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Optical strategies for the treatment of cutaneous melanoma

JASINEVICIUS, Gabriel Oliveira[1]; BUZZÁ, HIlde Harb[2]; MORIYAMA, Lilian Tan[1]; KURACHI, Cristina[1]; CHEN, Juan[3]; ZHENG, Gang[3]; MARTINELLI, Letícia Palombo[1]; TOVAR, Johan Sebastián Díaz[1]

leticia.martinelli@usp.br

[1]Instituto de Física de São Carlos - USP; [2]Pontificia Universidad Catolica de Chile - UC; [3]University of Toronto - U of T

Melanoma is the most aggressive type of skin cancer and a major health problem. Even with a low incidence, it has a high mortality rate when not diagnosed at local stage. (1) The standard treatment is surgery and for advanced stages, treatments such as chemotherapy, radiotherapy and immunotherapy are only palliative. There is a need, therefore, to develop new therapeutic options. In the case of cutaneous melanoma, therapies that use light in the wavelength of visible light show a poor response due to the limitation of light penetration into the tumor caused by melanin. In this study, the effect of a indocyanine green nanoemulsion (NanoICG) was evaluated in an animal model for the treatment of cutaneous melanoma, using photothermal therapy (PTT) with irradiation at 808 nm and its association with optical clearing agents (OCAs). PTT is a technique based on the use of a compound called photosensitizer (PS) and light at a suitable wavelength for its activation. Upon gaining energy from light, the PS goes to an excited state and returns to the ground state, releasing heat. (2) This localized temperature rise can cause cell damage and even death. OCAs decrease attenuation in tissues causing light to reach deeper into the tissue, increasing response to therapy. (3) Different doses of light and concentrations of the molecule were tested, in addition to intratumoral and systemic administration. Experiments were also carried out with the same B16F10 cell line, but with two different phenotypes: one had greater melanin production while the other less. Optical properties of the tumors were also taken, such as diffuse reflectance, to better understand the response to treatment in these two conditions. The group with intratumoral administration and with less pigmented cells showed a better response to PTT, in which 66% of the animals had complete reduction of the lesion within 14 days. Macroscopic response and histological analyses are performed to evaluate the PTT response. PTT with more pigmented cells showed total or partial tumor reduction in 57% of the animals. Kaplan-Meier curves for animal survival are also compared for the investigated protocols, in which animals with less pigmented tumors survived up to approximately 30 days and with more pigmented tumors more than 50 days. The groups with OCAs are being held.

Palavras-chave: Melanoma. Optical clearing agents. Photothermal therapy.

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