Stimuli-responsive polydopamine/protein nanoparticles can target cancer cells and induce cell death

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Abstract

Polydopamine is a major pigment of naturally occurring melanin. In relation to this material, nanoparticles made of polydopamine (PDA NPs) exhibit peculiar physicochemical properties, such as heat induction upon exposure to UV light. In return, these features make them particularly attractive for the theranostic field.[1]

Depending on the intended application, any protein can be combined with these PDA NPs to adapt the surface by conducting a relatively simple synthesis. In this context, we have designed and produced PDA NPs containing human serum albumin (HSA), a readily available and biocompatible protein, and transferrin (Tf), a widely used epitope to target cancer cells.[2,3] *In vitro* studies demonstrated that these NPs are readily taken up by mouse macrophages (J774A.1 cells) and lead to apoptosis when irradiated with a UV laser (λ = 405 nm). Moreover, mouse melanoma (B16 F10) cells subjected to UV irradiation exhibited an enhanced cell death rate with PDA/Tf NPs in comparison to PDA/HSA NPs. These findings indicate that the proteins on the PDA NP surface retain their active nature and effectively convert UV irradiation into heat.

References

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