Dimosthenis Stamopoulos

National and Kapodistrian University of Athens
Greece

Iron oxide magnetic nanoparticles, Fe3O4 or Fe2O3, radiolabeled with 68Ga and 99mTc as dual modality contrast agents in diagnostic imaging techniques

Abstract:

In recent decades, dual-imaging contrast agents (DMCAs) have gained much interest regarding their utilization in radiology techniques for the diagnosis of diseases. Compared to conventional contrast agents, DMCAs provide a synergistic effect by combining the advantages of each imaging technique (i.e., the high sensitivity of positron emission tomography (PET) or of single photon emission computed tomography (SPECT) with the high spatial resolution magnetic resonance imaging (MRI)), leading to accurate and timely diagnosis of the underlying diseases. Here, we present the in vivo evaluation of two DMCAs, the first for application in PET and MRI, while the second for utilization in SPECT and MRI. Both DMCAs are based on iron oxide nanoparticles (magnetite, Fe3O4), due to their unique biocompatibility, when surface-coated with 2,3-dicarboxypropane-1,1-bisphosphonic acid (DPD). The first DMCA, aiming for application in PET, completes upon radiolabeling with 68Ga, i.e. 68Ga-DPD-Fe3O4. The second DMCA, aiming for application in SPECT, completes upon radiolabeling with 99mTc, i.e. 99mTc-DPD-Fe3O4. Both DMCAs were evaluated in vitro and in vivo through the investigation of their (i) stability in phosphate buffer saline and human serum, (ii) biocompatibility with cells of peripheral human blood, (iii) biodistribution/biokinetics in mice models, (iv) imaging performance in MRI (68Ga-DPD-Fe3O4 and 99mTc-DPD-Fe3O4), PET (68Ga-DPD-Fe3O4), SPECT/gamma-camera (99mTc-DPD-Fe3O4) applications in mice models. The obtained results guarantee that both DMCAs deserve additional investigations and are, possibly, promising candidates for clinical applications.

Biography

Stamopoulos obtained his BSc in 1996 from the School of Electrical and Computer Engineering, National Technical University of Athens (NTUA) and his Doctorate in Physics in 2001 from the School of Applied Mathematical and Physical Sciences of NTUA. Today, he is Associate Professor at the Department of Physics, National and Kapodistrian University of Athens. His research interests refer to experimental Condensed Matter Physics: Strongly Correlated Electron Systems (superconductivity, ferromagnetism etc), Hybrid Systems of Multifunctional Behavior (piezoelectric/superconducting, ferromagnetic/superconducting) and Diagnostic/Therapeutic Applications in Biomedicine (contrast agents, microscopy techniques etc). He has more than 106 publications in international peer-reviewed journals.