Primary Structure and Composition: Tailored Thermo-, Oxidative and Thermo-Oxidative Responsiveness of Polysulfides

Richard d’Arcy¹, Charlotte Gourmel², Alessandro Siani¹, Enrique Lallana²,³ and Nicola Tirelli¹,²,³

¹Manchester School of Pharmacy, Stopford Building, Oxford Road, University of Manchester, M13 9PT, U.K.; ²Centre for Injury and Repair, Institute of Inflammation and Repair, Stopford Building, University of Manchester, M13 9PT, U.K.; ³NorthWest Centre for Advanced Drug Delivery (NoWCADD), University of Manchester, Manchester, M13 9PT, U.K.

The ability to tune the responsiveness of polymers is of the utmost importance to achieve fit for purpose properties.¹ This work shows how chemical composition and primary structure allows for the fine tuning of both thermal and oxidative responsiveness of polysulfide-based amphiphilic nanomaterials. Poly(ethylene glycol)(PEG)-polysulfide-PEG triblock copolymers were synthesised with the core polysulfide containing various length, monomer composition (different ratios of propylene sulfide (PS) to ethylene sulfide(ES)) and due to the large difference in monomer reactivity different monomer-addition protocols were employed (i.e. one or multiple additions of monomer); this library of polymers were then tested in regards to the their thermal-gelling properties and oxidation responsiveness to model oxidant H₂O₂. The results suggest that oxidative responsiveness was solely affected by the molecular composition of the polymer whereas the thermal properties were mainly controlled by the primary structure and the resulting changes in the supramolecular interactions.² With biotechnological applications in mind, the technology has now been extended to larger particle formulations, where the hydrophobic poly(PS-co-ES) have been polymerized in emulsion and crosslinked to afford nanoparticles with a good control over both monomer composition and size, with Z-ave. ranging from 50-170 nm.

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References: