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RESEARCH GOALS: The goal of our research program is to improve the outcome of nerve repair by enhancing the specificity with which regenerating axons reinnervate their targets.

RESEARCH SUMMARY AND SIGNIFICANCE: Using retrograde labeling techniques in the rat femoral nerve model we have defined a process termed preferential motor reinnervation, the tendency for motoneurons to reinnervate muscle rather than skin when regenerating in mixed nerve. In exploring the mechanism of this phenomenon, we have recently demonstrated that cutaneous and muscle nerve differ significantly in their ability to make growth-supporting proteins, and that these differences correlate with their ability to support modality-specific regeneration. Similarly, we have found that electrical stimulation for one hour at the time of nerve repair enhances regeneration specificity.

CURRENT PROJECTS:
1) Correlation of upper extremity function with regeneration specificity in the rat upper extremity
2) Phenotypic changes in denervated Schwann cells and their effects on regeneration
3) Development of a two-chamber in vitro model of nerve repair
4) The effects of pathway-derived neurotrophins on peripheral axon regeneration

RECENT PUBLICATIONS:

1. **Brushart, T.M.**, Jari, R., Verge, V., Rohde, C., and Gordon, T. Electrical Stimulation Restores the Specificity of Sensory Axon Regeneration. Exp. Neurol. 194:221-229, 2005.
2. Witzel, C., Rohde, C., and **Brushart, T.M.** Pathway Sampling by Regenerating Peripheral Axons. J. Comparative Neurol. 485:183-190, 2005.
3. Redett, R., Jari, R., Crawford, T., Chen, Y-G., Rohde, C., and **Brushart, T.M.** Peripheral Pathways Regulate Motoneuron Collateral Dynamics. J. Neurosci. 25(41):9406-9412, 2005.
4. Hoke, A., Redett, R., Hameed, H., Jari, R., Zhou, C., Li, Z.B., Griffin, J.W., and **Brushart, T.M.** Schwann Cells Express Motor and Sensory Phenotypes that Regulate Axon Regeneration. J. Neurosci. 26:9646-9655, 2006
5. Aspalter, M., Vyas, A., Feiner, J., Griffin, J., **Brushart, T.M.**, Redett, R. Modification of Schwann Cell Gene Expression by Electroporation *in vivo*. J. Neuroscience Methods 176:96-103, 2009.