

Click Hydrogel for Re-Synostosis Therapy (#5430)

A hydrogel based on copper-free click chemistry, (CH:click hydrogel) that is composed of a cross linker and a multifunctional reversible addition–fragmentation chain transfer (RAFT) co-polymer

Inventors at Georgia Tech have developed a hydrogel based on copper-free click chemistry, (CH:click hydrogel) that is composed of a cross linker and a multifunctional reversible addition–fragmentation chain transfer (RAFT) co-polymer. The reaction forms a covalently cross-linked gel; proceeds rapidly and can be safely carried out in living tissue. The architecture of the co-polymer allows for the incorporation of controlled release moieties for the delivery of small molecules, proteins, and nucleic acid therapeutics. The CH hydrogel also allows for customized release rates and degradation characteristics. The ratios between the cross linker and the co-polymer can be altered to achieve specific mechanical and degradation properties of the polymer. A major advantage of this hydrogel is that the polymerization does not produce free radicals and can be accomplished in-vivo. Completed mouse studies prove the effectiveness, safety, and utility of this technology in treating craniosynostosis.

Benefits/Advantages

- Provides a novel delivery vehicle for proteins or other factors for correction of craniosynostosis.
- Spontaneously polymerizes without producing free radicals. Polymerization can safely take place in-vivo.
- Allows for tunable mechanical properties and compound release kinetics.
- Potential uses include as a delivery vehicle in craniofacial, orthopedic, dental, and other medical applications.

Potential Commercial Applications

- Delivery vehicle for factors to heal long-bone or calvarial defects
- Treating craniosynostosis and orthopedic conditions
- Cell delivery scaffold or carrier to deliver drugs
- Regeneration of bone via delivery of bioactive agents
- Scaffold for repair of large muscle injuries

Background/Context for This Invention

Craniosynostosis is the premature fusion of the cranial suture early in development. If left untreated, blindness, deafness, and delays in development can occur. The current treatment for craniosynostosis uses surgery to remove the fused area and remodel the skull. In up to 40% of patients, the skull re-fuses;

necessitating additional surgery that often results in death or permanent damage. There is an unmet need for a safer and more effective method to delay the re-closure of such defects.

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More Information

Publications

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/click-hydrogel-re-synostosis-therapy>

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot

