# Proteomic Analysis of Nerve Regeneration

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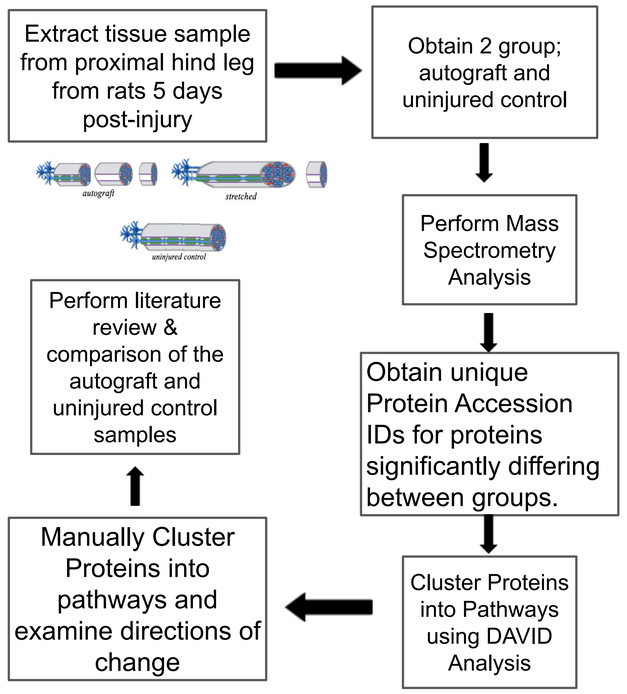
## BACKGROUND & OBJECTIVE

Our project aims to identify key molecular pathways that change following peripheral nerve injury and early phases of regeneration.

## INTRODUCTION

- With traumatic nerve injuries, the nerve is severed/damaged, leaving proximal and distal nerve ends.
- To repair severed nerves, in an autograft procedure, a portion of nervous tissue from another part of the body is inserted into the site of injury.
- There are many cellular pathways that change following nerve injury, however these are not very well understood.
- We have used a proteomic analysis to evaluate these pathways.

## METHODS




## RESULTS & CONCLUSIONS

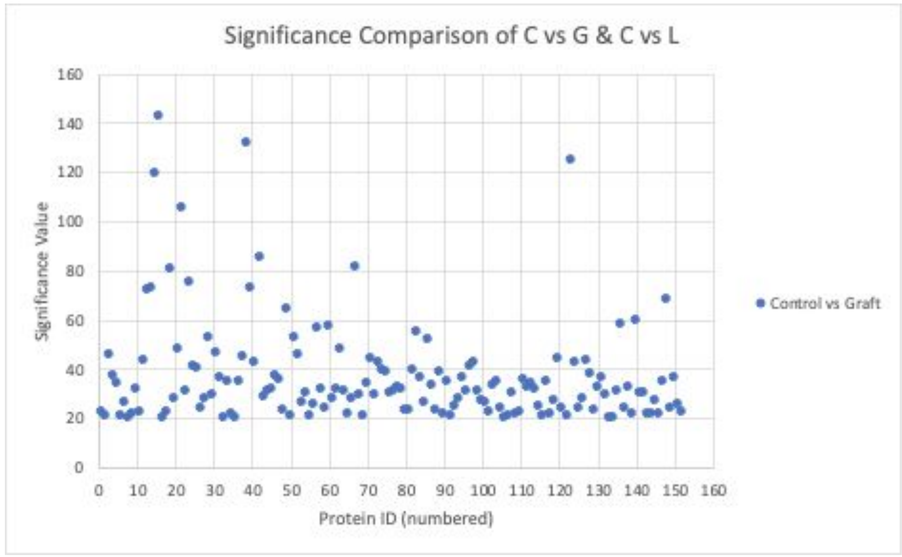



Figure 1: Graphical representation of significant differences in protein levels between control and graft groups. It can be seen that the majority of such differences are increased protein levels after injury. The threshold significance for change was 20.

| Cluster | Control versus Injured |
|---|---|
| Cytoskeleton/Motility | 22 |
| Peripheral Nervous System/ Myelin/ Proliferation Regulator | 12 |
| ECM/ Focal Adhesion | 32 |
| Bioenergetics | 184 |
| Enzymatic Activity/ Serpin | 52 |
| Post-Translational Modifications | 47 |
| Calcium | 31 |
| mRNA Processing/ Transcription | 33 |
| Ribosome/ Translation | 70 |
| Protein Folding, Processing and Sorting (Intracellular Transport) | 137 |
| Coagulation | 26 |
| Complement Cascade/ Immune | 24 |
| Acute Phase Immunity | 12 |
| Protein Degradation/ Clearance (Ubiquitin-Proteasome) | 50 |
| Apoptosis | 0 |

Table 1: Automatically and manually clustering the proteins in our control and injured samples resulted in significantly different protein levels between the groups in multiple clusters. The results indicate a high number of bioenergetics, protein folding and degradation pathways changing post injury.

## FUTURE DIRECTIONS

- Moving forward, we plan to develop a Python algorithm that would categorize proteins based on their functions automatically, in order to preserve all of the time it took to manually determine and sort each protein's function.
- Compare these outcomes with those from other regenerative strategies for future publication.
- View later time points of regeneration.

## ACKNOWLEDGEMENTS & REFERENCES

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[1] Chhugani, Neha, "Proteomic Analysis of the Regenerating Proximal Nerve After Injury and Repair: Autograft versus Nerve Lengthening." UCSD Master's of Science Thesis. University of California, San Diego. December 2020.
[2] Schmidt, Christine E., and Jennie Baier Leach. "Neural Tissue Engineering: Strategies for Repair and Regeneration." Annual Review of Biomedical Engineering, vol. 5, no. 1, 2003, pp. 293–347., doi:10.1146/annurev.bioeng.5.011303.120731.