



Embedding Electrodes Within Engineered Neural Tissues

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I was very excited to find out that I would be spending my summer after freshman year with Dr. Isaac Chen's lab, working on growing engineered neural tissues around flexible electrodes. The purpose behind the project is to create a stable interface between human tissue and the electrode to prevent tissue scarring and improve electrical signals. Little did I know that along the way, I would also gain insight into how to plan experiments, maintain healthy neuronal cultures, and grow cortical organoid tissue.

My summer started with training to work with cells in a sterile environment, in the context of a team. Weekly lab meetings helped to ease me into the busy flow of the lab. Soon enough, I gave my own presentation at a lab meeting to present some findings I had for my project. My main focus for the summer was to find a way to grow human neurons, cultured into an organoid structure, around a flexible electrode. The ultimate goal was to use the electrode to record electrical activity from the tissue around it in a stable fashion over time. However, there were many challenges and obstacles I had to work around and solve. Dennis Jgamadze, a post-doctoral fellow in the Chen lab with a background in both medicine and engineering, helped me navigate the various challenges in this project. Together, we designed a 3D construct in SolidWorks to make a customized culturing well for cells and electrodes to facilitate the attachment and growth of organoid tissue to the electrode. Although the project is still a work in progress, I hope that we will be able to successfully record signals from the electrodes in the near future.

I also worked on other projects in the lab during the summer. With Dennis, I helped grow organoids around metal beads to facilitate the stretch growth of axons using magnetic fields. I also experimented with different surface coatings to find the ideal environment to grow and attach organoids to inorganic surfaces. Along the way, James Lim, a lab technician in the Chen lab, helped me learn how to maintain cortical neuron cultures and perform immunocytochemistry protocols. Nadir Bilici, a medical student working on electrophysiology, taught me many new ideas in electrophysiology and the human nervous system. My fellow PURM award recipient, Clarissa Liu, was also very helpful in showing me her projects, including tissue slicing and organoid staining.

This experience has helped me find a practical use for many of the skills I learned through my courses. Overall, I gained many new skills this summer and I look forward to doing more research in the future.