Cationic Solid Lipid Nanoparticles (cSLNs) for shNUPR1 plasmid delivery in the treatment of hepatocellular carcinoma (HCC)

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Over the last decade, gene therapy has gained enormous attention as a therapeutic strategy for a large number of pathologies including genetic, neoplastic and infectious diseases. Gene therapy consists in any procedure intended to treat or alleviate a disease by genetically modifying the cell of a patient. In particular, fragments of DNA or RNA are delivered into specific cells in order to modulate the expression or suppression of specific altered proteins involved in the onset of the disease [1].

The aim of this study was to investigate the potential of cationic solid lipid nanoparticles (cSLNs) to deliver and transfect shNUPR1 plasmid into cancer liver cells for application in hepatocellular carcinoma (HCC) therapy. NUPR1 is a small multifunctional protein whose expression is increased in HCC tissues and has been shown to control HCC cell growth, proliferation, migration, invasion and response to chemotherapy. For all these reasons NUPR1 might be a protein whose blockade would prevent HCC progression and metastasis development. In the present study, different positively charged nanocarriers were prepared, characterized and complexed with a plasmid DNA. The biocompatibility of the particles and their complexes were confirmed by hemolysis assay (Figure 1) and the cytotoxicity studies were carried out on the human hepatocellular carcinoma cell line Hep3B. Finally, the nanoparticles showed to protect shNUPR1 plasmid from degradation by DNase I and to transfect it into Hep3B cells.

These findings suggest that these systems can be considered quite biocompatible and this feature opens new scenarios for the use of this class of biocompatible cationic nanomaterials for biomedical applications, such as gene delivery.

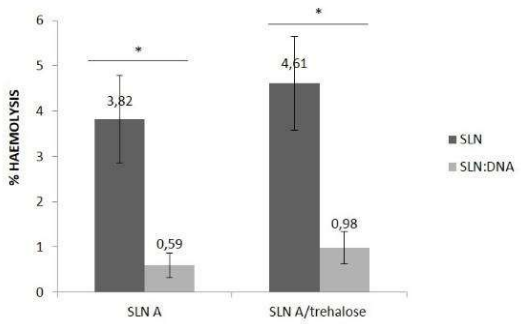

Figure 1. Haemolysis test results after incubation of the cSLNs samples (empty or complexed with the shNUPR1 plasmid) with red blood cells for 1 hour at 37 °C.

1. M.L. Bondì, E.F. Craparo, *Expert Opinion in Drug Delivery*, **2010,** *7*, 7.