cutaneous barrier function. FLG play a fundamental part in skin barrier function, and gene mutations of FLG are usually associated with the deterioration of atopic dermatitis and ichthyosis. Excessive exposure to sunlight can diminish epidermal FLG and result in an acquired filaggrin insufficiency (which is consistent with our results.

The full study can be found here

National Library of Medicine USA

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10033878/