BOOK OF ABSTRACTS

SEPTEMBER 14-18 — OLOMOUC, CZECH REPUBLIC

FE-BSA-AU AND MN-BSA-AU BIMETALLIC NANOCOMPOSITES FOR MAGNETIC RESONANCE AND FLUORESCENCE IMAGING

29

Radek OSTRUSZKA[1], Aminadav HALILI[2], Dominika VALÁŠKOVÁ[2], Daniel JIRÁK[2], Karolína ŠIŠKOVÁ[1]

[1]*Department of Experimental Physics, Faculty of Science, Palacký University Olomouc, 17. listopadu 1192/12, 779 00 Olomouc, Czech Republic*
[2]*Department of Radiodiagnostic and Interventional Radiology, Institute for Clinical and Experimental Medicine, Vídeňská 1958/9, 140 21 Prague, Czech Republic*
Email of presenting author: radek.ostruszka@upol.cz

To accurately characterize complex biological systems in the context of diseases such as cancer, neurodegenerative, and cardiovascular disorders, multimodal imaging is required. For these conditions, the combination of magnetic resonance imaging (MRI) and fluorescence imaging (FI) is widely used because of their complementary strength. MRI allows non-invasive, non-ionizing deep-tissue visualization with excellent anatomical and soft-tissue contrast, while FI offers high sensitivity and high spatial resolution at the cellular and molecular levels. For this purpose, nanocomposites combining iron oxide nanoparticles and gadolinium ions or manganese ions (providing MRI contrast) with metal nanoclusters, fluorescent dyes, or quantum dots (providing FI contrast) have been employed. Herein, we developed nanocomposites stabilized with bovine serum albumin (BSA), composed either of iron oxide nanoparticles and gold nanoclusters (Fe-BSA-Au system) [1], or of manganese ions/nanostructures and gold nanoclusters (Mn-BSA-Au system). Typical synthetic procedure consists of mixing the following precursors: $FeCl_3 \cdot 6H_2O$ or $MnCl_2 \cdot 4H_2O$, BSA as a stabilizing and reducing agent, $HAuCl_4 \cdot 3H_2O$, and finally NaOH to increase the pH of the mixture, thereby promoting the formation of nanostructures. After the addition of the final precursor, the sample is incubated at 50 °C and then purified by dialysis. The functionality of the resulting nanocomposites as bimodal imaging contrast agents was evaluated with *in vitro* MRI and FI (and *in vivo* for the Fe-BSA-Au system). Cytotoxicity was assessed prior to the *in vivo* experiments. Both imaging techniques demonstrated the potential of both systems for use as *in vitro* bimodal MRI (T_2-weighted)/FI contrast agent (additionally, in the case of Fe-BSA-Au system, even *in vivo*). Both systems were found to be non-cytotoxic toward healthy cell lines. Further research focuses on targeted cellular uptake, particularly in the islets of Langerhans.

References

[1] R. Ostruszka, A. Halili, T. Pluháček, L. Rárová, D. Jirák, K. Šišková, Advanced protein-embedded bimetallic nanocomposite optimized for *in vivo* fluorescence and magnetic resonance bimodal imaging, *Journal of Colloid and Interface Science* 663 (2024) 467–477. DOI: 10.1016/j.jcis.2024.02.116.

Acknowledgements

This research was funded by Ministry of Health of the Czech Republic (grant number NW25-08-00113).