ARVO Annual Meeting Abstract | March 2012

Development And Evaluation Of PNIPAAm-based Material For Injectable, Thermally Responsive Accommodating Intraocular Lenses

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Footnotes

Commercial Relationships Robyn E. Perry, None; M. A. Jafar Mazumder, None; Scott Fitzpatrick, None; Heather Sheardown, None

Support None

Investigative Ophthalmology & Visual Science March 2012, Vol.53, 6676. doi:

Abstract

Purpose: : Despite widespread success and high rates of use, commercially available intraocular lenses still suffer from a lack of true postoperative accommodative focus and prevalent posterior capsule opacification. These deficiencies mean that cataract patients require corrective lenses even after lens replacement surgery, and will often need to undergo additional surgical treatments to remove secondary cataracts. Capsular bag refilling has been proposed as an alternative treatment to traditional cataract surgery where the native lens is replaced by an injectable polymer gel. In the present work, a novel thermally responsive pNIPAAm-based material has been developed as an injectable

system for use in this application. Target parameters for transparency as well as mechanical strength and cellular compatibility have been investigated.

Methods: : Materials have been synthesized by radical-initiated polymerization of pNIPAAm, NAS and PEO. Optimization of composition led to the formation of materials with a variety of different properties. Transparency is visually assessed, and cellular compatibility studies are performed with HLE-B3 cells using MTT assay. Young's modulus is determined by Instron testing at physiological temperatures.

Results: : Current materials exhibit rapid gelation; transparent materials can be obtained but optimization remains necessary to obtain high transparency at physiologic temperatures. Cell studies indicate acceptable compatibility levels in vitro.

Conclusions: : While these materials require continued optimization, these results suggest that injectable polymers comprised of pNIPAAM and PEO may have the potential for use in lens refilling applications.

Keywords: intraocular lens