Immune regulation of neuronal injury and repair by observing T cell activation

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Background and Hypothesis:
It is unknown how the immune system maintains the majority of facial motoneuron (FMN) survival after axotomy. IL-10 cytokine is necessary for FMN survival and $CD4^+$ T cells are activated and play a critical role in survival, but do not produce IL-10. It was proposed that the source of IL-10 resides in the CNS; however, it is possible that antigen presenting cells (APC) produce IL-10 which activate $CD4^+$ T cells to a neuroprotective phenotype. The regulation of IL-10 receptors (IL-10R) in immunodeficient compared to wild-type (WT) mice in the facial nucleus was studied in this experiment, as well as the possibility of the PNS producing IL-10.

Experimental Design or Project Methods:
To study APC's role in motoneuron survival, we transferred WT whole splenocytes into global IL-10 knock out (KO) mice prior to axotomy. To study IL-10R gene expression, immunodeficient RAG-2 KO mice received WT or IL-$10R^{-/-}$ $CD4^+$ T cells prior to axotomy.

Results:
qPCR revealed that WT mice upregulate IL-10R after axotomy, whereas RAG-2 KO mice had decreased expression comparatively. RAG-2 mice who received WT $CD4^+$ T cells transfer restored IL-10R comparable to WT values.IL-10R was rescued in RAG-2 mice after the adoptive transfer of WT $CD4^+$T cells. When IL-$10R^{-/-}$ $CD4^+$ cells were transferred into RAG-2 mice, IL-10R values were restored; however, these T cells were unable to rescue FMN survival.

Conclusion and Potential Impact:
If WT whole splenocytes transferred into global IL-10 KO mice rescue FMN survival, it implies that APC play a role in producing IL-10. If they cannot mediate rescue, then peripheral IL-10 is unlikely sufficient for FMN survival. $CD4^+$ T cells regulate central IL-10R response and must respond to IL-10 to mediate FMN survival. The transfer of whole splenocytes provides APCs capable of producing IL-10 and $CD4^+$ T cells capable of responding to IL-10.