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| **Degradable nanogels of poly(oligoethylene glycol methyl ether methacrylate) (poegma) for biomedical applications** |
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| **Background:** Poly(N-isopropylacrylamide (PNIPAM) is one of the most widely researched thermoresponsive polymers. We have previously shown that the PNIPAM nanogels can be used to produce in situ forming implants that can offer long-acting drug delivery. However, there are potential concerns for PNIPAM regarding the toxicity of any acrylamide monomer residuals. This limitation has led researchers to search for alternatives that are safer for biomedical applications. One such alternative is poly(oligoethylene glycol methyl ether methacrylate) (POEGMA), which is a methacrylate-based polymer. POEGMA has attracted significant interest from researchers due to its biocompatibility and the ability to tune the thermoresponsive behaviour. It is also possible to obtain biodegradable nanogels making POEGMA a promising material for a variety of biomedical applications. In this work we design and test degradable POEGMA nanogels for future applications as in situ forming implants. |
| **Methods:** The POEGMA nanogels were polymerised by dispersion polymerisation using copolymers of 2-(2-methoxyethoxy)ethyl methacrylate, oligo(ethylene glycol)methacrylate, and a disulfide-containing crosslinker, N,N’-bis(acryloyl)cystamine. The nanogels were characterised by dynamic light scattering and electrophoretic mobility measurements to determine their thermoresponsive and degradation properties. |
| **Results:** The nanogels obtained had sizes ranging from 112-183 nm with polydispersity index value of below than 0.2. The 1H NMR conversion analysis indicated that the conversion rates were varied depending on the composition of the monomers used. The POEGMA nanogel samples exhibited high degradability with up to a 79% ± 6.62 reduction in the light scattering intensity when the nanogels were treated with dithiotreitol. The temperature-dependent experiments revealed the thermoresponsive behaviours were tuneable and an aggregation temperature of 28 °C was possible depending on the composition. |
| **Conclusions:** The results suggest that POEGMA nanogels have great potential as a biocompatible and biodegradable alternative to PNIPAM or other thermoresponsive polymers for biomedical applications. These nanogels will be used to control the drug release behaviour as part of an in-situ forming implant application. |