

Proof-of-Concept Study of Gold-based Nanosystem Combined with NIR Laser Irradiation for Melanoma

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The global impact of cancer emphasizes the importance of developing innovative, effective and non- or minimally invasive therapies. Photothermal therapy (PTT) is attracting increased attention for the treatment of superficial localized tumors, relying on the induction of local hyperthermia of tumor cells upon their irradiation with light beams. PTT efficacy depends, however, on the heat generated and, on the depth reached by the light. Some strategies to improve PTT efficacy includes the use of the near infrared (NIR, 650 to 900 nm) radiation to enhance the penetration depth of the light, combined with gold nanoparticles to enhance the photothermal effect. The development of a multifunctional nanoparticle-based system and its *in vitro* and *in vivo* safety and efficacy characterization are, herein, proposed as a proof-of-concept. This multifunctional system consists of coated gold nanoparticles [1-2] and functionalized with epidermal growth factor for greater specificity towards cutaneous melanoma cells [3]. The characterization of this system included several phases [4], with *in vitro* assays being firstly performed to assess the safety of gold nanoparticles without laser irradiation. Then, hairless immunocompromised mice were selected for a xenograft model upon inoculation of A375 human melanoma cells. Treatment with near-infrared laser irradiation for five minutes combined with *in situ* administration of the nanoparticles showed a tumor volume reduction of approximately 80% and, in some cases, led to the formation of several necrotic foci, observed histologically. No significant skin erythema at the irradiation zone was verified, nor other harmful effects on the excised organs. In conclusion, these assays suggest that this system is safe and shows promising results for the treatment of superficial melanoma.

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