Delivery of biologicals using nanotechnology

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Antigen and therapeutic proteins, including monoclonal antibodies, are normally being administered by injection. To prolong the duration of their effects, a number of strategies, including long-acting injectables have been developed. Despite these advances, the difficulties of these macromolecules for overcoming biological barriers and reach the intracellular targets have limited their full exploitation.

Fortunately, the continuously improved understanding of the biological barriers and the molecular biology associated to pathological conditions is paving the way for a more comprehensive and rational design of protein formulations based on the use of nanotechnology. Our laboratory, with a long-track experience in the formulation of macromolecules using polymer nanoparticles, has significantly contributed to this field. As an example, in the 90's we were the first to report that nanoparticles made of either PLA-PEG or chitosan were efficient vehicles for the transmucosal delivery of proteins and antigens. The result of our subsequent efforts is an array of nanotechnologies that can be used to deliver proteins across mucosal surfaces, and, also, to facilitate their intracellular delivery following parenteral administration.

In my presentation, I will focus on the design of protein carriers that could be used in different therapeutic areas: (i) oral delivery of peptides intended to treat either local or systemic diseases, (ii) delivery of mAb targeted to intracellular onco-proteins, as new oncological treatments, (iii) nanovaccines designed to prevent diseases, i.e. HIV.

Overall, our experience in this field has benefited from integrative approaches adopted by specifically designed consortia. Hopefully, the results of these cooperative efforts will help to accelerate the progress of a rational design of protein-based nanomedicines.

More information about these projects can be found at: http://www.usc.es/grupos/mjalonsolab/

Acknowledgements:

The following researchers have contributed to different projects:

Oral Drug delivery: Matilde Duran, Sulay Tovar, Carlos Dieguez

Anticancer drug delivery: Desirée Teijeiro, Ana Cadete, Ana Olivera and Dolores Torres from the USC, Spain and Gema Moreno and Angela Molina from the "Universidad Autónoma de Madrid", Spain.

Vaccine delivery: Jose Crecente, Tamara Gómez from the USC and Ma Luo and Francis Plummer from University of Manitoba, Canada.

The research activity has been founded by the European Comision, Horizon 2020 Program (# 646142 – NANOPILOT and #21058- B-SMART), by MINECO- PCIN-2017-129/ AEI, under the frame of EuroNanoMed III, and by The National Institutes of Health (NIH) (#R01AI111805),