# CALIFORNIA STATE SCIENCE FAIR
## 2007 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**S0424**

**Project Title**
# Integrated Microfluidic Device for the Development of Human Embryonic Stem Cells

**Abstract**

**Objectives/Goals**
Stem cell technology can help pave the way for personalized medicine, but current methodologies prevent from doing so. Human embryonic stem cell cultures are contaminated with animal products, preventing transplantations. Lack of understanding of stem cells in their microenvironments hinders tissue engineering and accurate drug screening.

**Methods/Materials**
In order to address these problems, an integrated microfluidic device that can sustain the growth and development of human embryonic stem cells (hESCs) was developed. The device was fabricated by soft-lithography. HSF1 hESCs were cultured inside the device with mouse embryonic fibroblasts (MEFs) and cultured media.

**Results**
Human embryonic stem cells were able to grow inside the microfluidic device. The morphology of the stem cells matched that of conventional methods. The undifferentiated nature of the embryonic stem cells was confirmed through immunostaining with AP, DAPI, Oct-4 and SSEA-4. Stem cell growth curves matched conventional methods and were robust.

**Conclusions/Discussion**
Human embryonic stem cells were efficiently cultured in a microfluidic device. This device can maintain hESC self-renewal and pluripotency in a microenvironment similar to in vivo conditions. hESC colonies were stained for SSEA-4, Oct-4, AP, and DAPI. This microfluidic cell culture device can later be used for high-throughput drug screening and the creation of animal free culture systems.

**Summary Statement**
This project is about developing a microfluidic stem cell culture device that can later be used for high-throughput drug screening and the creation of animal free culture systems, leading to personalized medicine.

**Help Received**
Used lab equipment at University of California, Los Angeles under the supervision of Dr. Hsian-Rong Tseng and Kenichiro Kamei.