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Experimental factorial design to optimize the formulation of soli lipid nanoparticles of *Chondroitin sulfate*

Eduviges Bustos Araya[1], Marc Suñé-Pou[1, 3], Débora Mercadé Frutos[1], Isaac Nofrerias-Roig[1], Anna Nardi-Ricart[1], PilarPérez-Lozano[1, 4], Encarna García-Montoya[1, 4], JM Suñé-Negre[1, 4], J R Ticó[1, 4] and **Montserrat Miñarro-Carmona[1, 4]**

[1]University of Barcelona, Spain
[2]University of Costa Rica, Costa Rica
[3]Institute of Parasitology and Biomedicine López-Neyra, Spain
[4]Hospitalet de Llobregat, Spain

Introduction: At the Faculty of Pharmacy and Food Sciences of the University of Barcelona, efforts have been made to obtain cationic solid lipid nanoparticles (cSLN) with an average size of less than 200nm, producing by hot micro emulsion method, which have been tested as a vehicle for pDNA and siRNA, in the transfection of cell lines. It is of scientific interest to evaluate the capacity of SLN transporting different types of biomolecules with pharmacological potential. Chondroitin sulfate (CHON) is a major component of the extracellular matrix of several connective tissues, including skin, bone, ligaments, tendons and cartilage. For that reason, CHON is a potential therapeutically agent in Osteoarthritis (OA), which is characterized by progressive structural and metabolic changes in joint tissues. Studies recommend topical administration in treating OA as first line therapy, and the development of topical systems with nanotechnology may introduce a new perspective for future treatment of OA. Here, we have employed factorial design to optimize the production of solid lipid nanoparticles (SLN) of CHON as a possible future OA therapy. An initial 3x3x2 full-factorial experimental design was used for the optimization of SLN formulations. The variables were defined as Concentration (mg/ml), Stirring rate (rpm) and Reaction time (min). Different SLN formulations were prepared and different properties were tested, including entrapment efficiency of CHON, zeta potential and particle size. In addition, TEM technique was used to characterize nanoparticles. Subsequently, the model was adjusted to the 2x3 full-factorial experimental with the following variables Concentration (mg/ml) and Stirring rate (rpm). Finally, the optimal factors for the higher entrapment efficiency of CHON and optimum zeta potential were attained by Minitab® program, using design of experiment (DOE) that predicted the best parameters by investigating the combined effect of different factors simultaneously. Pareto chart was used in the screening step to find the significant variables. In conclusion, nanoparticles usually adopt a spherical shape with an average size smaller than 150nm. This study revealed that Reaction time (min) does not have a significant impact in the evaluated responses. However, concentration (0.4mg/ml) and stirring rate (20000rpm) were determinant to maximize entrapment efficiency of CHON in SLN and to get the optimum zeta potential of SLN.

Biography

Marta Eduviges Bustos Araya received the Bachelor of Science degree in Pharmacy from the University of Costa Rica. She is currently a PhD student at the University of Barcelona, Faculty of Pharmacy and Food Sciences. She has a Master's degree in Molecular Biotechnology from the University of Barcelona and a Master of Science in Quality Management from the Central American Institute of Public Administration (ICAP) in Costa Rica. Her research is centered in the field of Nanoscience and Nanobiotechnology in the area of drug delivery systems.

eduviges.ba@gmail.com

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