CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

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Project Number

38579

Project Title

The Decellularization of a Spinach Leaf by Perfusion and Submersion of Detergent Solution

Abstract

Objectives/Goals

My objective was to decellularize a leaf using sodium lauryl sulfate (SLS), leaving only it#s extracellular matrix with an intact vascular system. If completely decellularized, this new scaffold could be infused with animal cells, and turned into transplantable tissue. I also wanted to discover whether perfusion or submersion of SLS would decellularize more efficiently.

Methods/Materials

To decellularize through perfusion, I inserted an IV into the stem of a spinach leaf. The IV was set on a drip to perfuse detergent solution (2.2% sodium lauryl sulfate and distilled water) through the vascular system. To decellularize through submersion, I soaked a leaf in the same detergent solution. The control group was soaked in only water. A fully decellularized leaf is transparent or white, therefore, I measured opacity/color.

Results

After a 42 day trial (for all groups), the submerged leaf lost color, and was translucent with an intact vascular system/scaffolding. Once placed in the isopropyl alcohol intended to preserve the leaf, it turned white. A faulty IV prohibited data collection from the perfused leaf. The control group was more transparent than the soaking group, but fell apart when removed from water.

Conclusions/Discussion

My results disprove my hypothesis because sodium lauryl sulfate didn#t complete decellularization though either method. The SLS removed cells while leaving an intact scaffolding, and worked better than water, but didn#t remove all cells. Next time for perfusion, I#ll use a smaller, secured needle, and air pressure relief in the IV tubing. Next time for submersion I#ll try isopropyl alcohol.

Summary Statement

I tested if perfusion or sumbersion of detergent soultion would best decellularize a leaf, leaving an intact scaffolding and vascular system, and found sumbersion did.

Help Received

When my perfusion group failed, I reached out to (emailed) Joshua Gershlak at Worcester Polytechnic Institute and he explained that before decellularization can commence, I had to first open the stomata on the leaves.