○ AR1 ○ AR2 ● AR3	● Comunicación oral ○ Póster	☐ Opta a Premio

New bioactive polymers for tissue engineering

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Introduction. The aim of this project is to obtain a mussel-inspired biodegradable copolymeric system that gathers bioadhesive and thermosensitive properties which can find application to activate regeneration processes involved in body tissue such as epidermal or cartilage. To that end, we synthesize a novel acrylic monomer containing catechol moieties (2-(3-(3,4-dihydroxyphenyl)propanamido)ethyl methacrylate) (CEMA) bioinspired by the mussel adhesion mechanism [1 - 2]. Subsequently, we carry out the synthesis and characterization of a functional copolymeric system based on CEMA and N-vinyl caprolactam (VCL). VCL was selected as the comonomer due to the well-known thermosensitive behaviour of its polymer (PVCL) [3].

Methods. CEMA is synthesized by amide bond formation conjugating hydrocaffeic acid (HCA) with 2-aminoethyl methacrylate hydrochloride (AEMA) using EDC/NHS system as activator. CEMA is later radical copolymerized with VCL in VCL:CEMA feed ratios of 2.5 and 5 mol-% using thermal initiation. The structural characterization of the VCL-CEMA copolymers by spectroscopic techniques is studied with other physicochemical properties. Finally, cytotoxicity and biological properties of the copolymers are evaluated *in vitro* using cell cultures of different strains and standardized protocols (ISO-10993-5).

Results. The coupling reaction and formation of CEMA monomer is confirmed by ^{1}H NMR, FTIR and TGA analysis. Copolymerization reactions (yields < 20 %) provide low molecular weight copolymers. Copolymer compositions calculated by ^{1}H NMR manifest the lower reactivity of CEMA respect to VCL, giving CEMA contents of 0.4 and 5.3 mol-% respectively. Both copolymers are water soluble and show thermo-responsive properties, presenting LCST values between 40 and 50ºC. DPPH$^{\bullet}$ assay results confirm the antioxidant activity of both copolymers, giving radical scavenging activities higher than 80 %. Cytotoxicity of copolymers studied by MTT tests show that VCL_CEMA0.4 is biocompatible with fibroblasts cells at concentrations equal or lower than 4.5 mg/mL and VCL_CEMA5.3 has a IC_{50} value of 1.45 ± 0.01 mg/mL. In addition, copolymers are tested with macrophages in a nitric oxide (NO) inhibitory assay and results show that both of them possess good anti-inflammatory activity while biocompatibility is not compromised in this type of cells.

Conclusions. In overall, we can say that results obtained in this work support the enormous potential of this functionalized copolymer system presenting bioadhesive and thermosensitive properties for application as drug delivery systems and scaffolds in tissue regeneration processes.

References.

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