Functionalized Gold Nanoparticles for Adrenocortical Tumor Cells Targeting and Imaging

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The present study aims to explicitly target adrenocortical carcinomas (ACC) using gold nanoparticle (AuNP) probes bound to specific antibodies. Recently, a neonatal screening study in the state of Paraná, Brazil, confirmed that the incidence of benign and malignant adrenocortical carcinomas (ACC) among children is nearly 20 times higher than that in other countries [1]. Due to limitations to most commonly used diagnostic methods, and considering the low rate of cure of ACC in children and adults, we aim at developing a new approach, which is based on nanotechnology, for the improvement of ACC diagnosis and therapy.

Nanotechnology has been instrumental in driving modern biology and medicine applications forward. Particularly, nanoparticles constitute promising materials for medical and biological applications, including imaging, drug delivery systems, and theranostics - a combination of treatment with diagnosis and monitoring in a single treatment [2]. AuNP form a very special class since gold cores are inert, biocompatible and nontoxic. Furthermore, the surface of AuNP can be easily modified for a specific application, and ligands for targeting, drugs or biocompatible coatings can be introduced. Through surface functionalization, which includes the addition of larger molecules such as antibodies, AuNP can be directed to specific targets, such as tumours.

In our work, we raised polyclonal antibodies in rabbits immunized with a peptide related to human melanocortin 2 receptor (hMC2R). hMC2R is a transmembrane protein primarily expressed in the adrenal gland which represents a potential specific target for adrenocortical tumors. Therefore, AuNP were functionalized with anti-hMC2R antibodies. Further surface functionalization with fluorescein (FITC), lead to a AuNP-FITC-anti-hMC2R probe. FITC was employed so immunofluorescence tests could be performed both in vivo and in cultured cells. Our experiments indicate that the developed probes can specifically target cells known to express hMC2 with very low background [3]. These results suggest that it might be possible to bring the AuNPs to the target cells and to utilize them for ACC identification in vivo imaging tests. This ability would increase the probability of finding small metastases in areas of difficult access, specially through computed tomography (CT) methods. AuNP thus constitute good candidates for both ACC diagnosis and treatment.

References: