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NANOPARTICLES OF LIPOIC ACID: PRODUCTION, CHARACTERIZATION AND BIOLOGICAL TESTS

Vieira, J.L.(1); Maurmann, N.(1); Govoni, B.(1); Davies, S.(1); Pranke, P.(2);
(1) UFRGS; (2) UFRGS/ IPCT;

Polymeric nanoparticles such as nanocapsules and nanospheres are used in drug delivery systems (DDS) with bioactive compounds. Lipoic acid (AL) is a molecule with antioxidant activity present in plants, animals and microorganisms. However, it is chemically unstable. Given this, an alternative is to produce the core-shell technology, containing AL as the core, and a more stable material as shell, like polycaprolactone (PCL). PCL is an FDA approved biodegradable polymer that has been widely used as an implantable biomaterial for long-term implantable devices. The objective of this work was to produced and characterize physically the lipid core nanoparticles containing AL, as well as to evaluate their effect on keratinocyte proliferation. The polymeric nanoparticles were prepared by the interfacial deposition of the pre-formed polymer method. Light scattering was used to evaluate the size, zeta potential and polydispersion index (PDI) of AL nanoparticles with a Zetasizer Nano ZS Zetasizer Nano ZS. The cell line HaCat was used for the evaluation of cell viability MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) reduction assay, which is a colorimetric assay for assessing cell metabolic activity. The cells were plated (7,500 per well into 96-well culture plates) and treated with nanoparticles with different concentrations of AL (0, 5, 10, 50 and 100 µg/mL), resuspended in the culture medium of Dulbecco's modified eagle's medium (DMEM) with high glucose. Cell viability was assessed 2 days after treated and the results were expressed by mean of absorbance and the standard error of the mean (SEM) followed by ANOVA and a Tukey test. The mean of the size of the nanoparticles was 222.43 ± 8.10 nm, the PDI was 0.19 ± 0.00, with controlled size distribution and the zeta potential of -12.50 ± 0.09 characteristics of formulation components. The mean ± SEM of the absorbance values obtained related to cell treated with LA viability were: 0.29 ± 0.01 to 0; 0.31 ± 0.01 for 5 µg/mL (p?0.05); 0.35 ± 0.01 for 10 µg/mL (p? 0.01); 0.33 ± 0.01 for 50 µg/mL (p?0.05) and 0.23 ± 0.01 for 100 µg/mL (p? 0.01). These absorbances obtained using MTT are directly proportional to the number of viable cells and showed dose-dependent results: 5 µg/mL did not affect the cell viability of keratinocytes; 10 µg/mL promoted increase of cell viability; 50 µg/mL did not affect the cell viability and the highest concentration tested (100 µg/mL) showed a decreased viability. Nanoparticles of lipoic acid were obtained with about 220 nm and negative charge density. The negative charge is an important parameter to guarantee the stability of the systems and to improve the interaction with biological membranes. These nanoparticles of lipoic acid in the intermediate doses (approximately 10 to 20 µg/mL) are promising for tissue engineering and regenerative medicine.