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Innovative approach to safely induce controlled lipolysis by superparamagnetic iron oxide nanoparticles-mediated hyperthermic treatment

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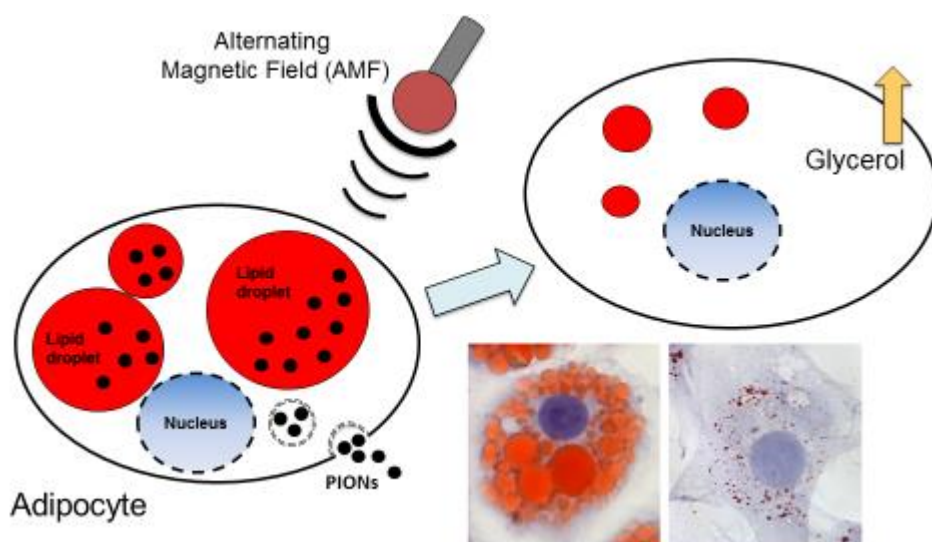
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Graphical abstract



ABSTRACT

During last years, evidence has been provided on the involvement of overweight and obesity in the pathogenesis and aggravation of several life-threatening diseases. Here, we demonstrate that, under appropriate administration conditions, polyhedral iron oxide nanoparticles are efficiently and safely taken up by 3T3 cell line-derived adipocytes (3T3 adipocytes) in vitro. Since these nanoparticles proved to effectively produce heat when subjected to alternating magnetic field, 3T3 adipocytes were submitted to superparamagnetic iron oxide nanoparticles-mediated hyperthermia treatment (SMHT), with the aim of modulating their lipid content. Notably, the treatment resulted in a significant delipidation persisting for at least 24 h, and in the absence of cell death, damage or dedifferentiation. Interestingly, transcript expression of adipose triglyceride lipase (ATGL), a key gene involved in canonical lipolysis, was not modulated upon SMHT, suggesting the involvement of a novel/alternative mechanism in the effective lipolysis observed. By applying the same experimental conditions successfully used for 3T3 adipocytes,

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