NANOSCIENCE APPROACH TO MIMIC WOOL FIBRE FOR STAIN PROOF TEXTILE

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ABSTRACT

Background & Objectives:

Bioinks are promising substances for printing three dimensional structures for tissue engineering or organ-on-a-chip systems. They contain living cells and thus have to be deposited at suitable temperatures and renouncing cell damaging cross-linking or hardening processes which occur in most 3D printing approaches. The viscosity of such bioinks has to be precisely adjusted to allow cell migration, growth and forming of networks and at the same time avoiding cell immobilization or gravity-driven cell sinking due to unfavorable ratios between the traction forces of the cells and the stability of the bioink. Additionally, the overall low viscosity and the high water content of the (hydro-) gel-based materials lead to reduced dimensional stability and geometric integrity in comparison to state-of-the-art 3D printed parts.

Methods:

Fiber-reinforced composites (FRC) are well established in multiple applications for lightweight construction, mechanical and civil engineering, transport and many more. The overall mechanical strength of FRCs may exceed the strength of the matrix material many fold. A novel approach for combining bioinks as matrix system and short biopolymer fibers as reinforcement is introduced.

Results & Conclusion:

The innovative concept is implemented within an additive manufacturing (AM) technology that allows purposeful adjustment of the fiber volume content. The cell behavior as well as the overall geometric integrity and the mechanical strength of the novel constructs are reported. The innovative approach is intended to serve as a technology platform towards improved properties of tissue engineering components and organ-on-a-chip systems.