# CALIFORNIA STATE SCIENCE FAIR
# 2014 PROJECT SUMMARY

**Name(s)**

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**Project Number**

**S1707**

**Project Title**

## Biological Properties of a Novel 3D Scaffold for Use in Transplantation to Treat Stroke

**Abstract**

**Objectives/Goals**

New advances in stem cell therapies have promising implications for victims of many diseases, especially post-stroke patients who suffer from physical, cognitive and emotional impairments due to the death of brain cells during stroke. Transplanting neural stem cells into stroke infarct cavities can facilitate neurogenesis following injury. However, direct transplantation of cells into the stroke infarct cavity has resulted in dramatic death of transplanted cells and little reduction in lesion size. More obvious improvement may be achieved with the aid of 3D matrices that deliver necessary cells to the site of injury and protect them during the transplant. A novel combination hyaluronic acid and fibrin gel is proposed here as a 3D scaffold for use in transplantation therapies. The gel is designed to resist degradation in vivo while stimulating the survival and proliferation of neural stem cells.

**Methods/Materials**

The viability of cells was measured using a LIVE/DEAD Viability/Cytotoxicity Assay from Invitrogen. Degradation, which plays a large role in how effective 3D scaffolds are, was determined by measuring the presence of fibrinolytic factors with absorbance. Proliferation was observed by marking newly synthesized DNA with an EdU Assay. The results of the combination gels were contrasted with those of the commonly used fibrin gel.

**Results**

Neural stem cells cultured in these gels were shown to have a 3-fold increase in survival, and a 1.5-fold higher level of proliferation. The combination gels were especially resistant to degradation, lasting up to three times longer than the fibrin gels.

**Conclusions/Discussion**

These results suggest that this novel gel would be beneficial in recovering motor skills affected by neuronal loss during stroke by serving as a replacement extra-cellular matrix, which is lacking in the stroke infarct cavity. Specifically, it highlights the interaction between fibrin and hyaluronic acid and their potential for use in conjunction to increase cell survival and proliferation. Furthermore, the success of this formulation emphasizes is a promising precursor to future therapies to replace lost brain cells and return normalcy to the lives of disabled stroke patients.

**Summary Statement**

A novel formulation of a biodegradable 3D scaffold is tested in conjunction with neural stem cells to determine its potential in relieving stroke-induced disabilities.

**Help Received**

Used lab equipment at UCI under the supervision of Dr. Lisa Flanagan.