

# Magnetic nanoparticle hyperthermia delivers the coup de grâce

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**ABSTRACT:** Magnetic hyperthermia is based on heat dissipation by a magnetic material when exposed to an alternating field – first proposed in the late 1950s using fine magnetic particles as heat sources to elevate the temperature and destroy metastatic tumours. Magnetic nanoparticles provide a unique combination of small size and responsiveness to magnetic fields, and can generate heat through loss-power mechanisms that continue to challenge a complete physical description. In addition, there are three highly entangled basic challenges that must be overcome to enable the technology of magnetic nanoparticle hyperthermia in medicinal products: i) understanding and controlling the biomolecule/nanoparticle interaction (biomolecular corona) in vivo, ii) avoiding intracellular degradation, and iii) in vivo highly specific targeting. I will present our recent work that identifies for the first time the internal magnetic structure of nanoparticles used in hyperthermia, and the critical role this nanomagnetism plays. I will also show we are able to use our fundamental insights into the chemistry and physics of magnetic nanoparticles to optimize hyperthermia, and how we are able to target nanoparticles to overcome biological challenges, enabling magnetic nanoparticle hyperthermia to deliver the finishing blow to tumours and biofilms.

**ALL ARE WELCOME!**