New colloidal frontiers as radiosensiters agents : a smart chemical approach to Biocompatible Gold and Platinum Nanoparticles.

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The recent explosion of Nanobiotechnology, an interdisciplinary reasearch area between Physics, Chemistry and Biology, gives new tools for developing new therapeutic approaches and also for the improvement of the efficacy of radiotherapy by means of a new generation of radiosensitizers materials [1]. Dose absorption increase at the tumor site is usually achieved through administration of compounds containing high atomic number (Z) atoms like Iodine (Z=53) or Gadolium (Z=63) [2]. Despite that, a trade off is often mandatory between the drug induced citoxicity to healthy tissues and the amount of High Z atoms delivered to the tumor. Noteworthy, noble metals such as Gold (Z=79) or Platinum (Z=78) Nanoparticles (NP) offers many advantages in radiotherapy application due to very low citoxicity and the huge number of atoms delivered inside the cells [1]. Moreover, the extreme chemical versatility of NP surface allow a stable conjugation with biomolecules in order to further increase the targeting of cell tumor only [3]. Among such molecules, Glucose is taking the scene due the high bio-effectiveness and binding simplicity to NP surface [4]. Although the great success of metal nanoparticles in this framework, there is still need to open new routes for the synthesis of more stable and functional nanoparticles.

Herein are reported some results concerning with the synthesis, the characterization and the bio-response assessment of new kind of stable Gold and Platinum NP (Figure 1) stabilized with the organic thiol 3MPS (3-mercapto-1-propansulfonate) and 1-β-thio-D-glucose (TG). X-Rays Photoelectron Spectroscopy (XPS) was performed in order to study the chemical surface integrity of the nanostructure. The radiosensitizers effect of the nanostructured systems were tested with clonogenic assay on Human Salivary Gland Tumor cells.

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[1] J.A. Coulter, W.B. Hyland, J. Nicol, F.J. Currell ,*Clinical Oncology*, 2013, **25,** 593-60
[2] K. A. Bradley, I. F. Pollack, J.M. Reid,P. C. Adamson, M.M. Ames,G.Vezina, S.Blaney, P.Ivy, T.Zhou, M. Krailo, G.Reaman, M.P. Mehta, *Neuro Oncology*, 2008, **10**, 752
[3] S. Her, A. Jaffray, C.Allen, *Advanced Drug Delivery Reviews*, 10.1016/j.addr.2015.12.012. *In Press*
[4] F. Porcaro, C. Battocchio, A. Antoccia, I. Fratoddi, I. Venditti, A. Fracassi, S. Moreno, I. Luisetto, M. V. Russo and G. Polzonetti*, Colloids and Surfaces B* ,2016, **142**, 408-416.