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3-D in vitro model systems for studying tissue impedance

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Mammalian cell culture typically is performed on planar substrates. However, cells cultured in two-dimensions behave differently from cells in their native three-dimensional (3-D) environments. Functionalized alginate scaffolds were used to make culture systems for 3-D reconstructions of neural tissue. Astroglia, endothelial cells, and neurons were used. Tissue impedance spectroscopy and histochemistry were used to describe organization of 3-D tissue constructs. Impedance spectroscopy provides a real time method for assessing organization in living cultures. Immunochemistry and 3-D imaging, and image analysis permit mapping of cells within scaffolds. Impedance spectroscopy and image analysis data will be correlated to determine how cell density, cell type, and changes in cell morphology contribute to tissue impedance spectra. These data can be used to predict changes in cell and tissue organization following tissue damage and to model the cellular interactions that occur at the blood brain barrier.