Involvement of Melanin Monomers in the Skin Persistent UVA-Pigmentation and Effectiveness of Vitamin C Ethyl on UVA-Pigmentation

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Abstract

We have discovered that melanin, which is dark brown in color and is a well-known cause of pigment spots and freckles, can also be produced outside of melanocytes (pigment-producing cells) by ultraviolet (UV) A radiation. Melanin is usually produced in melanocytes; however, this research proved that colorless melanin monomers (melanin precursors) accumulating in the basal layer of the epidermis, outside of melanocytes, turn into melanin by direct exposure to UVA radiation, and the brownish pigmentation remains in skin exposed to high doses of UVA for several weeks. Melanin is produced from one of the amino acids called tyrosine as a starting material through various premelansins. We conducted in vitro and in vivo experiments and found that 5,6-dihydroxyindole-2-carboxylic acid (DHICA) and 6-hydroxy-5-methoxyindole-2-carboxylic acid (6 H 5 MICA) accumulate in the keratinocytes and supernatants co-cultured with melanocytes, and readily respond to UVA to produce brownish melanin. We developed an in vitro and in situ method to evaluate ingredients, which inhibit melanization of DHICA and 6 H 5 MICA caused by UVA radiation. We found that vitamin C ethyl (ethyl ascorbic acid) is an effective ingredient to inhibit the pigment formation from DHICA and 6 H 5 MICA, and to prevent pigmentation of the basal layer of the epidermis caused by UVA. Clinical study proved that the effectiveness of vitamin C ethyl on UVA-induce persistent pigmentation. Making use of this technology, we have promoted the development of whitening skincare products.

Key words: ethyl ascorbic acid, DHICA, 6 H 5 MICA, melanin, UVA.

1. 緒言

日光を通度に浴びると皮膚がすぐに黒くなり、数時間後には赤くなる日焼けが起こりはじめる。すぐに起こる黑化はおもに長波長紫外線（UVA）が原因である。数十分後に消える一過性の灰黒色の黒化は即時黒化（immediate pigment darkening: IPD）とよばれるが、数時間残るもののは即時型持続黑化（persistent pigment darkening: PPD），数週間つ1カ月ほど褐色の色素沈着となって残るものは即時型色素沈着（immediate pigment darkening: IPD）とよばれる。