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Impact of silk hydrogel secondary structure on hydrogel formation, silk leaching and *in vitro* response for wound healing applications

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Silk can be processed into a broad spectrum of material formats and is explored for a wide range of medical applications, including hydrogels for wound care. The current paradigm is that solution-stable silk fibroin in the hydrogels is responsible for their therapeutic response in wound healing. Here, we generated physically cross-linked silk fibroin hydrogels with tuned secondary structure and examined their ability to influence their biological response by leaching silk fibroin. Significantly more silk fibroin leached from hydrogels with an amorphous silk fibroin structure than with a beta sheet-rich silk fibroin structure, although all hydrogels leached silk fibroin. The leached silk was biologically active, as it induced vitro chemokinesis and faster scratch assay wound healing by activating receptor tyrosine kinases. Overall, these effects are desirable for wound management and show the promise of silk fibroin and hydrogel leaching in the wider healthcare setting.

Recent Publications

1. Matthew S.A.L, Egan G, Witte K, Kaewchuchuen J, Phuagkhaopong S, Totten J.D, Seib F.P. Smart Silk Origami as Eco Sensors for Environmental Pollution ACS Appl. Bio Mater. 2022, 5, 8, 3658–3666.

2. Egan G, Phuagkhaopong S, Matthew S.A.L, Connolly P, Seib F.P. Impact of silk hydrogel secondary structure on hydrogel formation, silk leaching and *in vitro* response. Sci Rep 12, 3729 (2022).

3. Matthew S.A.L., Totten J.D, Phuagkhaopong S, Egan G, Witte K, Perrie Y, Seib F.P. Silk Nanoparticle Manufacture in Semi-Batch Format. ACS Biomaterials Science & Engineering. 2020, 6(12), 6748-6759.

Biography

Gemma Egan studies at the University of Strathclyde, Glasgow, UK. She completed her biomedical engineering honours degree in 2017 before undertaking an engineering doctorate. Throughout her doctorate she researched the natural biomaterial silk, with a scope for potential wound care applications. She is currently working as a research assistant with a focus on bacterial detection using sensor-based methods. She has an interest in natural biomaterials for wound healing and health technology advancement.

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