MINDSHARE

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Environment & Biodiversity Conservation

GUTENBERG

MINDSHARE VOLUME XXXVIII

Environment and Biodiversity Conservation

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Open Access at MindshareYuva.com

ISBN 978-93-93937-08-7

Published by
Gutenberg
B-4, NDSE Housing Society, South Ext. Part 1,
New Delhi 110049 INDIA
M: 9005090070, 9026293423
Email: gutenberginc@gmail.com
www.gutenbergbooks.com

Printed by
Trident Enterprises
D-204, Sector-10, Noida 201301 INDIA

MiNDSHARE
VOLUME XXXVIII ISSN 2229-4872

Board of Editors

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MINDSHARE
https://doi.org/10.55031/mshare.2021.38.Bd.6
MINDSHARE Vol XXXVIII 2021 pp. 60-68
Environment and Biodiversity Conservation

Nanostructured Lipid Carrier System for the Treatment of Skin Cancer: A Review

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ABSTRACT

Skin cancer is the abnormal growth of the skin. Intense solar radiation causes suntan, premature ageing which can ultimately lead to skin cancer. To protect our skin from the sun it is necessary to work on UV blockers and their effective path of delivery. Nanostructured lipid carriers (NLCs) are made of a mixture of solid lipids and liquid lipids and it enhances the solubility and bioavailability, drug loading capacity which makes them a suitable drug delivery carrier for the topical application and also permits to load 70 % UV blocker. In this review, the disease burden, its pathogenesis due to genetic alteration in the p53 tumor suppressor gene are explored further the types of NLCs and their use in various ways for skin are discussed. Literature was searched on PubMed, Google Scholar, Web of Science and Science direct for studies. I also assessed the global trends for skin cancer worldwide through the Global Burden of Disease Study database. The rate of change in skin cancers varied among countries. Squamous cell carcinomas increased during this time. Men have occurred

a high rate of keratinocyte carcinoma and women experienced a greater prevalence of melanoma. Various types of NLCs with their mechanism were also described to prevent skin cancer. The mechanism of NLCs has presented hotspots in research that need to be emphasized. Nanostructured lipid carriers will be further advanced to a more efficient, exact and protected manner. More research in the clinical investigation of NLCs will pave the way for success for nano lipid carriers. The incidence, prevalence of skin cancers are increasing disproportionately among different demographic groups. Updated measures of the skin cancer burden, need to be found and allocate good funding to eradicate the skin cancer.

KEYWORDS

Skin cancer; Nanostructured lipid carrier, Ultraviolet radiation.

1. INTRODUCTION

Skin cancer is the abnormal growth of skin cells. The morbidity and mortality rates of skin cancers are increasing day by day so it is matter of public health concern. The basic reason for the development of skin cancer is ultraviolet radiations which mutation in the gene. One can reduce the risk skin cancer by avoiding the exposure to the sun. https://www.mayoclinic.org/diseases-conditions/skin-cancer/symptoms-causes/syc-20377605. So it is very necessary to clearly understand the UVR mechanism to stop the development of skin cancer (Narayanan et al., 2010). There are basically three types of skin cancer — basal cell carcinoma, squamous cell carcinoma and melanoma. Ionizing radiation, environmental pollutants, chemical carcinogens can cause skin cancers. Exposure to artificial UV radiation (tanning beds and lamps), aging, skin color, diet and smoking, dermatoses and various types of keratoses, chronically injured or non healing wounds, and scars can also causes skin cancer (Saladi and Persaud, 2005).

Nanostructured lipid carriers have attracted the pharmaceutical companies over the last years (Selvamuthukumar et al., 2012). Nanostructured lipid carriers (NLC) consist of solid and liquid lipids (oils) dispersed in an aqueous solution containing a surfactant. NLC have many advantages: good biocompatibility, low cytotoxicity, high drug content; they enhance a drug's stability and it can deliver by various ways

like oral, intravenous, pulmonary, ocular, dermal (Mahant et al.,2018; Czajkowska-Kośnik et al., 2019).

2. BURDEN OF SKIN CANCER

The rate of occurrence of both type of skin cancer i,e, non-melanoma and melanoma increasing continuously. Basal cell carcinoma (BCC) is the most common type of skin cancer (Mohan and Chang 2014). Millions of cases are diagnosed in the U.S. each year (Roger et al. 2015). Squamous cell carcinoma is the standard form of skin cancer (Karia et al. 2013). Generally, non-melanoma skin cancers are developed with exposure to harmful ultraviolet radiation coming from the sun (Koh et al. 1996). In U.S. approximately, 87,110 cases of melanoma will be diagnosed in the year 2017, in which 52,170 cases reported in the men while 34,940 cases reported in the women http://www.cancer.org/acs/groups/content/@editorial/documents/document/acspc048738. In India, skin cancers diagnosed about 1-2%. BCC is the also the most common form of skin cancer worldwide, but various studies from India have consistently reported SCC as the most prevalent skin malignancy. Although complete data of incidence is not available, various cancer registries in India reported the cumulative impact of skin cancer varying from 0.5 to 2 per 100 000 population (National Cancer Registry Programme, Indian Council of Medical Research). Melanoma patients were treated according to recurrence-free survival (RFS) and duration of follow-up (DOFU) courses and dependent on the factors like age, sex, and tissue of origin, site of disease, number of nodes, lymphadenopathy and ulceration stage. During both the courses regional lymphadenopathy and distant metastases were observed in 33% and 32% respectively. The highest incidence of lymphadenopathy was observed in skin lesions and primaries from trunk and extremities. Of all treated patients, 47% achieved a complete response, 18% partial response, and others had either stable or progressive disease. The median of DOFU was 6.2 months whereas the median of RFS was 10 months. Malignant melanoma is incurable more studies further needed to come to definite path (Sharma et al. 2009).

3. SKIN CANCER PATHOGENESIS BY UV RADIATION

The damaging effects of ultraviolet radiations on the skin are thought to be caused by direct cellular damage and changes immune response. UVR damages the DNA by develops the cyclobutane pyrimidine dimers, oxidative stress, inflammatory