MAGNETIC NANOPARTICLES DECORATED WITH GOLD NANOCLUSTERS – NEW THERANOSTIC NANOPLATFORM

Marijus Pleckaitis[1], Vitalijus Karabanovas[1,2], Greta Jarockyte[1], Agne Mikalauskaite[3], Arunas Jagminas[3], Ricardas Rotomskis[1,4]

[1]Biomedical Physics Laboratory, National Cancer Institute, Vilnius, Lithuania
[2]Department of Chemistry and Bioengineering, Vilnius Gediminas Technical University, Vilnius, Lithuania
[3]State Research Institute Centre for Physical Sciences and Technology, Vilnius, Lithuania
[4]Biophotonics group of Laser Research Center, Faculty of Physics, Vilnius University, Vilnius, Lithuania
marijus.pleckaitis@nvi.lt

Efficient nanoprobes for multimodal bioimaging and therapeutic applications are in high demand. Therefore, nanomaterials exhibiting both magnetic and optical properties have been in the spotlight because of high potential for promising biomedical applications. In our study, we show that magnetic nanoparticles decorated with gold nanoclusters have a high applicability promise in the fields that are in need for multifunctional nanoprobes, e.g. for cancer diagnostics and therapy (theranostics). To evaluate the implementation possibilities of such multimodal nanoplatforms, we performed a variety of experiments assessing photophysical, photochemical characteristics and *in vitro* biocompatibility of magnetic nanoparticles decorated with gold nanoclusters. The experiments proved nanoparticles to have good optical properties and colloidal stability in various solutions (distilled water, PBS, cells growing media). Moreover, this nanoplatform demonstrated the reversible photoquenching effect – the ability to restore photoluminescence in the dark after irradiation with various wavelengths that induced photoquenching effect. During before mentioned process, additionally we noticed the formation of photoproducts. Further experimentations showed the generation of singlet oxygen species. Biodistribution of magnetic nanoparticles decorated with gold nanoclusters was evaluated at subcellular level using confocal laser scanning microscope. After assessing uptake dynamics of nanoparticles we performed cell viability assays with different cell lines and showed that at tested concentrations (from 0.25 to 2.5 mg/ml) nanoparticles had no cytotoxic effects. Therefore, the results of this study highlight the promising potential of magnetic nanoparticles decorated with gold nanoclusters for future bimodal bioimaging and cancer therapy purposes.