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# Radiolabelled Gold Nanoparticles for Image-guided Chemoradiotherapy of Glioblastoma Multiforme

A. Paulo,<sup>1,\*</sup> A. Belchior, A. D'Onofrio,<sup>1</sup> C. Oliveira,<sup>1</sup> D. Peitinho,<sup>1</sup> F. Marques,<sup>1</sup> F. Silva,<sup>1</sup> M. P. C. Campello,<sup>1</sup> Lurdes Gano,<sup>1</sup> M. Ravera,<sup>2</sup> P. Raposinho<sup>1</sup>

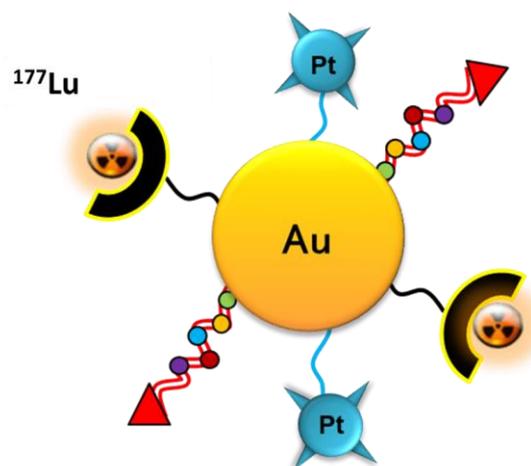
<sup>1</sup>Centro de Ciências e Tecnologias Nucleares, Instituto Superior Técnico, Universidade de Lisboa, Estrada Nacional 10 (km 139,7), 2695-066 Bobadela LRS, Portugal

<sup>2</sup>Dipartimento di Scienze e Innovazione Tecnologica, Università del Piemonte Orientale "Amedeo Avogadro", Alessandria, Italy

## Abstract:

Glioblastoma multiforme (GBM) is among the most aggressive cancers and remains essentially an incurable disease. Therefore, there is an urgent need for innovative therapies against GBM. To tackle this goal, we have focused on multifunctional gold nanoparticles (AuNPs) for image-guided GBM chemoradiotherapy, using an unprecedented strategy that relies on the simultaneous delivery of Pt(IV) prodrugs and therapeutic radionuclides. By considering AuNPs for the design of these new theranostic tools, we have took into consideration their appealing properties for medical application, such as, biocompatibility, easy functionalization with molecular vectors and good biological half-life. Additionally, AuNPs can also be explored as multifunctional platforms for targeted-delivery of radionuclides and chemotherapeutic drugs. Herein, we will report on the synthesis, characterization and biological evaluation of AuNPs decorated with Pt(IV) prodrugs, a DOTA-based chelator for coordination of medically relevant trivalent metals (e.g.  $^{67}\text{Ga}$ ,  $^{177}\text{Lu}$ )<sup>1</sup> and a bioactive peptide (substance P (SP) derivatives) that recognizes the NK1 receptor overexpressed in GBM cells. Some of the SP-containing AuNPs were also labeled with  $^{125}\text{I}$  profiting from the presence of a Tyr residue in the peptide sequence. The studies included the assessment of cellular uptake and (radio)cytotoxic activity in cells for the designed multifunctional nanoparticles, aiming to obtain a first insight on their suitability for targeted chemoradiotherapy of glioblastoma

**Keywords:** gold nanoparticles, substance P, radionuclide therapy, Pt(IV) prodrugs, chemoradiotherapy, glioblastoma multiforme.



**Figure 1:** Schematic drawing of the multifunctional AuNPs, decorated with a therapeutic radionuclide ( $^{177}\text{Lu}$ ), Pt(IV) drugs and Substance P peptide to target the NK1 receptor.

## References:

1. Silva, F., Zambre, A., Campello, M. P. C., Gano, L., Santos, I., Ferraria, A. M., Ferreira, M. J., Singh, A., Upendran, A., Paulo A., Kannan, R. (2016) *Bioconjugate Chemistry*, 27, 1153-1164.

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