Biodegradable nanoparticles containing benzopsoralen and vascular function in pathological skin disorders

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Statement of Purpose: Psoralens are often used to treat skin disorders such as psoriasis, vitiligo and others. The toxicity and fast degradation of these drugs can be diminished by encapsulation in drug delivery systems (DDS). Nanoparticles (NPs) containing the benzopsoralen (BP) (3-ethoxy carbonyl-2H-benzofuro[3,2-e]-1-benzopiran-2-one) were prepared by the solvent evaporation technique[1-2]. In skin disorders such as psoriasis there is now considerable evidence indicating that angiogenesis may, at least in part, play a role in increasing the psoriatic plaque.The delivery of agents that induce the destruction of the endothelial cells in skin vasculature, activated by light irradiation, needs to be investigated[3]. Thus, the main objective of this work is to evaluate the morphological changes of vasculature in the normal rat skin after BP-NP in local delivery associated with light irradiation. In this work we analyzed the normal rat skin and used rat aorta as the mimetic vessel model to understand the uptake of the BP-NP by endothelial cell.

Methods: Nanoparticles (NPs) containing the benzopsoralen (BP) (3-ethoxy carbonyl-2H-benzofuro[3,2-e]-1-benzopiran-2-one) were prepared by the solvent evaporation technique, and parameters such as particle size, zeta potential, drug encapsulation efficiency, visualization of cellular uptake by confocal laser scanning microscopy and external morphology were evaluated.

Results: The analysis revealed that the NPs are spherical and with smooth external surface with diameter of 815 ± 80 nm, they present low tendency toward aggregation, and the encapsulation efficiency was of 74%. The intracellular distribution of NPs as well as their uptake by tissues was monitored by using laser confocal microscopy and transmission electron microscopy (TEM). The use of a benzopsoralen in association with ultraviolet light (360 nm) revealed by TEM morphological characteristics of cell damage such as cytosolic vesiculation, mitochondria condensation, and swelling of both the granular endoplasmic reticulum and the nuclear membrane.

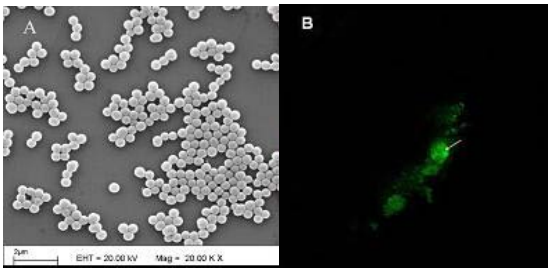

Fig. 1: *(A) Scanning electron microscopy (SEM) of external morphology of nanoparticles loaded benzopsoralen, magnification of 20,000 x. Scale bar corresponds to 2 μM. (B)* Cross section of a rat aorta artery segment by confocal microscope *of BP-NP excited at 488nm.*

Conclusions: The results presented in this work indicate that Poly(lactic-co-glycolic acid**)** nanoparticle **(**PLGA-NP) should be a promising sustained release for BP for systemic and local delivery associated with ultraviolet irradiation (PUVA therapy).

References:

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