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Advancing supramolecular peptide-based magnetic gels towards smart drug delivery systems

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Peptide-based hydrogels provide many advantages for drug delivery, such as low critical gelation concentration, easy tailoring and modulation, and biocompatibility [1]. The self-assembly gelation potentiates novel fabrication strategies and the encapsulation of different composites, such as magnetic nanoparticles and liposomes [2]. The combination with magnetic and/or plasmonic nanoparticles provides a means for on-demand drug release, which can be further optimized through the combination with liposomes. These storage units enable the compartmentalization of various drugs that can be released in a sequential and on-demand manner through the use of different triggers [3]. However, the implementation of a stimulus can often lead to undesirable effects on the gel's properties or affect the drug encapsulation.
From the understanding of drug encapsulation in peptide-based gels [4], the use of photothermia as a trigger [5], and the way different nanoparticle functionalization impact the properties [6], peptide-based magnetic gels have progressed towards the combination with liposomes as storage units [6]. Currently, a strategy was developed that enabled the modulation of the chemotherapeutic drug doxorubicin release through the co-assembly of different composites in dehydropeptide-based gels (figure 1). The interplay of liposomes as storage units and nanoparticles co-assembly enabled the tuneability of both passive and active doxorubicin release through different triggers, which makes this design strategy promising for future developments on the control of drug release.

References

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Primary authors: Dr CASTANHEIRA, Elisabete (Centre of Physics of Minho and Porto Universities (CF-UM-UP)); Dr CORREA-DUARTE, Miguel (CINBIO); Mr VELOSO, Sérgio (Centre of Physics of Minho and Porto Universities (CF-UM-UP)); Dr FERREIRA, Paula (Centre of Chemistry (CQUM))

Presenter: Mr VELOSO, Sérgio (Centre of Physics of Minho and Porto Universities (CF-UM-UP))

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