Encapsulation of the natural product hydroxytyrosol in poly(lactic)acid nanoparticles coated with β-cyclodextrin polymer

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Derived from olive leaf and olive oil, Hydroxytyrosol (HT) is considered to be a very promising active molecule due to the variety of biological benefits it exhibits, such as anti-inflammatory, antibacterial, antioxidant and cardioprotective. HT is air- and light-sensitive, and can easily degrade to inactive derivatives. Encapsulation of such compounds in polymeric nanoparticles is considered to be a necessity for their protection.

The use of nanoparticles (NPs) as a drug delivery medium shows great promise in the Pharmaceutical and Cosmetic industry. The NPs particle size, their ability to improve the stability of active substances along with their biocompability with tissue and cells, when synthesized from materials that are biocompatible and biodegradable, have proven to be useful to the industry.

Polylactic acid (PLA) is an aliphatic polyester with adjusted hydrolyzability and it is commonly used in the Food and Pharmaceutical industry as it is a biodegradable and biocompatible polymer. The aim of this study was to encapsulate HT in PLA NPs and PLA NPs coated with β-cyclodextrin polymer, to evaluate the release of HT from both categories of NPs and to control the initial drug release (burst effect) with the use of cyclodextrins. Cyclodextrins have a hydrophilic exterior which makes them an ideal coating material for the hydrophobic PLA core.

Different complementary techniques were used to fully characterize the blank and loaded PLA NPs and Core(PLA)-Shell(Cyclodextrin) NPs as to their size, encapsulation efficiency, thermal properties and morphology. These techniques include dynamic light scattering(DLS), zeta potential measurements, Scanning electron microscopy(SEM), UV-Vis spectrometry, nuclear magnetic resonance spectrometry (NMR), Fourier transform infrared spectroscopy (FTIR), Differential Scanning Calorimetry (DSC), Thermogravimetric analysis (TGA) , viscometry and COOH group analysis concerning the PLA used.