**Neuroregeneration: Potentiation of Nerve Growth Factor Receptor in Peripheral Nerves**

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**Introduction**

When a traumatic injury to the peripheral nervous system (PNS) occurs, the human body elicits a series of responses to try to heal the damage. One of these responses is the re-expression of nerve growth factor receptors (NGFRs), which help to stimulate the regeneration of the nerve. In a normal, healthy PNS, NGFRs are rarely found. Following damage to the nerve, NGFRs can be found in high levels around the damaged area.

In our study, we are simulating traumatic injury to the sciatic nerve of rats in order to study the effects of regeneration after a local application of nerve growth factor (NGF). We hypothesize that the addition of NGF will increase the rate at which the nerves will be able to regenerate by interaction with the increased levels of NGFRs that occur after damage.

**Methods**

We are using two treatment models in rats that simulate traumatic injury: a crush model and a focal demyelination model. In the crush model, we are examining the degeneration effects of crushing the extracellular matrix (ECM) of the nerve and its subsequent regeneration. In the focal demyelination model, we are examining the degeneration effects of local demyelination through the application of lysolecithin and subsequent regeneration of the nerve. We will test six experimental groups: Sham, Crush, Lysolecithin, Crush + Lysolecithin, Lysolecithin + NGF, and Crush + Lysolecithin + NGF. In two of our experimental groups, we will perform intraneural injections of NGF into the sciatic nerve one week after the local crush or focal demyelination injury. We will examine the nerves both qualitatively using SEM and immunohistochemistry, and quantitatively using electrophysiology.

**Results**

We have been able to see the effects of the crush model in our preliminary experiments through electrophysiology recordings. These nerve conduction tests have shown us that crushed nerves have sustained damage for a few weeks following the crush. We also are monitoring the gait of the rats to help us understand their rate of healing.

**Discussion and Conclusion**

There is a measurable decrease in nerve conduction after crush that persists for several weeks, and the lasting effects of the crush model on our rats can be observed. In conjunction with the monitoring of the gait, the electrophysiology suggests that after three weeks our rats have only recovered about a third of their limb function. Our next step is to perform immunohistochemistry to help us determine the extent of nerve recovery. We will be looking for residual damage to the nerve ECM and intact nerve bundles that demonstrate regeneration. The rats receiving no NGF will help us to establish the rate of normal degeneration and regeneration. We can then compare those rates to the rats that receive an injection of NGF to see if there is an increase in the rate of regeneration of the nerve due to NGF.