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Potential role for programmed cell death in the formation of an in vitro neural stem cell niche

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Stem cell therapies have the potential to treat neurodegenerative diseases, such as Batten Disease. Batten disease, a rare inherited disease in children, causes severe neurodegeneratoin, which results in blindness, seizures, and eventual death. In Batten disease, the transplantation of stem cells into a patient may replace lost cells or to prevent cell loss due to the disease. In one form of Batten Disease, transplantation of stem cells into the retinas of mutant model mice have shown signs of neuroprotection; including enhanced survival of photoreceptors (Meyer et al. 2006). One possible method to increase the efficiency of this treatment is the transplantation of a functional unit capable of producing its own neural precursors “on demand”. Such a structure, known as a neural stem cell (NSC) niche, can be found in two small areas in the brain of mammals, and is the center for adult neurogenesis throughout the lives of these mammals. In our lab, we have developed a way to produce a NSC niche *in vitro* from neuralized mouse embryonic stem cells. To test how this structure is formed and maintained, I am investigating cell death within this *in vitro* NSC niche-like structure. I performed two different tests for apoptosis, or programmed cell death, Trypan Blue exclusion and TUNEL. Trypan Blue shows membrane permeability; if cells turn blue it is indicative of a late stage in the apoptotic process. In the TUNEL assay, nicked ends of DNA are labeled, an indication of early stage apoptosis. I also tested the affects of induced cell death on the advancement of *in vitro* niche formation. We hope that this information will lead to a better understanding of how the i*n vitro* niche forms.