Project title: Development of a Novel Multi-Functional Smart Wound Dressing

Project leader: Samaneh Ghazanfari/ Stefan Jockenhövel

Function: Group Leader/ Professor

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Proposal (250 words):

Introduction: The wound healing process occurs in highly ordered phases of (1) haemostasis and coagulation, (2) inflammation, (3) proliferation and (4) maturation. A multi-functional dressing that can cover all these healing phases without a need for daily changes holds considerable promises. However, in order to use such dressings, the healing dynamics of wound should be regularly monitored to avoid critical challenges such as infection. The pH of wound fluid has been indicated as an important diagnostic factor of wound condition. Therefore, a multi-functional wound dressing equipped with smart materials, pH monitoring and communication technologies can significantly improve the clinical outcomes.

Hypothesis and Objectives: A smart wound dressing consisting of healing materials and monitoring system can provide a) an objective assessment of the wound healing process, b) realtime information on the wound healing process, and c) more comfort and reassurance to the patient, improving the quality of care.

Setting and Methods: The project will focus on proof-of-concept development and evaluation studies of the smart wound dressing, providing evidence for the statements in the areas mention in the last section. These studies will be a basis for clinical trials to be carried out within a follow up project.

Impact: 1) Wound treatment complications and costs will be reduced. 2) Since there is no need for daily checkups and dressing changes, fewer hospital stays will be needed, and patient's quality of life will be tremendously improved.

Requirements candidate: Highly motivated student with good English communication skills and proactive and resolute attitude. Good technical knowledge (sensors, data processing, materials, materials integration), and affinity with healthcare applications.

Keywords: Multi-functional wound dressing; Wearable health monitoring; Smart materials.

Top 5 selected publications:

1. J. Samal, S. Weinandy, A. Weinandy, M. Helmedag, L. Rongen, B. Hermanns-Sachweh, S.C. Kundu, S. Jockenhoevel, Co-Culture of Human Endothelial Cells and Foreskin Fibroblasts on 3D Silk-Fibrin Scaffolds Supports Vascularization, **Macromol Biosci**, 15, 1433-46, 2015.
2. M.J. Helmedag, S. Weinandy, Y. Marquardt, J.M. Baron, N. Pallua, C.V. Suschek, S. Jockenhoevel, The effects of constant flow bioreactor cultivation and keratinocyte seeding densities on prevascularized organotypic skin grafts based on a fibrin scaffold, **Tissue Eng Part A**, 21, 343-52, 2015.
3. S. Ghazanfari, A. Driessen-Mol, C.V. C. Bouten, F.P.T. Baaijens, Modulation of collagen fiber orientation by strain-controlled enzymatic degradation, **Acta Biomaterialia**, 35, 118-126, 2016.
4. S. Ghazanfari, A. Khademhosseini, T.H. Smit, Mechanisms of collagen lamellar structure formation in connective tissues, **Biomaterials**, 97, 74-84, 2016.
5. S. Ghazanfari, A. Driessen-Mol, B. Sanders, P. Dijkman, S.P. Hoerstrup, F.P.T. Baaijens, C.V.C. Bouten, In-vivo collagen remodeling in the vascular wall of decellularized stented tissue engineered heart valves, **Tissue Eng Part A**, 21, 2206-15, 2015.