

Gold Nanoparticles for the Photo(thermal) enhancement of therapeutic strategies

Pedro V. Baptista

UCIBIO, Departamento de Ciências da Vida, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Campus de Caparica, 2829-516 Caparica, Portugal
Email : pmvb@fct.unl.pt

Photothermal therapy (PTT) uses agents tuned for near infrared (NIR) or visible (VIS) light to convert light into heat and increase the temperature of specific tissues^{1,2}. Tissues have natural photothermal agents, such as hemoglobin, but their absorption efficiency is very low, requiring higher amounts of energy. Recently, nanoscale-based photothermal agents, such as gold nanoparticles (AuNPs) have supported PTT as anti-cancer treatment. AuNPs of specific sizes and shapes, including gold nanorods, nanocages and nanoshells are capable to convert NIR radiation into heat. Commonly, NIR lasers are usually used with AuNPs due to the optical window in the NIR, where hemoglobin, melanin and water absorption is reduced, allowing deeper light penetration into fluids and tissues².

We have been using spherical AuNPs (10 to 30 nm) with a characteristic localized SPR band around 520 nm, for efficient light-to-heat conversion in cells. The higher photothermal conversion when compared to other sized and shaped AuNP derives from their absorption corresponds almost totally to their extinction. Examples include laser irradiation for hyperthermia against cancer cells is a simple strategy capable to induce selective death of tumor cells that are more sensitive to local increase of temperature, which has been coupled to chemotherapeutic strategies to tackle recurrent issues of drug resistance^{3,4}.

Acknowledge UCIBIO (UID/Multi/04378/2013); RA-Detect; Acção Integrada A 02/18

[1] Abadeer, et al. *J Phys Chem C* 2016, 120, 4691–4718;

[2] Cabral, R.M., & Baptista, P.V. *Nano Life* 2013, 03, 1–18

[3] Mendes, R., et al. *Sci Rep* 2017, 7, 10872;

[4] Pedrosa, P., et al. *Sci Rep* 2018, 8, 11429