Funded 3.5 years PhD
Open to UK and EU nationals

Functional magnetic nanoparticles for cancer treatment

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Cancer is still a leading cause of disease worldwide. Magnetic nanoparticles (MNPs) offers an exciting new alternative treatment, with local heat treatment of affected areas allows eliminate the side effect of current radio-or chemotherapy. The most cutting edge research has recently focused on the combination of heat treatment with traditional cancer drugs. That synergistic effect will enhance the treatment efficacy of both components compared to single mode of treatments. The bottleneck is still the functionalization of magnetic nanoparticle that can be use for clinical treatment.

Our group has developed a multifunctional magnetic thermo sensitive liposome and optimizes it by introducing both pharmaceutics and biomolecular concepts. In this project, the students will continue with this effort using MNPs that have best heating efficiency and combining with the synergic drugs and label the construct with radiotracer to study the effect of drug release. And ultimate aim is to study the effect of cancer treatment of the whole construct using thermo-chemico therapy.

The student is expect to be able to synthesise high magnetic moment nanoparticle and characterize them using various techniques such DLS (Dynamic light scattering), transmission electron microscopy (TEM) for size, shape and monodispersity of nanomaterials, thereby enabling the determination of the successful synthesis. X-Ray diffraction (XRD) will also be used at later stage to characterise further the structure of materials, and Superconducting QUantum Interference Devices (SQUID magnetometer) and heating measurement. The ligand conjugation will be investigated using FTIR and TGA (thermogravimetric analysis). The student will also do experiments with cells such as cell culture, cytotoxicity assays, flow cytometry. The student can be can be trained to use some of these techniques by experience users in the group.

The student needs to have strong back ground in chemical thesis and bioconjugation of nanoparticles.

Ref:

1. Blanco-Andujar, C., Southern, P., Ortega, D., Nesbitt, S.A., Pankhurst, Q.A., **Thanh, N.T.K**.* (2015) High performance multi-core iron oxide nanoparticles for magnetic hyperthermia: microwave synthesis, and the role of core-to-core interactions. *Nanoscale..* **7**: 1768-1775. Gold Open Access.

2. R. Hachani, M. Lowdell, M. Birchall, A. Hervault, D. Merts, S. Begin-Colin, **N.T.K. Thanh***. (2016) Polyol synthesis, functionalisation, and biocompatibility studies of superparamagnetic iron oxide nanoparticles for potential MRI contrast agents. *Nanoscale*. **8**: 3278-3287. Highly cited paper. Gold Open Access.

3. C. Blanco-Andujar, P. Southern, D. Ortega, S.A. Nesbitt, Q.A., Pankhurst and **N. T. K. Than***. (2016) Real -time tracking of delayed-onset cellular apoptosis induce d by intracellular magnetic hyperthermia. *Nanomedicine*. **11**: 121-136. Gold Open Access.

4. Hervault and N. T. K. Thanh, "Magnetic nanoparticle-based therapeutic agents for thermo-chemotherapy treatment of cancer," *Nanoscale*, vol. 6, no. 20, pp. 11553–11573, 2014. Gold Open Access. Front cover.