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Theranostics Imaging and Therapy: An Action to Develop Novel Nanosized Systems for Imaging-Guided Drug Delivery

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P30

In vitro cell interaction and in vivo biodistribution of poly (dl-lactide-co-glycolide) nanospheres with encapsulated selenium nanoparticles for the treatment of liver diseases

Magdalena Stevanović[1], Jana Nunić[2], Jonghoon Choi[3], Miloš Filipović[4], Dragan Uskoković[1], Theodore Tsotakos[5,6], Eirini Fragogeorgi[6,5], Dimitris Psimadas[6], Lazaros Palamaris[6], George Loudos[6]

[1]*Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Republic of Serbia*
[2]*Department of Genetic Toxicology and Cancer Biology, National Institute of Biology, Ljubljana, Slovenia*
[3]*Center for Biomaterials, Biomedical Research Institute, Korea Institute of Science and Technology, Seoul, Republic of Korea*
[4]*Department of Chemistry and Pharmacy, University of Erlangen-Nuremberg, 91058, Erlangen, Germany*
[5]*Institute of Nuclear and Radiological Sciences, Technology, Energy and Safety, National Center for Scientific Research "Demokritos", Athens, Greece*
[6]*Department of Biomedical Technology Engineering, Technological Educational Institute of Athens, Greece*

The role of selenium as a chemopreventive and chemotherapeutic agent has been supported by a large number of epidemiological, preclinical, and clinical trials [1, 2] suggesting that anti-tumor effect mechanisms of selenium include induction of apoptosis, inhibition of cell proliferation, protection against oxidative stress, and stimulation of immune system.

Herein we demonstrate a simple and quick synthesis of uniform, stable, amorphous selenium nanoparticles (SeNps), using ascorbic acid as the reduction agent. The choice of an appropriate stabilizer and reducing agent for preparation of stable selenium nanoparticles is very important. We used bovine serum albumin (BSA) as an organic layer for selenium nanoparticles, i.e., as a capping agent to make them more biocompatibile and protect them from agglomeration in the suspension medium.

SeNps were additionally encapsulated within spherical PLGA particles (PLGA/SeNps). One of the most important requirements for the controlled and balanced release of the drug in the body is ideal spherical shape of the particles and narrow distribution of their sizes. The morphology (size and shape) of the particles plays key role in their adhesion and interaction with the cell.

The influence of PLGA/SeNps on cell viability, ROS generation in HepG2 cells, as well as anticancer activity against epithelial tumor cells was investigated. Synthesized nanoparticles were characterized by FTIR spectroscopy, FESEM, TEM, HRTEM, and Zeta potential measurements. As a part of this study, we have also performed in vivo dynamic imaging studies in normal mice, using SPECT imaging and a high resolution gamma camera. The PLGA/SeNps nanoparticles have been radiolabelled with Tc-99m, by applying the direct labeling method [3]. Ex vivo biodistribution measurements, as well as in vivo dynamic studies up to 1h p.i. and at 24h were performed, showing increased concentration in liver and spleen.

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References

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