Abstract

Epilepsy is a burdensome condition which causes recurring episodes of seizures. In order to study a hypothesized linkage between mutations in the SLC35A2 gene and epilepsy, the Stein Lab has developed a new 3D electrode array setup – the HotPocket device- to measure the firing rates of neural organoids. However, testing the HotPocket device has resulted in failure to record action potentials. It was hypothesized that the insulating attachment factor was the reason behind the lack of observable action potentials. To counteract this, a new attachment factor was to be developed: a composite of Agarose, Cellulose Nanofibers, and Polypyrrole, which established literature indicated would possess the necessary conductivity and biocompatibility for use with neural tissue. To produce the attachment factor, agarose and pyrrole were polymerized *in situ* via oxidation with a metal catalyst, followed by lyophilization, combination with cellulose nanofibers, then lyophilization again. This material was then tested for its capacities to be degraded via enzyme as well as its conductance at operating concentrations in solution. The composite dissolved after the application of an enzyme at calculated concentrations. Electrochemical Impedance Spectroscopy, however, revealed the composite to be as resistive as laminin, the attachment factor believed to be responsible for the lack of action potentials. No testing was performed on the composite's capabilities to facilitate organoid adhesion, nor on the viability of cells adhered to it. More work remains to be done investigating why the lack of conductance was observed, as well as the testing the aforementioned adhesion and viability parameters.