Engineering versatile graphene oxide-based nanoplatforms for immunomodulation

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Abstract

The efficiency of current immunotherapeutic approaches is limited due to variable response rates resulting from the heterogeneity of immune mechanisms from patient to patient [1]. To overcome this issue, engineered nanoscale-based immunomodulation platforms able to improve specificity and durability of immunotherapy have been recently introduced [2]. Among their unique advantages are improved targeting to specific tissues followed by an enhanced cellular uptake, higher loading capacity as well as possible synergistic action between the immunomodulation platform and the immunotherapy [3]. In this frame, 2D materials characterized by a large available surface area are considered as suitable nanoplatforms for increased loading of biologically-active molecules. Graphene oxide (GO) nanosheets provide additionally the advantages of high colloidal stability and dispersibility in biological fluids, along with a biocompatibility and biodegradability profile that renders it an excellent carrier for medical use [4,5]. In the present study, GO was complexed non-covalently with a small immunomodulatory molecule (a synthetic TLR7/8 agonist) resulting in colloidally and chemically stable nanoplatforms (**Figure 1**). A simple and highly reproducible protocol for the fabrication of the thin and nanoscale GO-based drug complex will be presented. Moreover, the successful complexation has been demonstrated through a series of physicochemical characterizations along with *in vitro* biological studies demonstrating its immunomodulatory activity. The results of this study allow the future *in vivo* development of the present nanoplatform, and more generally encourage the use of non-covalent graphene-based nanoconstructs in biomedicine.

References

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Figures

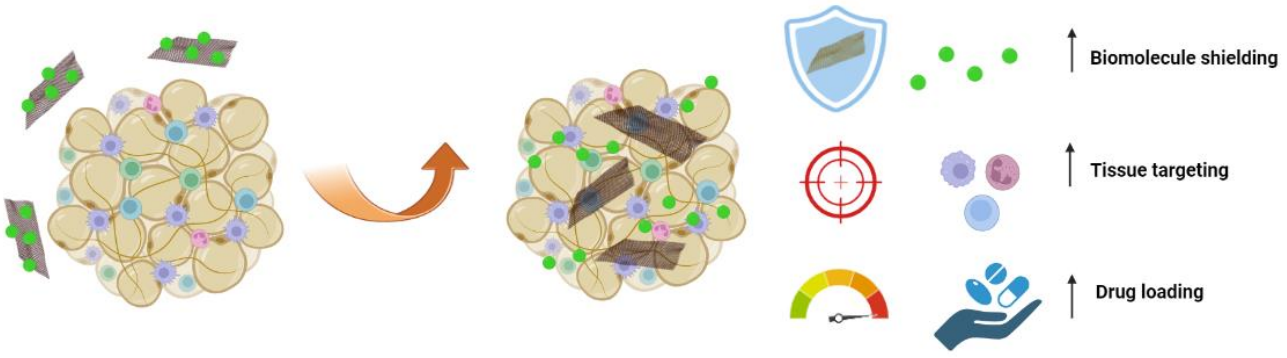

Figure 1: Schematic depiction of a GO-based immunotherapeutic platform.