Title: Anodic Aluminum Oxide (AAO) Membranes for Directed Neurite Outgrowth

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Abstract:
The ability to generate and control neuronal growth in vitro from stem cell precursors is an area of interest to researchers. Neuron development occurs in various stages from immature precursor cells to fully integrated and functional mature neurons. Activity dependent stages of neuronal growth are heavily regulated by secreted molecules. Neighboring cells can absorb these molecules making them difficult to study. The inert properties of AAO allows for the growth of neuronal cells, and the nano-pores allow the secretome to be concentrated away from neighboring cells. AAO membranes used in this study were grown with various pore sizes ranging from 34-95nm in order to characterize the cellular response of neurons. A two-step anodization procedure in oxalic acid was used to vary the pore size and morphology of the membranes which were then characterized via SEM. An immortalized and multipotent cell line, C17.2 neural stem cells (NSCs) were used to seed onto the AAO membranes. Cellular growth was characterized via Alamar Blue, immunocytochemistry (ICC) and SEM which indicate a highly tunable correlation between AAO pore morphology and resulting cell phenotype populations. By selecting AAO membranes with specific nano-pore size ranges, control of neuronal network density and neurite outgrowth length was achieved.

Keywords: AAO, NEURONS