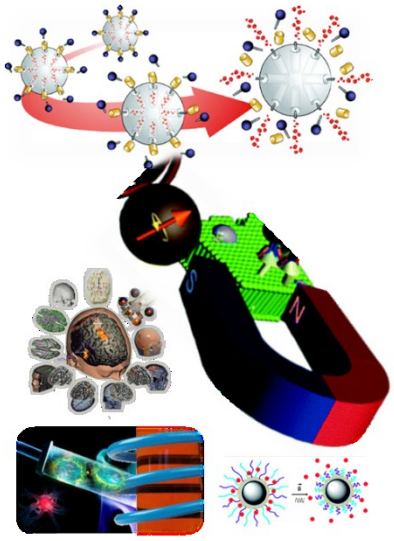

Biomagnetic applicability schemes

Many research groups worldwide are exploring the potential of magnetic nanoparticles (MNPs) as biomedical magnetism-driven carriers in biomedical applications. Most of these studies utilize MNPs synthesized in-house, aiming in the facile sample control and property tuning, while issues like formulation, reproducibility, toxicity and quality assurance are usually postponed for the later stages when MNPs will actually be introduced to clinical trials. AC hyperthermia is one of the diverse modalities under study, which is a cancer therapy, involving the targeted administration of MNPs into the body, their accumulation at sites of cancer, and their local heating with an externally applied AC magnetic field.

AC magnetic hyperthermia continues to gain interest as a synergistic approach of a least invasive character together with facile remote control of activation and multifunctional potential in diverse magnetism-driven treatments. Thus, it follows the current theranostics trend that requires multi¬functional MNPs, possessing more than one magnetically triggered modality.

Contrary to home-made MNPs, commercially produced materials, particularly those certified to Good Manufacturing Process (GMP) standards may be rapidly pushed through the medical approval processes since commercial drive and company resources are focusing in the delivery of the new therapy to the patient as rapidly as possible. Additionally, the biocompatibility and toxicity aspects of such products have usually been resolved prior to their commercial exploitation.

In this thesis I have examined a series of commercially available biomedical MNPs as possible candidates for hyperthermia applications and their exploitation as multifunctional biomedical carriers combining their initial modality with heat triggered actions. The major advantage of such a study is that an optimum system directly addresses the multifunctional role in modern theranostics and may be further implemented in therapies with faster steps since major tasks have already been undertaken.