

Designed for Dentistry, Articaine in NLC Improves Anaesthesia at Inflamed Tissues

Gustavo H. Rodrigues da Silva^{1,3}, Julia B. P. Lemes², Gabriela Geronimo¹, Iola F. Duarte³, Carlos A. Parada², Eneida de Paula¹

¹Department of Biochemistry and Tissue Biology, Institute of Biology, University of Campinas – UNICAMP, Campinas - São Paulo, Brazil. g008839@dac.unicamp.br; g.gabriela1995@hotmail.com; depaula@unicamp.br

²Department of Structural and Functional Biology, Institute of Biology, University of Campinas, Campinas, São Paulo, Brazil. juliabplemes@gmail.com; parada@unicamp.br

³CICECO – Aveiro Institute of Materials, Department of Chemistry, University of Aveiro, Aveiro, Portugal ioladuarte@ua.pt.

Abstract - Although used on a regular basis, local anaesthetics fail in places where inflammation is present, a problem for routine dental care. Intrinsic factors of the inflammatory process prevent anaesthetics from performing their function, at safe doses. The encapsulation of local anaesthetics in nanostructured lipid carriers (NLC) produces formulations with good physicochemical characteristics and improved anaesthetic effect. In that sense we developed an NLC formulation for articaine (ATC), a local anaesthetic with increasing use in dentistry. The developed formulation showed average particle sizes of 237.6 ± 3.3 nm, low polydispersity (PDI=0.169 \pm 0.015) and negative zeta potentials (-42.1 ± 0.5 mV), suitable for parenteral application. ATC was successfully encapsulated (%EE = 66.8 \pm 2.3%) in such lipid nanocarriers. When tested *in vivo*, in a rodent carrageenan-induced inflammation model, NLC-ATC decreased by 35% the inflammatory hyperalgesia response, in relation to free articaine. These results had encouraged us to propose further clinical evaluation tests to test the formulation in dentistry.

Keywords: Nanostructured lipid carriers, articaine, inflammatory pain, anaesthesia failure, dentistry.