The new generation of nanomedicines for biomedical applications: Dressing nanoparticles in cell's clothing

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The recent cutting-edge advances on nanomaterials is anticipated to overcome some of the therapeutic window and clinical applicability of many drug/peptide molecules and can also act as innovative theranostic platform and tool for the clinic in the future [1-4]. In the last decade, research on cancer immunotherapy resulted in a new set of potential treatments with promising results in the clinics[5-8]. Among these, immune checkpoint inhibitors are one of the few immunotherapies that have been clinically validated, yet with variable results, ranging from complete responses to hyperprogression. Amongst the different experimental treatments, active cancer immunotherapy hold great promises for the future. In this work, prominent nanosystems, such as biohybrid nanocomposites made of different nanoparticles (porous silicon and oncolytic virus) and cancer cell-based membrane materials are presented and discussed as potential platforms for the individualization of medical intervention and cancer immunotherapy applications. Examples on how these biohybrid nanomaterials can be prepared and scaled-up, as well as how they can be used to enhance the drug's targetability, intracellular drug delivery for both cancer chemo- and immune-therapy applications, will be highlighted and discussed. Overall, our results suggest that biohybrid nanomaterials are a versatile and advanced platform for cancer treatment with an interesting potential for present and future clinical impact given its easy tailorability to each patient, choosing a suitable inorganic or virus and obtaining cancer cells from biopsy.

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