

Limited changes in lumbar motoneuron gene expression 3 weeks after thoracic spinal cord transection

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Using retrograde labeling and laser capture microdissection, we have undertaken expression profiling of 3 spinal motor populations in adult mouse 3 weeks after either mid-thoracic spinal cord transection or sham operations. The cell populations compared were lumbar motoneurons in the medial (MMC) and lateral motor columns (LMC), and sympathetic preganglionic neurons in the thoracic intermediolateral nucleus (IML). Previously, we reported findings that focused both on validations of the microarray data and comparing differences between the 3 motor populations in sham controls (Cui et al 2003). Here we focus on the changes after spinal injury. We analyzed the Affymetrix U74AV2 Murine genome microarray. Student's t-tests ($p < 0.05$) were performed on the averages of the technical replicates for each population between sham ($n=5$) and transects ($n=6$). Very few genes underwent changes (MMC=6.8%, IML=3.0%, LMC=1.8%,) and this number was further reduced after Bonferroni correction ($p < 0.05/3$) (MMC=2.6%; IML=0.9%, LMC=0.5%). Also, fold changes in expression were small with only 22 genes overall having >1.5 fold changes. Importantly, there were no apparent changes in the expression of ion channels that control excitability. Thus, motoneurons do not appear to contribute greatly to the increased motor responsiveness observed after spinal injury. Nonetheless, there were two important observations. First, spinal injury preferentially induced an increase in gene expression with 5.4, 3.9 and 3.3 fold more up-regulated than down-regulated genes in IML, LMC and MMC respectively. One possible interpretation is that transcriptional activity has increased after spinalization. Second, compared to the LMC which innervates hindlimb muscles, the axial musculature-innervating MMC underwent five-fold more changes in gene expression. This suggests that injury-induced plasticity in axial motoneurons may further hinder locomotor recovery strategies.

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