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Synthesis and characterization of polymeric nanoparticles with potential anti-inflammatory capacity for surface modification of biomaterials

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Introduction. Aseptic loosening is one of the main causes associated to biomaterials failure [1]. To address this issue, the layer-by-layer (LbL) deposition technique to obtain polyelectrolyte multilayered implant coatings incorporating biologically active molecules has been used [2, 3]. This work describes the preparation of pH-responsive polymeric nanoparticles with potential anti-inflammatory capacity that may serve as positive electrolyte in LbL biomaterials' coating platforms contributing to reduce undesired inflammatory response.

Methods. A hydrophobic methacrylic derivative of naproxen (HNAP), a non-steroidal anti-inflammatory drug, was synthesized and characterized by ^{1}H-NMR. It was copolymerized via radical polymerization with hydrophilic 1-vinylimidazol at different molar feed compositions (20:80, 50:50 and 80:20). Monomers reactivity ratios were determined by "in-situ" ^{1}H-NMR. Moreover, nanoparticles were prepared via nanoprecipitation method in aqueous solution at different concentrations. The influence of copolymers composition and molecular weight on their hydrodynamic properties was studied. Morphology, stability upon time and their behavior at different pHs and temperatures were also tested.

Results. HNAP and the copolymers were successfully synthesized and extensively characterized (^{1}H-NMR, DSC and GPC) observing an important influence of copolymerization conditions on copolymers molecular weight. The big differences between the monomers' reactivity ratios lead to random copolymers with a pseudo-gradient microstructure. Those copolymers with lower content in HNAP (20:80, and 50:50) presented an adequate hydrophobic/hydrophilic balance and form nanoparticles by self-assembling in aqueous solution. Nanoparticles prepared using lower molecular weight copolymers were stable in time and at physiological temperatures and they were positively charged at acidic pHs.

Conclusions. These systems may be applied as cationic polyelectrolytes in LbL coating platforms to achieve naproxen controlled release in biomaterials surfaces to reduce inflammatory responses prolonging their lifetime.

References

1. B. G. X. Zhang et al. *Int. J. Mol. Sci.***15** (2014) 11878-11921
2. M. Keeney et al. *Biomaterials.* **34(38)** (2013) 10287-10295
3. N. J. Shah et al. *Adv.Mater.* **24(11)** (2012) 1445-1450

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