Bio-based lipid nanoparticles obtained from insect larvae biomass extract for skin diseases with barrier impairment

Almeida, Cíntia a,b, Rosado, Catarina a, Pereira-Leite, Catarina a,c

a. CBIOS - Universidade Lusófona's Research Center for Biosciences & Health Technologies, Lisboa, Portugal;
b. Department of Biomedical Sciences, University of Alcalá, Ctra, Madrid-Barcelona, Madrid, Spain;
c. LAQV, REQUIMTE, Departamento de Ciências Químicas, Faculdade de Farmácia, Universidade do Porto, Porto, Portugal.

INTRODUCTION: Dysfunctions in the cutaneous barrier are behind many pathologies, resulting in clinical manifestations such as inflammatory processes. Some of these disorders are related to alterations or depletion of the SC lipidic matrix. Hermetia illucens larvae biomass can be viewed as an innovative source of compounds with high aggregate value and marketing potential due to the sustainable organic matter bioconversion process used as a substrate for its development. Larvae oil seems particularly promising as a source of added-value lipids for the pharmaceutical and cosmetic industries, mainly due to its blend of mono and polyunsaturated fatty acids (FA). Good biocompatibility is foreseen for this biomaterial, since FA are critical in skin barrier function. Nanotechnology has provided promising and advanced tools for the delivery of drugs and actives for topical application in the context of skin diseases with barrier impairment. The use of lipid nanoparticles made up of larvae FA that are similar to those present in the epidermis may be a good strategy for topical application, since they can combine optimized delivery with an emollient protective effect.

AIM: In this context, the aim of the present work was to explore the use of the larvae lipid extract as biomaterial to encapsulate dexamethasone - a model drug for topical application - and evaluate the nanoformulations stability for 60 days at room temperature.

METHODS: The nanoparticles were prepared by ultrasonication and were characterized in terms of particle size, polydispersity index (PDI), zeta potential (ZP), and pH. The encapsulation efficacy (EE) of dexamethasone and loading capacity (LC) were also evaluated.

RESULTS & DISCUSSION: The lipid nanoparticles loaded with dexamethasone displayed particle sizes under 250 nm, a PDI<0.27, promising zeta potential values (< -34 mV), and satisfactory results in terms of the EE (ca. 89%) and LC (ca. 1%).

CONCLUSIONS: The results showed that the nanoformulations have acceptable physicochemical characteristics and stability, being adequate for cutaneous applications. Further studies are ongoing to probe the safety of the nanoparticles.

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