Magnetic Nanocrystals and magnetic hyperthermia to tackle cancer

Teresa Pellegrino

Italian Institute of Technology, via Morego 30, 16163, Genoa (Italy)

teresa.pellegro@iit.it

The use of heat to reduce tumor mass is very ancient. Nowadays, there are several techniques that allow to precisely focalize the heat in very specific body regions resulting in treatments that are more efficient and minimize side effects. Magnetic Nanoparticles can act as heat mediators under external magnetic activation in the so-called magnetic hyperthermia. The field of magnetic hyperthermia has received a renewed interest since the colloidal syntheses by non-hydrolytic methods have revealed several merits over conventional wet chemical hydrolytic processes in terms of controlled size, size distribution and crystallinity. All these parameters together with nanoparticles solubility and state of aggregation can affect structural and magnetic properties of nanomaterials and thus their heat performance. I will first focus on our recent progress on ironbased nanoparticles as heat mediators. Then, I will show our ongoing studies aiming at correlating heat effects on cancer stem cells. I will also report about in vitro hyperthermia experiments on primary tumor cells to relate nanoparticle geometry to changes of magnetic hyperthermia performances in tumor cell. Finally, I will show our preliminary in vivo studies performed with the aim to combine magnetic hyperthermia and heat-mediated drug release.