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Review Article

Nanostructure lipid carriers: A modish contrivance to overcome the ultraviolet effects

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ABSTRACT

Protection of the skin from the ultraviolet radiation is the prime concern of society. An increase in the adverse effects by ultraviolet (UV) radiation on the skin promoted cosmetic formulators to work in the area of UV blockers and their effective means of delivery. Nanostructured lipid carriers (NLCs) is a modern and successful lipid carrier system in the cosmetic world associated with various advantages i.e., stability, effective drug loading capacity etc. NLCs also permits to load 70% of UV blockers which are sufficient to obtain recommended Sun Protection Factor (SPF) which makes them suitable delivery systems for topical application of the UV blockers.

Contents

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1. Introduction

UV rays are the component of sunlight, which exerts both positive and negative effects on living beings. There are three types of UV radiations, which include UV-A (400–320 nm), UV-B (320–290 nm) and UV-C (100–290 nm) radiations (Fig. A1). About 95% of UV radiations enters into the earth are about UV-A radiations and form the part of solar radiation, which penetrates deeper on skin tissues or cells as compared to UV-B radiations [1]. UV-A is responsible for skin aging, wrinkles, tanning and can lead to the development of skin cancer. On the other hand UV-B radiation causes sunburn, weakening of the skin inner tissues, affects human eye lens and immune system [2]. It is also reported that when the human body is exposed to the UV-B rays, they are absorbed by the human cells and results DNA (deoxyribonucleic acid) impairments which will ultimately lead to death of cells. An excessive exposure of UV-B radiation, leads to suppression of the immune system which in turn make the body more vulnerable to herpes simplex virus, acne, and skin lesion, etc [3]. UV-C is completely absorbed by the ozone layer [4].

1.1. Skin and radiation

The structure of human skin consists of three main layers (1) Epidermis (2) Dermis (3) Subcutaneous (Fig. A2). Epidermis consists of five layers, namely stratum basale/germinativum, stratum spinosum, stratum granulosum, stratum lucidum and stratum corneum [5]. The stratum corneum is the uppermost layer of human skin made up of flattened dead cells and hold about 25% of total epidermis. In the stratum corneum due to continuous proliferation of keratinocytes, corneocytes are formed which are covered by

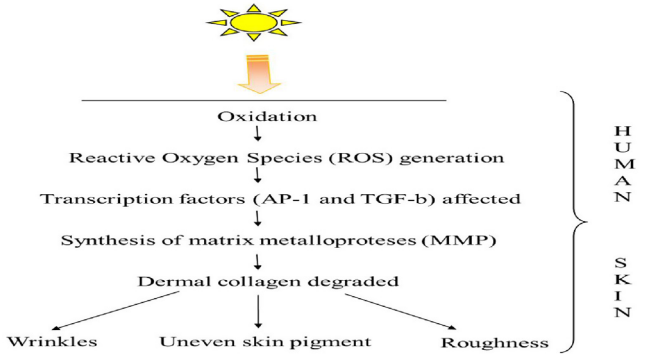

Fig. A2. Effect of UV radiation on human skin.

cornified protein [6]. Corneocytes tightly bound together to form a barrier of the skin. Proliferating keratinocytes releases lipid in this layer which make up the lipid barrier of the skin [7]. In stratum granulosum layer "Cornification" takes place which is a unique process of differentiation and programmed death of the cell in keratinocytes. Next layer, i.e. stratum spinosum consists of immune cells (Langerhens cells). Langerhans cells are responsible for the protection against the infections. These cells present about 3–6% in the epidermis excluding the stratum corneum and over expressed in stratum spinosum. They play an important role in immunity in several diseases and involved in maintaining the immune homeostasis in skin by activating skin resident regulatory T Cells. [8,9]. The deepest layer, stratum basale/germinativum is the most germinative part of the epidermis, which shows the highest mitotic activity. This layer consists of various cells, such

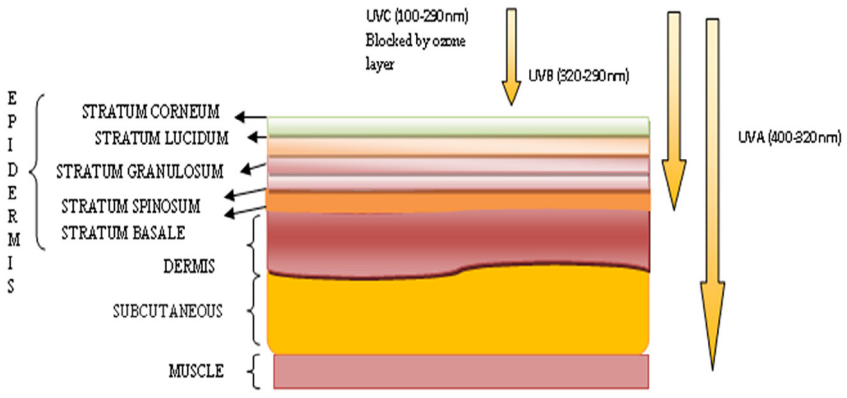

Fig. A1. Schematic representation of various layers of human skin and penetration of UV radiation to the various layers of human skin.

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