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Author: Marta Cristina Filipe Simões, João José Simões Sousa, Alberto António Caria Canelas Pais

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Review

Skin cancer and new treatment perspectives: a review

Marta Cristina Filipe Simões [*1], João José Simões Sousa [1], Alberto António Caria Canelas Pais [2]

[1] Faculty of Pharmacy, University of Coimbra, Azinhaga de Santa Comba, 3000-548 Coimbra, Portugal.

[2] Department of Chemistry, University of Coimbra, Rua Larga, 3004-535 Coimbra, Portugal.

*Corresponding author. Address: Faculty of Pharmacy, University of Coimbra, Azinhaga de Santa Comba, 3000-548 Coimbra, Portugal. Tel: +351 239 488 433; Fax: +351 239 488 503; e-mail address: martacfsimoes@gmail.com.

Highlights

- State of the art: technologies that may fit in the clinical practice are overviewed.
- New treatment options, prompted by the growing incidence of skin cancer, are discussed.
- Strategies from nanotechnology and immunotherapy are also focused.

Abstract

Skin cancers are by far the most common malignancy of humans, particularly in the white population. The growing incidence of cutaneous malignancies has heralded the need for multiple treatment options. Although surgical modalities remain the mainstay of treatment, new research and fresh innovation are still required to reduce morbidity and mortality. Approaches for skin cancer may pass through new technological methods instead of new molecules. The first part of this paper provides a review of the state of the art regarding skin cancer disease as well as epidemiology data. Then, it is described the gold standards of the current recommended therapies worldwide and the actual needs of these patients. This is the first paper that highlights the novel and future therapeutic perspectives for the treatment of skin malignancies, new therapeutic agents and promising technological approaches, from nanotechnology to immunotherapy.

Keywords

Skin cancer; nanoparticles; polymers; immunotherapy; phototherapy.

State of the art for Skin Cancer

1. Skin cancer

The skin is the largest organ of the body, covering approximately 16% of body mass. Skin is organized into two primary layers, epidermis and dermis, which are constituted of several components, as epithelial, mesenchymal, glandular and neurovascular. Epidermis, of ectodermal derivation, is the peripheral layer of skin that contacts with the environment, working as a physiochemical barrier against environmental stressors such as pathogens, chemicals and UV. This layer acts as body's armour (1-6). The most abundant cells of epidermis are keratinocytes, characterized by their expression of cytokeratins and tightly connected to each other by desmossomes and thigh junctions. Dermis, originated from mesoderm, underlies the epidermis and anchorages cutaneous structures such as hair follicles, nerves, sebaceous glands and sweat glands. Dermis also contains abundant immune cells and fibroblasts, which actively participate in many physiologic responses in the skin (1, 7) (Figure 1). Epidermal keratinocytes, as a result of cell division by keratinocyte stem cells in the *stratum basale* (basal layer), undergo a programmed differentiation as they migrate outward through the surface of the skin to eventually form corneocytes, which are tightly-linked dead but undamaged cells, constituting the principle barrier of the epidermal coating (7, 8).

Abbreviations

5-ALA: 5-Aminolevulinic acid
5-FU: 5-Fluorouracil
APC: Antigen presenting cell
BCC: Basal cell carcinoma
CAP: Cold Atmospheric Plasma
CM: Cutaneous malignant melanoma
CNP: Cerium oxide nanoparticle
CNT: Carbon nanotube
COX-2: cyclooxygenase II