Universidad de Navarra

Máster en Investigación Biomédica
Facultad de Ciencias

Research Project Proposal
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Project Nº 14

Title: In vivo Designing nanoparticles for the activation of Leishmania spp. infected macrophages

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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 (World Health Organization, 2010). Leishmania species are intracellular protozoan parasites that cause multiple diseases ranging from nonlethal cutaneous leishmaniasis to deadly visceral disease (VL). Macrophages are the primary replication sites for this parasite and the major effector cells to combat against it [1]. The parasite has developed several mechanisms in order to survive inside the macrophages and one of them is associated with active suppression of inflammatory cytokines and microbicidal molecules such as nitric oxide, reactive oxygen species, TNF-α, IL-6, IL-12, indicating M1-deactivation or M2-macrophage polarization. Treatments addressed to reprogram macrophage into M1 cells or repair the macrophage microbicidal functions are likely to be beneficial.
In the recent years, nanotechnology has emerged as a valuable tool for improving the selective delivery of drugs towards infected macrophages [2]. Besides targeted delivery, we aim to design nanoparticles with potential ability to switch M1-macrophage polarization for the adquisition of leishmanicial activities.
The purpose of the work will be to study the effect of NP and their composition in macrophage polarization. We will prepare NP with different biomaterials (nanotechnology-pharmaceutical technology) and analyse their physicochemical properties such as size and superficial charge. Their effect in bone marrow derived macrophages (cell cultures) will be performed in vitro by determination of gene expression profile of M1 and M2 markers and cytokines production by ELISA (immunology).

References

[1] Podinovskaia et al, 2015, Future Microbiol. 10, (1), 111-29

[2]Moghimi, Parhamifar et at., 2012, J Innate Immun, 4, (5-6), 509-528