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Characterization of pcl/atorvastatin films for potencial application in tissue regeneration

Garcia, Y.A.(1); Silva, T.G.(1); Patricio, B.F.C.(2); Sarcinelli, M.A.(2); Rocha, H.V.A.(2); Mendonça, R.H.(1); De Almeida, H.O.(1); Pereira, D.B.(1); Chaves, M.H.C.(2); Sales, T.B.(1);
(1) UFRRJ; (2) FIOCRUZ;

Biodegradable polymers have been investigated as raw materials to manufacture biomaterials applied to tissue regeneration and devices for drug delivery. Polycaprolactone (PCL) has been extensively studied to produce 2D and 3D materials applied to both bone and cartilage repair (films, scaffolds). Atorvastatin (ATV) is part of the pharmacological class of statins, which are drugs frequently prescribed against cholesterol. Traditional forms of this statin are tablet and it has an absorbed fraction and absolute bioavailability about 30% and 12%, respectively. ATV presents pleiotropic effects such as bone anabolism, vasodilating, antithrombotic, antioxidant, anti-inflammatory and immunosuppressive actions. Recent studies on metabolic abnormalities and obesity, in particular abnormal lipid metabolism, have been associated with diseases caused by cartilage degeneration, such as osteoarthritis (OA). Due to the PCL and ATV characteristics, to develop materials based on PCL and ATV can, potentially, be an alternative to treat problems associated to bone, local cholesterol disorder, and cartilage diseases, due to the PCL2 and ATV characteristics3. Being thus, the aim of this work was to produce PCL / ATV films and evaluate the ATV release kinetics. The films PA4, PA8, PA12 and PA16 (20%, 40%, 60% and 80% ATV / PCL, respectively) were produced by casting and analyzed by Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM), Thermal gravimetric analysis (TGA) and Differential Scanning Calorimetry (DSC). The ATV release was evaluated by UV-Vis. FTIR and XRD showed compatible peaks for both the polymer and the drug, being better visualized in higher concentrations of the drug. SEM analyzes showed that the distribution of atorvastatin in the matrices was uniform only in the PA4 and PA8 films. Thermal analysis showed consistent fusion steps with the starting materials, with the exception of film PA4, which presented only one endothermic event in the DSC. The release of the drug was evaluated in a buffer solution at 37 °C, with rotation of 75 rpm, temperature of 37°, in a dissolver. With the tests performed, it can be concluded that the drug has been released for a prolonged period, reaching 40% of the drug released in approximately 5 days.