

Self-navigated integrin receptors seeking “thermally-smart” multifunctional few-layer graphene-encapsulated magnetic nanoparticles for molecular MRI-guided anticancer treatments in “real time” personalized nanomedicine

Acronym: GEMNS

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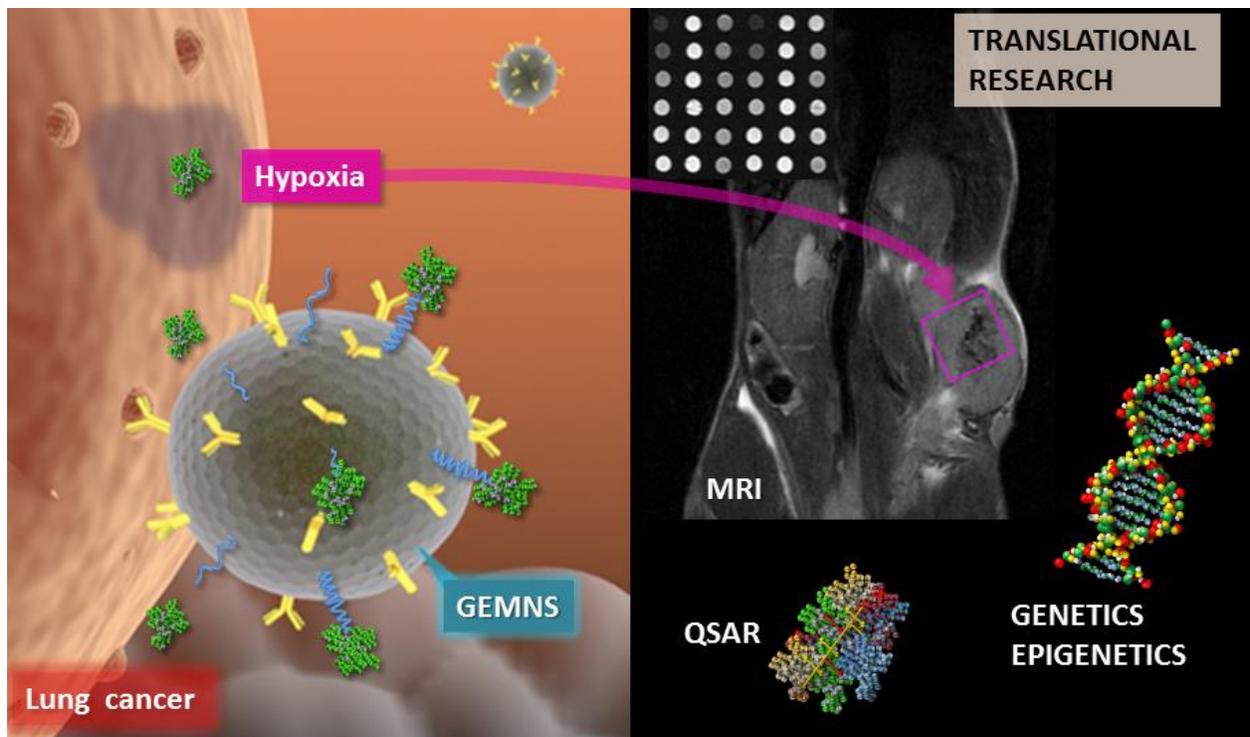
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Partner countries: Norway, Poland, Romania

Project abstract:

Multifunctional nanoparticles show great promise in personalized cancer nanomedicine. In the project, we plan to develop a novel generation of thermally “smart” multifunctional few-layer graphene-encapsulated magnetic nanoparticles (GEMNS) for molecular MR imaging (mMRI) and anticancer treatments in translation lung cancer studies. The theranostic GEMNS will be bioengineered with self-assembled polymeric nano-gels and decorated with antibodies that recognize some integrin receptors on lung cancer tissues and new cancer vessels. A special selected enzyme will be adsorbed onto GEMNS and released in a controllable and fully predictable manner in order to promote the anticancer activity via the “Trojan-horse”-like effect. The release of the enzyme will trigger “switch-on-off” hypoxia states at the molecular level in lung cancer cells and tissues. After some courses of such enzymatic-based molecular pre-sensing, the mMRI-guided targeted X-ray radiotherapy of lung cancer will be applied in preclinical animal models. The new nanosafety paradigm for the PRE-FIM strategy will also be developed using comprehensive QSAR, microfluidic, and genetic/epigenetic approaches to characterize the GEMNS theranostic contrast/drug candidates in accordance with global regulatory requirements.



A schematic idea of GEMNS recognizing and releasing thermostable enzyme into lung cancer cells (left) and T2-weighted images of solid cancer in mice (right) and cancer cells (insert, right) using a 7T system (Grudzinski IP et al.). The nanosafety paradigm for the PRE-FIM strategy is listed (right).