

27. Title: Layered hydrogel scaffold for the regulation of diabetic wound bed for faster healing

Inventor: Prof. Jayanta Bhattacharyya, Center for Biomedical Engineering

Keywords: Silk fibroin, Hyaluronic acid, Hydrogel, Genipin, Growth factor, Chronic wound healing

Domain: Healthcare (Drug delivery)

Summary: Diabetes mellitus (DM) associated impairments in wound healing include prolonged inflammation, overexpression of matrix metalloproteases (MMPs) and low levels of growth factor at the wound site. The present technology relates to a layer-by-layer scaffold (SL-B-L) made natural polymeric material for delivery of an MMP-9 inhibitor along with PDGF-BB and an antimicrobial agent. The SL-B-L exhibited highly porous morphology. Diabetic rats treated with SL-B-L demonstrated an early wound closure, a fully reconstructed epithelial layer by 14 days and reduced level of IL-6, TNF- α , TGF- β 1 and MMP-9. Interestingly, SL-B-L treatment increased angiogenesis, bio-availability of collagen, DNA content, and VEGF-A level. Furthermore, enhanced keratinocyte-fibroblast interaction along with ordered collagen deposition was observed in SL-B-L treated rats. Most interestingly, when compared with a clinically used scaffold SEESKIN+®, SL-B-L outperformed in promoting wound healing in a diabetic rat model by regulating the inflammation while delivering growth factor and MMP-9 inhibitor.

Advantages:

- » Single scaffold to take care of all problems arising at different stages of chronic wound healing
- » Prolonged release of payloads, reducing the need for multiple changes that disturb the healing wound
- » Economic as multiple changes in the dressing are not required
- » Can reduce MMP-9 in the wound bed, which leads to cleavage of growth factor that actually cause delay in healing
- » Delivers growth factor to enhance chemotaxis of other growth factors to assist healing
- » Platform technology that can be used to deliver other drugs and proteins that are otherwise difficult to deliver
- » Layer-by-layer structure for better mechanical strength
- » Sustained delivery of anti-microbial agent and PDGF-BB (till 21days)
- » Excellent antimicrobial effectivity and cytocompatibility.
- » Can modulate the inflammation in the wound bed and reduce the inflammatory phase
- » Increases availability of VEGF-A in the wound bed to augment angiogenesis

Applications: Wound healing, therapeutic, drug delivery

Scale of Development: In vivo studies and characterization of hydrogel has been done

Technology Readiness Level: 4

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