MeTro

MeTro is an elastic hydrogel-based sealant from a modified recombinant protein that can be rapidly polymerized with UV light to adhere strongly to soft tissue and withstand supraphysiological conditions. A recent study introduced this compound and performed a battery of biophysical tests to demonstrate the efficacy of MeTro to stop air leaks in rat and porcine lung and to maintain hemostasis in rat aorta.

Methacryloyl-substituted tropoelastin (MeTro), designed for use in pulmonary and vascular closures, shows promise for neurosurgical applications based on its highly adhesive and elastic properties, as well as its ability to promote cell adhesion and proliferation

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In vitro biomechanical testing of MeTro compared to the current FDA approved surgical lung sealant, demonstrated a higher tensile strength and elongation. In addition, cyclic compression testing demonstrated resilience of the compound with increased concentrations of MeTro. Further testing using electron microscopy demonstrated increased porosity and reduced swelling ratio at higher concentrations. Of particular interest, in vitro studies to test the cytocompatibility of the compound with mesenchymal and endothelial stem cells showed that MeTro promotes cell adhesion, growth, and proliferation between days 1 and 7 of application. Biodegradation of MeTro was studied after subcutaneous implantation at days 7, 28, and 84, demonstrating that by day 84 only 5% of the subjects had completely degraded the compound, indicating that the material will not be completely degraded prior to tissue healing. Lastly, ex vivo and in vivo studies demonstrated MeTro's ability to seal explanted rat aorta and withstand pressures as high as 300 mmHg, to achieve hemostasis following lethal aortic incisions, and to maintain a statistically significant increased burst pressure in porcine lung compared to other bioglues and sutures.

Histological analysis under light and electron microscopy revealed that MeTro formed a tight, coherent, and strong bond with underlying tissue with a production cost of $50/ml.

While there are many techniques in neurosurgery to reduce persistent spinal fluid leak, a need to further decrease this complication exists, in particular for spinal, posterior fossa, and transnasal operations. Improved bioglues that safely and reliably close dural openings and can withstand the fluid dynamics in the central nervous system could prevent the use of unnecessary lumbar drains and complex wound closures, such as nasoseptal flaps, reduce the length of hospitalization, and limit rehospitalizations and reoperations. While further studies to test the utility of MeTro for neurosurgical applications are necessary, the present work by Annabi et al. demonstrates promise for this compound to be used to improve the safety and reliability of a number of neurosurgical procedures [1)].

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Annabi N , Zhang YN , Assmann A et al. Engineering a highly elastic human protein based sealant for surgical applications . Sci Transl Med . 2017 ;9 (410):1 -14.