Research Project Proposal
Academic year 2020-2021
Máster en Investigación Biomédica

Project Nº 45

Title: Design of nanoparticles for the local treatment of cutaneous leishmaniasis

Department/ Laboratory:
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Summary

Leishmaniasis is one of the world's most neglected diseases, affecting about 12 million people worldwide, with a range of 1.5 to 2 million new cases yearly (WHO). *Leishmania* species are intracellular protozoan parasites that cause multiple diseases ranging from nonlethal cutaneous leishmaniasis (CL) to deadly visceral disease (VL). Although only VL is fatal if untreated, currently therapeutic options have lower efficacy in CL. WHO strongly recommends the local treatments (intralesional and especially topical ones) for CL because the lower systemic toxicity and/or the ease of use and accessibility.

The therapeutic target of CL are the infected dermal macrophages localized in the deepest skin layer. The effective local delivery of drugs at this level is particularly problematic because they must deal with the stratum corneum barrier and/or upon arrival on dermis with a rapid clearance to systemic circulation. Nanoparticles as carriers for antileishmanial drugs and/or immunomodulators can afford several advantages in the local management of CL. As a function of their composition and physicochemical properties (size, surface, elasticity, degradation), their topical application can promote the drug diffusion through the skin. Furthermore, they can be also directly injected into the dermis (intralesional administration) providing controlled-release properties, delaying the rapid clearance of the drug and avoiding the need of frequent painful injections.

The aim of this project is to analyse the effect of NP properties in their ability to target drugs to dermal infected macrophages either by topical or intralesional administrations. We will prepare drug-loaded NP with different composition (nanotechnology-pharmaceutical technology) and determine their physicochemical properties. By encapsulating a fluorescent tracker, NP targeting to the dermal skin layer/macrophages and sustained release properties will be analysed by fluorescence techniques (flow cytometry, microscopy) *in vivo* and *ex vivo.* Their efficacy to clear the parasite will be analysed by RT-qPCR in a mice model of CL.

yes	**X**
no	

Does the project include the possibility of supervised animal manipulation to complete the training for animal manipulator?