

# Chapter 12

## Innovative Approaches in Skin Cancer Therapy: The Promise of Terpenes


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### ABSTRACT

*Skin cancer, including melanoma, is a worldwide health issue with rising rates. UV exposure, genetics, and environment are risk factors. NMSCs grow from UV radiation, genetic mutations, and viruses. Melanocyte-derived melanoma is the deadliest skin cancer, with adolescent UV exposure and genetic susceptibility as risk factors. DNA damage and immunosuppression result from UV exposure. Adolescent sunburns increase melanoma risk, whereas cumulative UV exposure increases BCC and SCC risk. Tanning beds, HPV, chemicals, and immunosuppression are further risk factors. Whites' lower melanin levels increase their risk and requires early diagnosis. Understanding these aspects is crucial for global skin cancer prevention and individualized treatment. Terpenes, plant chemicals, regulate apoptosis, autophagy, signaling pathways, gene expression, angiogenesis, and inflammation by downregulating anti-apoptotic proteins and upregulating pro-apoptotic proteins. Terpenes also boost conventional chemotherapeutics. Exploring terpenes as mela-*

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*noma treatments requires understanding these pathways.*

## 1. INTRODUCTION

### Skin Cancer

Skin cancer (SC) is the fifth general cancer today, and approximate 18 million newly diagnosed cases and approximate 9.5 millions people was died globally in 2018. Melanoma cases are rising, with estimates of 6% in males and 4% in females by 2023 (De Martel et al., 2020). SC stems from abnormal cell proliferation due to DNA mutations and also due to genetic defects. Skin comprises of two layers: One is the epidermis (containing melanocytes and epithelial cells) and second one is the dermis (with blood vessels, sweat glands, and hair follicles). Malignant melanoma occurs due to melanocyte mutations, whereas non-melanoma skin cancer (NMSC), the most general type, originates from epidermis and includes BCC and SCC (Rogers et al., 2015).

One in five people will experience SC in their lifetime, but early detection keeps mortality low. NMSC or keratinocyte skin cancer (KSC) affects cells other than melanocytes and is increasing by 10% annually, mainly due to UV radiation and genetic mutations in genes like CYP450, GST, and p53. NMSC includes various forms, such as SCC, BCC, and Merkel cell carcinoma (Rogers et al., 2010)

BCC is most common skin malignancy, largely due to sunlight exposure, affecting 4.3 million people annually in the US. It appears as pinkish bumps or patches on sun-exposed areas and is primarily treated with radiation or topical therapies, given its low metastatic nature (Madan et al., 2010)

CSCC is second most general skin malignancy, with around 1 million US cases annually and increasing incidence. It presents as scaly patches or red bumps, with higher mortality rates than BCC. Contributing factors include UV radiation, light skin, aging, and genetic mutations. Treatment mainly involves surgery, with radiation and systemic therapies for advanced cases (Alam & Ratner, 2001)

Terpenes, sometimes referred to as isoprenoids, which are a broad and have various categories of organic compounds that are present in plants, fungus, and certain animals . They are distinguished by a unique carbon skeleton (Tholl, 2006) It is made up of several isoprene units, which can be arranged in a cyclic, branching, or linear fashion. Terpenes are involved in many physiological processes, like defense against biotic and abiotic stress, and reproduction. Terpenes are also play a major role in biosynthesis of plants secondary metabolites, like as pigments and essential oils (Pichersky & Raguso, 2018) Terpenes are frequently found in resins, and other materials obtained from plants. They are produced by other organisms

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