Tufts TECH TRANSFER

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Silk Biomaterials for Hemostasis and Blood Clotting

Available Technologies:

Tufts ID #

- T001557
- T001621
- T001891
- T001917

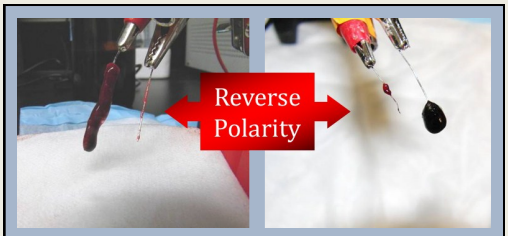
Features and Applications:

- Biocompatible, biodegradable protein hydrogels for hemostasis
- On-demand, reversible clotting via silk-electrogels
- Delivery of pro–clotting and wound healing cytokines via platelet encapsulating silk gels
- Tunable mechanical properties and degradation rates

Researchers at Tufts University have developed novel techniques to promote hemostasis, blood clotting, and wound healing using silk hydrogels. Silk is a biocompatible, biodegradable protein which can be processed into a wide variety of material formats. This versatility makes silk amenable to multiple hemostatic approaches including temporary, reversible treatments as well as longer-term, cytokine-mediated clotting/wound healing.

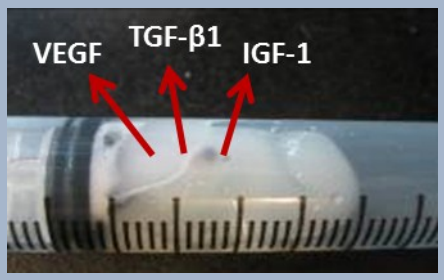
Recent work indicates that silk electrogels (e-gels) show great promise as a hemostat in situations requiring immediate, but temporary clotting (e.g. in the field before a patient is transported to a hospital where wounds may need to be re-opened). Silk e-gels, formed via application of a DC voltage to aqueous solutions, are highly adhesive, mechanically robust, and fully reversible when the voltage polarity is switched. Silk/blood e-gels can be generated in solutions comprising > 60% whole blood and these gels maintain their adhesive and reversible nature.

In another format, silk gels have been shown to be effective at encapsulating platelet rich plasma and subsequently releasing platelet-derived growth factors and cytokines that promote clotting and wound healing. The injectable silk gel serves to localize the platelets and the growth factors they produce at the site of injury. Further, the degradation rate and mechanical properties of the gels can be tuned to match the tissue properties surrounding the wound.



On-Demand Reversible Blood Clotting

Left: A silk/blood e-gel clot forms on one electrode when a voltage is applied. Right: The silk/blood e-gel returns to the liquid state when the polarity is reversed.



Silk Platelet-gel for Sustained Growth Factor Release

Platelets encapsulated in an injectable silk hydrogel release pro-clotting and wound healing cytokines and growth factors.

Summary

Silk hydrogel-based hemostatic devices and treatments show great promise for promoting blood clotting and wound healing over a wide range of timescales. The e-gel based technique allows for on-demand hemostasis, which can be reversed and cycled as desired, while the platelet-encapsulating silk gels promote endogenous clotting and healing processes via cytokine release.

Several IP positions are now available for licensing from Tufts University. Check out a full description of the technology at [http://techtransfer.tufts.edu/]

Contact: Martin Son, Office for Technology Licensing & Industry Collaboration (Martin.Son@tufts.edu) for more information