BIO_12 - Synthesis of Polycaprolatone nanoparticles with potential application as Antiviral carrier against Neurological effects of COVID-19

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Introduction: Coronavirus 2019 disease (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is considered the worst pandemic disease of the current millennium. In some cases, it causes severe neurological complications, such as encephalitis and Guilain-Barré syndrome. Therapeutic strategies that clearly inhibit the effects of this virus in the brain still need to be achieved. Therefore, polymeric nanoparticles (PNPs) have been shown to be a promising material in the biomedical area due to the targeted administration of therapeutics (e.g. antivirals) for specific areas of the body such as the brain. So, this work describes development of encapsulated polycaprolactone (PCL) nanoparticles against SARS-CoV-2 on infected brain cells.

Objective: Synthesize PCL-carrier nanoparticles against the SARS-CoV-2 virus and evaluate their biological activities.

Methodology: 1) Synthesis: The PNPs suspensions were obtained by the unique method of emulsion and solvent evaporation, using a 4:1 ratio of polymer and drug, which was selected in previous studies. The organic solvent was then removed by vacuum evaporation and the PNPs were washed by the ultrafiltration method. 2) Characterization: The mean diameter and zeta potential of the nanoparticles were determined by Dynamic Light Scattering method using Zetasizer™ Nano ZS 90 equipment. The amount of free antiviral was estimated by UV-visible spectroscopy and the encapsulation efficiency (EE%) was calculated by subtraction the amount of free drug released from the total of the inserted drug. Biologic function was evaluated *in vitro* by using Vero E6 cells.

Results: The average size of PNPs was estimated as 173.3 ± 0.08 nm with a polydispersivity index (PDI) of 0.07 suggesting a narrow size distribution and high homogeneity. In addition, zeta potential was slightly negative due to dissociation of the PCL functional groups on the particle surface. The concentration of the free drug releasing, calculated as encapsulation efficiency was estimated as 69.0%. Also, *in vitro* assay showed to be non toxic and able to inhibit viral replication by 40%.

Conclusion: The production of PNPs by the single emulsion and solvent evaporation method was efficient for the production of carrier particles with nanometric scale. The sample showed size within desired range which would allow targeting to the brain. In addition, the encapsulation efficiency showed that high level of the drug remains encapsulated. Therefore, we were able to obtain compatible nanoparticles for use in the brain in which preliminary *in vitro* tests proved to be non-toxic and able to inhibit viral replication even at low doses of antiviral.

Keywords: Nanoparticles; Neurocovid; Antiviral