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Dual composite bioadhesives for wound closure applications: An *In vitro* and *In vivo* study

Conventional sutures have been the most common practice for wound closure applications for years. The alternative method, to use surgical adhesives, is more convenient and less time consuming. However, the application of commercial adhesives such as Histoacryl® Blue is limited, due to cytotoxicity. Hence, developing surgical adhesives with strong adhesion to soft tissue in wet environment, controlled physical and mechanical properties and excellent biocompatibility has been a significant challenge. In the current study we developed a new bioadhesive concept, which is based on the highly biocompatible natural polymers gelatin and alginate. In order to enhance the mechanical- physical properties and functionality, two types of fillers were added: hemostatic agents (kaolin or montmorillonite) and cellulose fibers. Our results show that addition of the functional fillers enabled to increase the tensile strength and modulus of the bulk material, leading to both, higher sealing ability and higher bonding strength. The gelation time and swelling degree of significantly decreased and the viscosity increased with the functional fillers incorporation, which all together enables better functioning. The *in-vivo* study focused on the bioadhesives function in a porcine skin incisions model, compared to conventional sutures and the commercial adhesive Histoacryl® Blue. The histological analysis demonstrated a superior efficacy of these new bioadhsives compared to the control Histoacryl group. I.e., they resulted in rapid healing, less inflammation and higher degree of wound closure. In conclusion, our dual-composite bioadhesives demonstrated promising potential for use in wound closure applications and may serve as a suitable alternative for conventional sutures.

Recent publications

1. Daniella Goder, Lior Matsliah, Shir Giladi, Liron Reshef-Steinberger, Idan Zin, Alon Shaul, Meital Zilberman, Mechanical physical and biological characterization of soy protein films loaded with bupivacaine for wound healing applications. International Journal of Polymeric Materials and Polymeric Biomaterials, 70(5), 345-355 (2021).
2. Lior Matsliah, Daniella Goder, Shir Giladi, Meital Zilberman, *In Vitro* characterization of novel multidrug-eluting soy protein wound dressings. Journal of Biomaterials Applications, 35(8), 978-993 (2021).
3. Inbar Eshkol-Yogev, Efrat Gilboa, Shir Giladi, Meital Zilberman, Formulation - properties effects of novel dual composite hydrogels for use as medical sealants. European Polymer Journal, 152 (2021).

Biography

Meital Zilberman holds an appointment of full professor at the department of biomedical engineering and the department of materials science and engineering of Tel Aviv University. Her research interests are polymeric biomaterials, active implants and scaffolds for tissue engineering and drug- delivery systems. During 2015-2020 she served as the president of Israel Society for Medical and Biological Engineering (ISMBE). She published more than 100 articles in the top biomaterials, biomedical engineering and polymers journals, invented over 30 patents and delivered about 250 presentations (including invited talks keynote and plenary lectures). Among her prizes and awards is the prestigious Journal of Wound Care (JWC) world first place innovation award.

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