BHE 013
Transport Modeling within Engineered Tissues

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Abstract
Critical to any tissue engineered therapy is the regulatory role of growth factors, whether exogenously delivered or provided endogenously by patent tissues. Growth factors regulate communication between cells and provide the cures to direct repair and regeneration of healthy replacement tissues. Gradients of growth factors guide cell migration to the repair site. Similarly, cells organize and differentiate to produce the various cellular products that cumulate into functional replacement tissues in response to growth factor regulation. However, the various mechanisms involved in growth factor transport within tissue engineered constructs, between such constructs and the surrounding host tissues, and within the interstitial environment (extracellular spaces surrounding cells within a tissue compartment) of the host tissue itself, remains unclear. Understanding these transport processes and developing relevant models to predict growth factor transport for tissue engineered therapies will be critical to all tissue engineering applications.

The purpose of this project is to co-develop complimentary growth factor transport experimental and computer models for a paradigm 3-D fibrin-based tissue engineered construct. Transport mechanisms to be addressed will include diffusion, convection, and binding pharmacokinetics between test growth factors (insulin-like growth factors) and fibrin hydrogel. The goal is to create a relevant experimental model to determine how hydrogel physical properties and various transport conditions impact growth factor transport and to develop predictive models which compliment the experimental. This proposal is the first such application for PITA funding. This proposed research involves the development and validation of complimentary experimental and computer models to understand and predict growth factor transport in tissue engineered materials.