Thais P. Pivetta [1], Tânia Carvalho [2], Sandra I. D. Simões [3], Priscyla D. Marcato [1]

1 Nanobiolab, School of Pharmaceutical Sciences of Ribeirão Preto, University of São Paulo, Ribeirão Preto, Brazil
2 Instituto de Medicina Molecular, Faculdade de Medicina, Universidade de Lisboa, Lisboa, Portugal
3 Nanostructured Systems for Overcoming Biological Barriers group of iMed.ULisboa, Faculdade de Farmácia, Universidade de Lisboa, Lisboa, Portugal

thaisppivetta@gmail.com

Investigation of the anti-inflammatory potential of thymol encapsulated in lipid nanoparticles

Inflammation can be generated due to many causes including microbial infection, immune reactions and physical damage. To treat these disorders it is common the use of anti-inflammatory agents such as steroidal and non-steroidal medicines but some of these drugs are related with undesirable side effects [1]. Thus, there is a search for alternative therapeutics that are less toxic. Thymol is a phenolic monoterpene that exhibits antimicrobial, antioxidant, anesthetic and anti-inflammatory effects. Therefore, thymol could be a promising compound for the treatment of inflammatory processes and wound healing [2]. However, constituents of essential oil such as thymol can easily decompose. Nanostructured lipid carriers (NLCs) are able to provide chemical protection and sustained release. Also, NLCs enable the inclusion of natural lipids with biological properties and suitable for topical application [3].

The aim of this study was to evaluate the anti-inflammatory potential of thymol encapsulated in NLCs aiming its topical application. The nanoparticles were produced by hot emulsion and sonication method and characterized regarding to size, zeta potential and entrapment efficiency. Nanoparticles were incorporated in carbopol gel and used to study the anti-inflammatory activity in an anthralin ear swelling mouse model. The anti-inflammatory potential was determined through the measure of mice's ears thickness and histopathological analysis.

The average particle size was 108 nm (polydispersity index of 0.220), zeta potential of -12mV and 89% of the drug encapsulation efficiency. The ears treated with the betamethasone commercial ointment (positive control) exhibited total inhibition of ear edema. Thymol-NLCs inhibited 68% and the other samples presented lower inhibition (20% for empty-NLCs-gel and 37% for thymol-gel). The animals treated with thymol-NLCs showed histopathological scores similar to betamethasone (positive control) and the other samples exhibited higher scores of inflammation (Figure 1). Therefore, the encapsulation of thymol in NLCs appears as a promising manner for its topical administration in inflammatory skin diseases.

References

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Figures

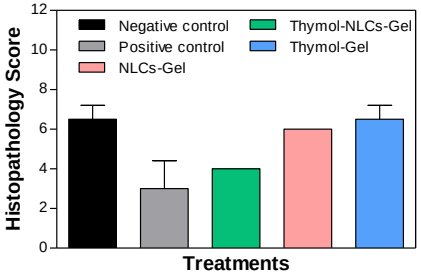

Figure 1: Histopathological score of mice ears treated with positive control (betamethasone), thymol-NLC-gel, empty-NLC-gel and thymol-gel after challenge with anthralin (negative control).