

# Magnetic hyperthermia for cancer treatment: past problems, ongoing work and future possibilities

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Magnetic nanoparticles (MNPs) emerged more than two decades ago as promising tools for several biomedical applications such as contrast agents, drug delivery systems or heat mediators in magnetic hyperthermia. Recently, new approaches for cancer treatment based on the production on heat that go one step further than traditional hyperthermia have been developed. Instead of focusing just on the heat generation to induce cell death, the main aim of these new approaches is to use the temperature increase as a stimulus to trigger different reactions or transformations in the surrounding environment.

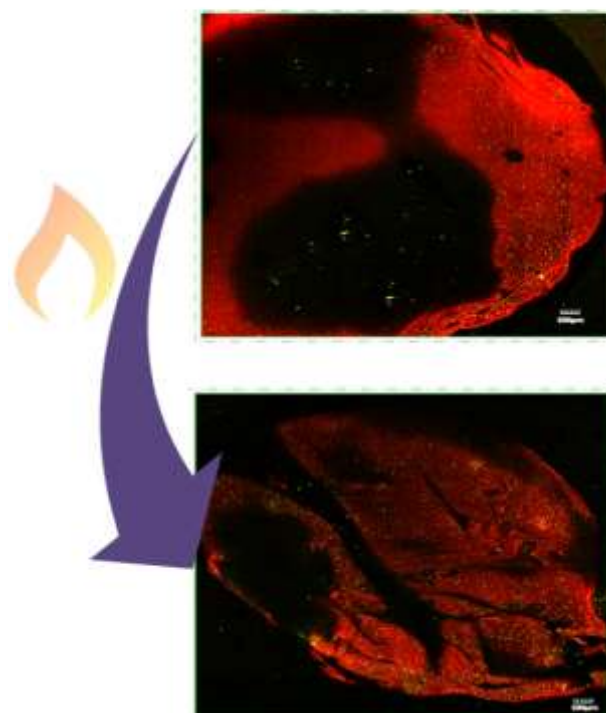
In this talk, first, a critical review of the research performed in the past decades on magnetic hyperthermia will be presented. Then, current work related to the use of magnetic hyperthermia as a tool to increase the permeability of the extracellular matrix in tumour models will be discussed. The analysis of 3D cell cultures [1] and tumour tissues will be shown paying special attention to problems observed to achieve a satisfactory treatment. Finally, aspects to considered to improve the effectiveness of the treatment will be indicated.

## References

- [1] L. Beola et al, ACS Applied Materials and Interfaces, 10(51) (2018), 44301-44313

Figure

Increase of the extracellular matrix permeability after magnetic hyperthermia



**Figure 1:** Map image of confocal microscopy of 3D cell culture without (up) and with (down) the alternating magnetic field exposure. The image shows the overlay of two channels: green fluorescence of the labeled cells and red fluorescence of the magnetic nanoparticles. Scale bar is 500  $\mu\text{m}$ .