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Ink Jet Printing of Therapeutic Agents

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Abstract

Tissue engineered therapies include the delivery of growth factors to promote wound healing. Growth factors are typically delivered as soluble molecules ('liquid phase') that diffuse out from the wound site into surrounding healthy tissue. A concentration gradient of the growth factor thus forms, which directs cell migration from the host into the wound site to initiate the healing process. Concentration gradients play critical roles in development and normal wound healing; therefore mimicking spatial/temporal patterns of growth factors appears to be important for therapy design. However, after over 20 years of R&D of growth factor delivery systems, these therapies have yet to meet clinical expectations. Two limitations of current delivery methods are: 1) liquid-phase growth factors must be delivered in large, non-physiological dosages, which can have deleterious side-effects, and 2) diffusion gradients do not persist.

The aim of this research is to investigate cell response to 2D gradient patterns of immobilized ('solid phase') growth factors, which will be delivered in relatively low dosages and persist. The long-term goal is to use this knowledge to create more effective 3D tissue engineering therapies for wound healing applications. An ink jet printing methodology will be developed that can produce high-resolution patterns of growth factors on biomimetic substrates.