Internship Proposal

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Project Title:
Evaluating the regenerative potential of genes differentially expressed after spinal cord injury in Acomys vs. Mus.

Level:

Master Student

Project Summary:

Lesions to the brain and spinal cord remain a major unmet medical condition. The main obstacles to treat these conditions is the formation of a scar at the injury site and the intrinsic inability of adult neurons to regenerate. Our group has recently discovered that the spiny mouse (Acomys) is a unique exception and is able to regenerate and recover function after full spinal cord transection. To understand the mechanism underlying regeneration in Acomys, we have performed RNAseq of the spinal cord injury (SCI) site of Acomys and the closely related non-regenerative regular mouse (Mus).

Work to be developed by the student:

In this project we will undertake the in vitro validation of the players differentially expressed in Acomys SCI site. The effect on axon regrowth of the modulation of the most promising genes (based on expression levels and patterns) differentially expressed following SCI in Acomys vs. Mus will be assessed. For that, initially, Mus neurons (sensory dorsal root ganglia-DRG and cortical neurons), will be grown on top of cells modified in an Acomys-like manner, to access its effect on neurite outgrowth. After screening of the most promising candidate genes, their effect on axon regeneration of Mus cortical and DRG neurons will be assessed using microfluidic systems for axotomy.

The knowledge gained with this analysis will enable us to proceed to in vivo proof-of-concept experiments where we will modify the Mus spinal cord environment in an Acomys-like manner, to enable this species to become regeneration-competent.

References:

Nogueira-Rodrigues, J., Leite, S. C., Pinto-Costa, R., Sousa, S. C., Luz, L. L., Sintra, M. A., Oliveira, R., Monteiro, A. C., Pinheiro, G. G., Vitorino, M., Silva, J. A., Simão, S.,

Fernandes, V. E., Provazník, J., Benes, V., Cruz, C. D., Safronov, B. V., Magalhães, A., Reis, C. A., Vieira, J., Vieira, C. P., Tiscórnia, G., Araújo, I. M. and Sousa, M. M. (2022) 'Rewired glycosylation activity promotes scarless regeneration and functional recovery in spiny mice after complete spinal cord transection', Dev Cell, 57(4), pp. 440-450.e7.

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