Cornell University
Center for Technology Enterprise and Commercialization

395 Pine Tree Road, Suite 310
Ithaca, New York 14850
p. 607-254-4698
f. 607-254-5454
www.cctec.cornell.edu

TECHNOLOGY BRIEF

Drug Delivery and Tissue Engineering with Dihydroxyacetone-Based Polymers
CCTEC D-3291

INVENTION SUMMARY

Post operative tissue adhesion can cause significant complications and often results in additional surgical procedures to remove the adhesions. Current solutions to prevent adhesion formation are limited due to their inflexible handling characteristics and inconsistent efficacies. This invention provides biopolymers that can be used for prevention or reduction of tissue adhesion, offering desirable flexibility in the surgical environment.

This biomaterial can also serve as an alternative for the two FDA approved polymers for drug delivery, polymers based on lactic acid and glycolic acid. With this new material, one can develop delivery systems, avoiding complicated IP landscape and enjoying long term patent protection and competitive market edge.

The new polymeric biomaterial is based on the monomeric unit of 1,3-propane-2-one, commonly known as dihydroxyacetone (DHA). DHA is an intermediate in human glucose metabolism, which means that the breakdown products of polyDHA will easily be incorporated into normal cellular processes, thus minimizing toxicity.

POTENTIAL COMMERCIAL APPLICATIONS

- Prevention or reduction of post operative tissue adhesions.
- Controlled drug delivery.
- Tissue engineering scaffolds, blood clotting meshes, hernia repair meshes.

ADVANTAGES

- Controlled release ability for drug delivery.
- Can be used in the forms of hydrophobic matrices or hydrophilic conjugates.
- DHA can be eliminated via natural metabolic pathways in human bodies.

TECHNICAL MERITS

- The inventors have overcome what was once a problem in forming polymers of DHA: the fact that DHA was unpolymerizable because its solutions contain a mixture of monomeric and dimeric forms. The inventors have created a synthetic scheme that not only locks DHA in its monomeric form but that is also amenable to polymerization. This is accomplished by controlled

protection and deprotection of the DHA hydroxyl groups, and results in polyDHA, a new and useful biomaterial whose degradation products are non-toxic.

- The ability of polyDHA to covalently link nucleophiles allows the alteration of surface properties of constructs built from this new biomaterial.

Inventors

David Putnam <http://www.cheme.cornell.edu/cheme/people/profile/index.cfm?netid=dap43>
Alexander Zelikin

Publications

- A.N. Zelikin, P.N. Zawaneh, D. Putnam. A Functionalizable Biomaterial based on Dihydroxyacetone, an Intermediate of Glucose Metabolism. ***Biomacromolecules*** (2006) 7:3239-3244.

- P.N. Zawaneh, A.M. Doody, A.N. Zelikin, D. Putnam. Diblock Copolymers Based on Dihydroxyacetone and Ethylene Glycol: Synthesis, Characterization and Nanoparticle Formulation. ***Biomacromolecules*** (2006) 7:3245-3251.

Patent Information

US 11/579,501.

License Status

Exclusive or non-exclusive licenses will be considered.

FOR MORE INFORMATION, CONTACT:

Alice Li, Ph.D.
Technology Commercialization and Liaison Officer
Phone: (607) 254-4487; Email: XL11@cornell.edu