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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.

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Contents

1. Introduction	00
1.1. Skin and radiation	00
2. Adverse effects of UV radiations	00
2.1. Sunburn (erythema) and tanning	00
2.2. Immune response	00
2.3. Skin photoaging	00
2.4. Skin cancer	00
2.5. Eye diseases	00
3. Sunscreen agents	00
3.1. Chemical sunscreens (Organic)	00
3.2. Physical sunscreens (Inorganic)	00
4. Novel drug delivery systems and formulations	00
4.1. Liposomes	00
4.2. Transfersomes	00
4.3. Niosomes	00
4.4. Ethosomes	00
4.5. Solid lipid nanoparticles (SLNs)	00
5. Nanostructured lipid carriers (NLCs)	00
5.1. Imperfect NLCs	00
5.2. Amorphous NLCs	00
5.3. Multiple NLCs	00
5.4. Advantages over other lipid carriers	00
5.5. Method of preparation of NLCs	00
5.5.1. Hot homogenization method	00
5.5.2. Cold homogenization method	00
5.5.3. Solvent-emulsification evaporation method	00

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5.6. Characterization of NLCs. 00

6. Patents on nanostructured lipid carriers. 00

6.1. Composite sun-screening agent nano-structure, lipid carrier and its preparation method (Application Number: CN 102697663 B). 00

6.2. Formulation of anti-screening agent with nanostructured lipid carrier as its carrier system and its preparation method (Application Number: CN 102688152 A) 00

6.3. Anionic lipids and lipid nano-structures and methods of producing and using same (Application Number: US20110059157 A1) 00

6.4. Nanostructured lipid carriers containing riluzole and pharmaceutical formulations containing said particles (Application Number: US20100247619 A1, WO2008000448 A3). 00

6.5. Sunscreen formulation containing triethanolamine neutralized 2-hydroxy-4-methoxy-benzophenone-5-sulfonic acid (Application Number: US3670074 A) 00

6.6. Disappearing color sunscreen compositions (Application Number: US6007797 A) 00

6.7. Amorphous silicon film as a uv filter (Application Number: US3743847 A) 00

6.8. Use of Benzophenone Uv Filters for Preventing Tanning (Application Number: US20070219275 A1) 00

7. Conclusion and future perspective 00

References 00

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

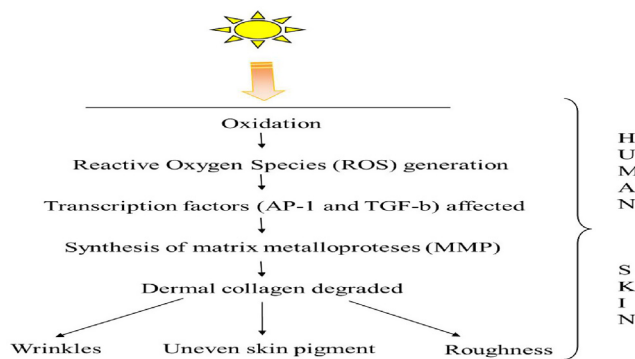


Fig. A2. Effect of UV radiation on human skin.

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

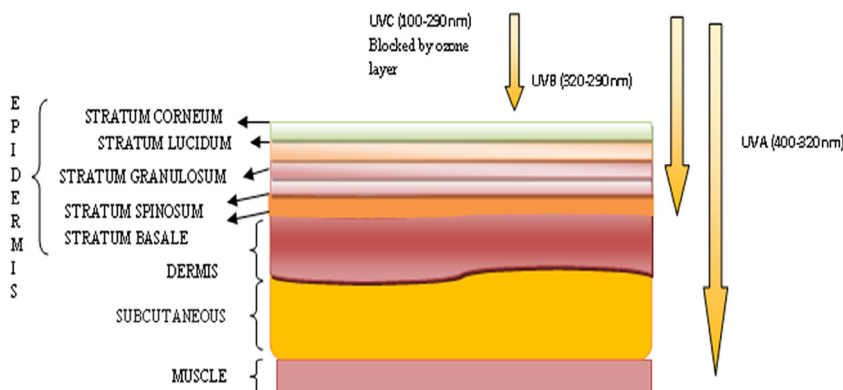


Fig. A1. Schematic representation of various layers of human skin and penetration of UV radiation to the various layers of human skin.

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