

SKIN REGENERATION WITH A SYNTHETIC BIOMATERIAL THAT REPLACES THE EXTRACELLULAR MATRIX

Matthew Davenport: Gemstone Biotherapeutics, LLC, USA
mdavenport@gemstonebio.com

Emily English, Gemstone Biotherapeutics, LLC, USA

Sharon Gerecht, Department of Chemical and Biomolecular Engineering, the Johns Hopkins Physical Sciences-Oncology Center, the Department of Materials Science and Engineering, and the Institute for NanoBioTechnology, Johns Hopkins University, USA

Our extracellular matrix replacement (EMR) is a photopolymerized, polysaccharide-PEG hydrogel scaffold that promotes functional skin regeneration and stimulates wound closure with reduced scarring. The advanced wound care market is dominated by collagen-based products isolated from animal and human tissues, and these products are often costly, show only modest efficacy, and cannot be extensively modified to provide customized devices. Preclinical data indicates that the EMR provides the optimal mechanical and chemical properties to stimulate an effective and efficient inflammatory response, followed by regeneration of a robust vascular network and restoration of a complete reticulated epithelium, hair follicles, and sebaceous glands. The EMR is a biodegradable synthetic biomaterial, and its properties can be rationally modified by adjusting the reaction conditions under which it is produced. Therefore, future generations of EMR products can be tailored to specific wound types and/or loaded with growth factors and small molecules.

We will review EMR discovery and development, covering its synthesis and chemical and biochemical characterization. We will present data from our preclinical animal studies in murine and porcine third degree burn and excisional wound models. Finally, we will discuss efforts to develop scalable EMR manufacturing processes and highlight some future directions to develop next generation EMR-based products.