Unit Assessment – Module 13 Regeneration and Cell Reprogramming

Methods in Neurobiology

Overview

You are asked to work independently and write a short research proposal based on the paper highlighted below. This is a 50-point assignment and considered a unit assessment.

Instructions

Based on methods and models learned until now, propose a short research proposal describing how you would apply the strategy of reprogramming astrocytes into neuron precursors to treat and replace dying neurons as a result of brain injury as reported in the following abstract.

Your work does not have to be limited to *in vivo* reprogramming but in vitro approaches may be suitable. In addition, brain injury does not have to be necessarily limited to traumatic brain injury. Aging or neurodegeneration or other type of brain diseases) causing neuronal death would be suitable too.

The proposal must be separated in at least 4 paragraphs:

- Introduction: introduce the topic, describe why it is important to investigate this issue, what is known so far and what is missing. Include references if necessary. 1 paragraph;
- Aim: state the aim of your strategy in 1 sentence.
- Strategy: describe your approach in detail. This will include: your plan, a description of experiment(s) and model(s) used. You can use bullet points;
- Validation: describe the experiment(s) and the techniques you would use to validate your approach and your expected results. You can use bullet points.
- Include citations.

Abstract

Adult differentiated cells can be reprogrammed into pluripotent stem cells or lineage-restricted proliferating precursors in culture; however, this has not been demonstrated in vivo. Here, we show that the single transcription factor SOX2 is sufficient to reprogram resident astrocytes into proliferative neuroblasts in the adult mouse brain. These induced adult neuroblasts (iANBs) persist for months and can be generated even in aged brains. When supplied with BDNF and noggin or when the mice are treated with a histone deacetylase inhibitor, iANBs develop into electrophysiologically mature neurons, which functionally integrate into the local neural network. Our results demonstrate that adult astrocytes exhibit remarkable plasticity in vivo, a feature that might have important implications in regeneration of the central nervous system using endogenous patient-specific glial cells.

From Niu, W., Zang, T., Zou, Y. et al. In vivo reprogramming of astrocytes to neuroblasts in the adult brain. Nat Cell Biol ***15,*** *1164–1175 (2013). https://doi.org/10.1038/ncb2843*