

# Nanomagnetic Carriers for Biomedical Applications

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## INTRODUCTION

Nanomagnetic carriers are used for several novel and exciting biomedical applications. Nanomagnetic particles are often coated with biocompatible materials which stabilize the nanoparticles and provide increased functionality. We are using these particles for **magnetically targeted drug delivery, gene delivery and artificial muscle applications**

## CANCER TREATMENT

Conventional radio or chemotherapy treatments have many limitations such as lack of tumor specificity, systemic side effects, large dosage of drug for local concentration. **We address these issues using nanomagnetic carriers for improved cancer treatment via combined magnetically targeted drug delivery, hyperthermia and triggered drug release.**

## APPROACH

The anti cancer drug is loaded in thermosensitive biopolymer coated magnetic nanoparticles. These drug loaded carriers are injected into the body and guided to the tumor site by an external magnetic field gradient. Then the magnetic particles are heated by external alternating magnetic field which results in destruction of cancerous tissue by heat between 43 and 48 °C, the drug is also released due to the shrinkage of the thermosensitive coating. This approach improves the therapeutic efficiency. In vivo experiments coupled with MRI and histology have been carried out.



Fig 1: *In-vivo* experiments to demonstrate targeting of drug loaded magnetic nanocarriers

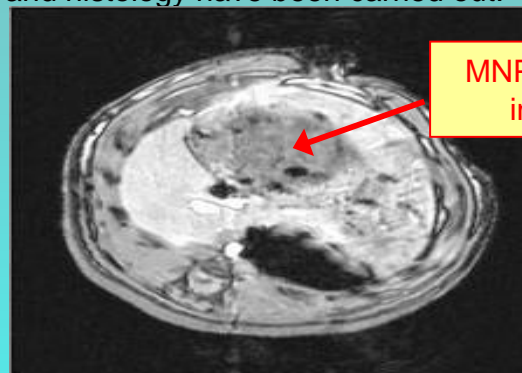


Fig 2: Post-injection MRI scan shows the presence of nanoparticles in hepatocellular carcinoma

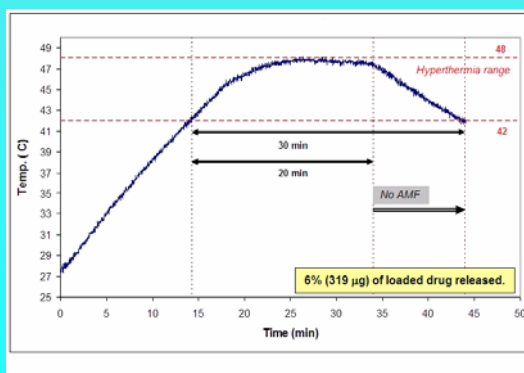


Fig 3: *In-vitro* simultaneous hyperthermia and drug release in PBS (pH 7.4)

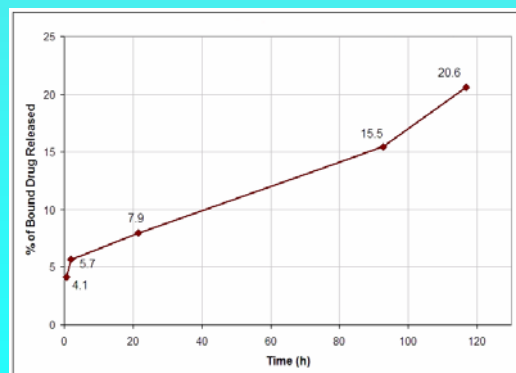


Fig 4: *In-vitro* drug release without AMF in PBS (pH 7.4) at 37°C