

Design of a Microfluidics Device for Facile Processing of Encapsulated  
Stem Cells  
(Technical Report)

From Bench to Bedside: Bioethical Issues in the Clinical Implementation of  
Stem Cell Therapies  
(STS Research Paper)

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by

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## Preface

Stem cells can give rise to the undifferentiated cells making up every tissue in the body, making them attractive candidates for therapeutics. How can stem cells be used as an effective therapy for a wide variety of human diseases?

Microfluidic devices can be used to encapsulate stem cells and protect them from rejection by the host immune system. How can the efficiency and efficacy of a procedure to encapsulate stem cells with polymers be improved? After conducting a literature review, the technique of inertial focusing was chosen as a basis for device design. Computer-aided design software was used to create various models and 3D-printing was used to create scaled-up prototypes. The flow characteristics of the 3D-printed devices was found to recapitulate those predicted by computational fluid dynamics simulations. Future work includes fabricating a to-scale device using soft lithography, a more robust fabrication method. This device will speed up the encapsulation process, thereby accelerating the feasibility of the clinical implementation of encapsulated stem cell therapy.

How do various social groups involved in the direct-to-consumer stem cell industry in the United States advance their respective agendas? Participants include regulatory agencies, stem cell clinics, advocacy groups, and professional societies. They invoke the same set of principles of medical ethics – patient autonomy, beneficence, non-maleficence, and justice – to justify their respective agendas but place differing emphasis on certain principles to suit their needs. Regulatory agencies use legal and criminal action, stem cell clinics use marketing appeals, and professional societies use publication of guidelines, lobbying, and monetary support. The use of the same ethical principles to motivate different courses of action highlights potential flaws of relying on overly generalized ethical or moral codes to guide behavior.

## **List of Contents**

1. Technical Report: Design of a Microfluidics Device for Facile Processing of Encapsulated Stem Cells
2. Sociotechnical Research Paper: From Bench to Bedside: Bioethical Issues in the Clinical Implementation of Stem Cell Therapies
3. Prospectus