

Targeted Nanotechnology-Based Strategies for Efficient Anti-Obesity Drug Delivery, Bioimaging and Therapy

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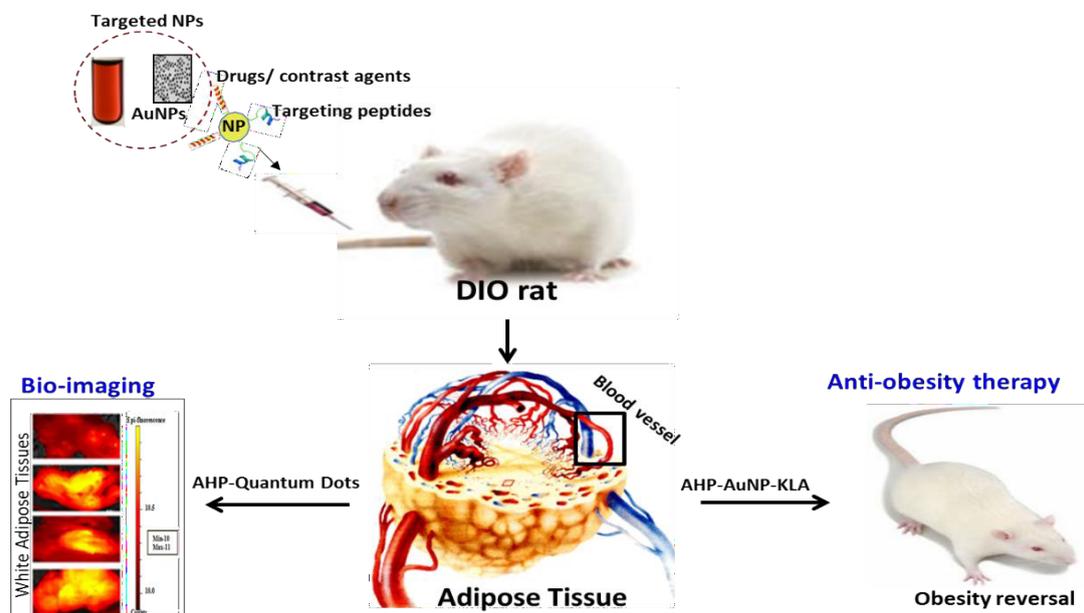


Figure 1: Targeted nanotechnology-based strategies for drug delivery and bio-imaging of the diseased adipose tissues in obese rats.

Introduction: Anti-obesity drugs are usually used for the management of obesity; however, they are non-specific and induce toxic side effects. As such, novel and improved approaches for the treatment of obesity are urgently needed. Nanotechnology-based therapies are investigated as an alternative strategy that can treat obesity and be able to overcome the drawbacks associated with conventional therapies. Therefore, this study investigated the use of peptide-functionalized gold nanoparticles (AuNPs) for targeted drug delivery and bio-imaging of adipose tissues in diet-induced obese rats.

Methods: Lean and diet-induced obese (DIO) Wistar rats were treated with either unfunctionalized AuNPs or adipose homing peptide (AHP) functionalized AuNPs (AHP-AuNPs). Biodistribution of the AuNPs was analysed by inductively coupled plasma optical emission spectroscopy (ICP-OES). Similarly, lean and obese rats were injected with either unfunctionalized quantum dots (QDs) or AHP functionalized QDs (AHP-QDs). Biodistribution of the QDs was analysed by an IVIS® Lumina XR imaging system and ICP-OES.

Results: Unfunctionalized AuNPs and QDs accumulated mainly in the reticuloendothelial system organs, while the AHP-AuNPs and AHP-QDs selectively accumulated in the tissues that express the receptor for AHP, i.e. the white adipose tissues (WATs) of obese rats.

Conclusion: AHP-functionalized nanoparticles were successfully and selectively delivered to the WAT vasculature. This nanotechnology-based approach could potentially be used for targeted drug delivery and molecular imaging of adipose tissues in obese patients in real time. AHP-AuNPs were further used to validate targeted delivery of antiobesity drugs in DIO rats and validated the feasibility of the targeted nanotechnology-based strategies in disease treatment.

Keywords: Obesity, Nanotechnology, Adipose homing peptide, Gold nanoparticles, Quantum dots