PCL Channels Promote the Differentiation of Neural Progenitor Cells into Neurons

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INTRODUCTION

- Spinal cord injury (SCI) is a devastating neurological condition which leaves individuals severely disabled.
- Neural progenitor cells (NPCs) may provide a means to replace damaged nerve cells in the spinal cord following injury.
- Biodegradable biopolymer channels carrying therapeutic factors may aid in the recruitment of adult NPCs.

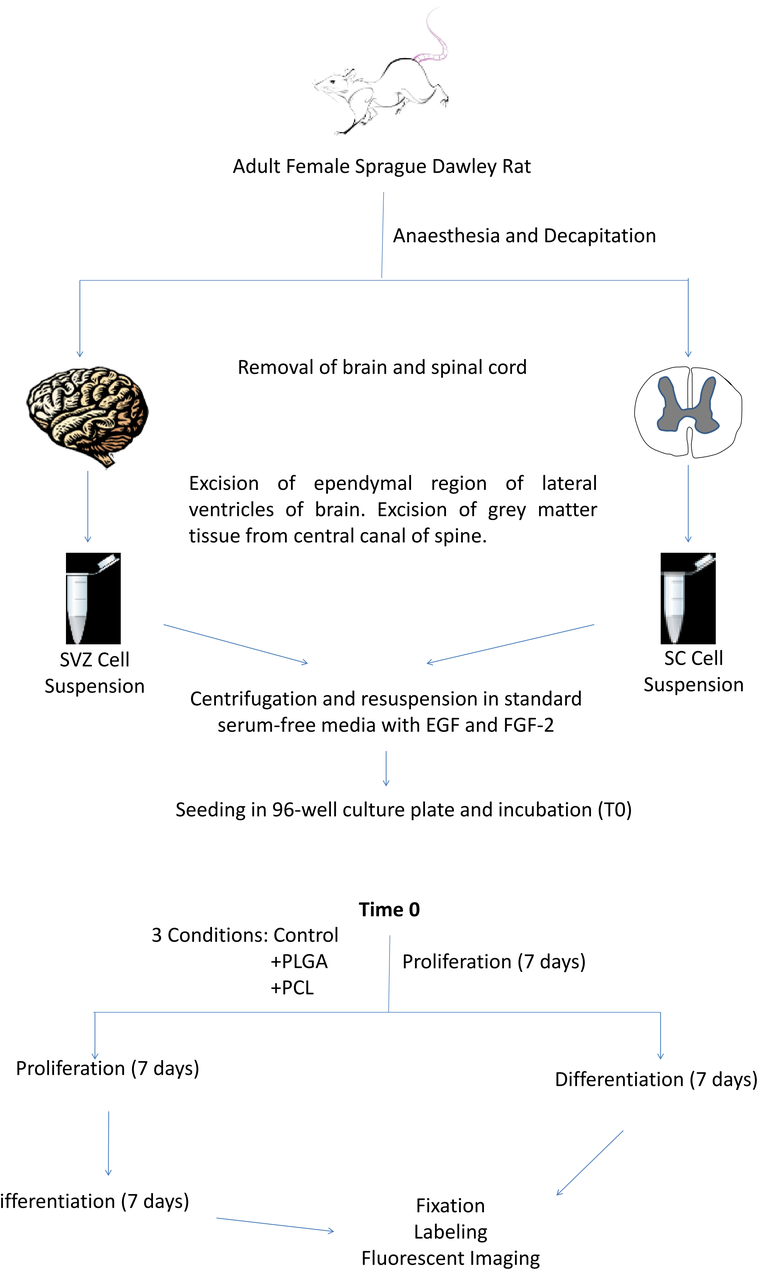
OBJECTIVE

The purpose of this investigation was to determine the effects of poly(lactic-co-glycolic acid) (PLGA) and poly(ε-caprolactone) (PCL) biomaterials on *in vitro* neural progenitor cell differentiation and survival.

HYPOTHESIS

The degradation of PLGA and PCL channels will not influence the *in vitro* NPC differentiation and survival when compared with standard *in vitro* conditions.

METHODS



RESULTS

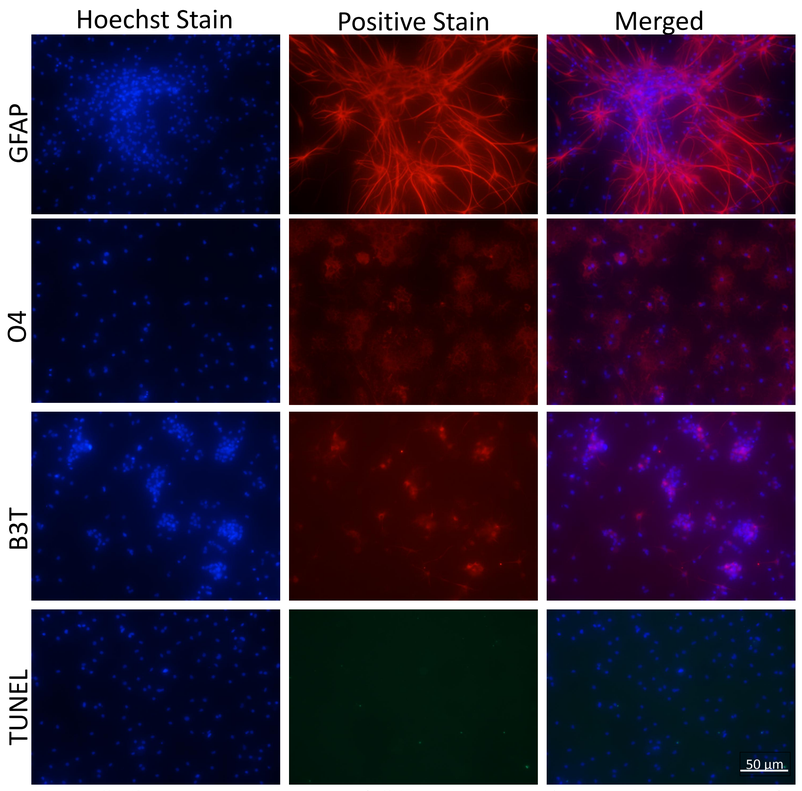


Figure 2. Representative images of SVZ-derived neural progenitors stained for astrocytes (GFAP), oligodendrocytes (O4), neurons (B3T), and for viability (TUNEL). Note that the SVZ NPCs differentiated into all three neural cell lineages and that there was little apoptosis at 14 days *in vitro.*

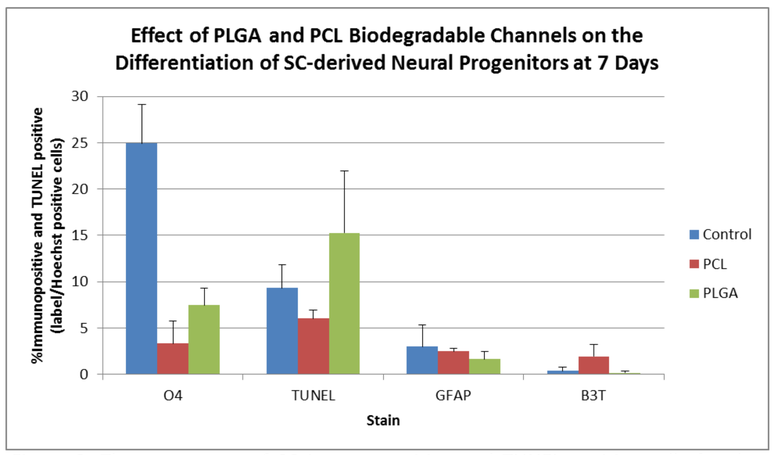


Figure 3. The percentage of SC immunopositive and TUNEL positive cells for the control, PCL, and PLGA conditions at 7 days. There was an increase in B3T (neurons) for PCL when compared to the control, and a decrease in cell viability for PLGA.

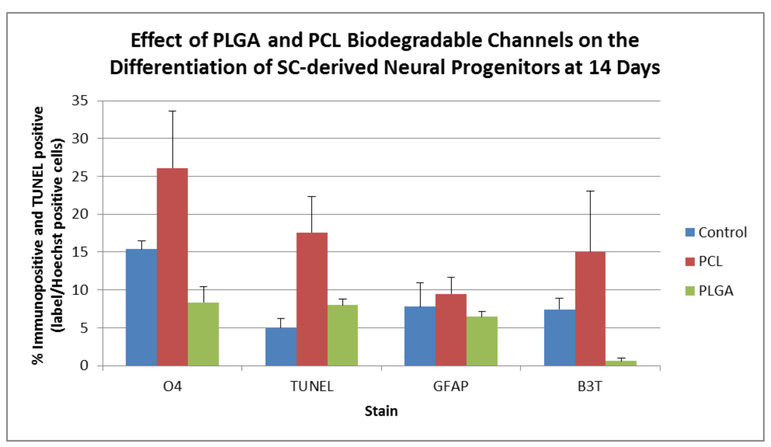


Figure 4. The percentage of SC immunopositive and TUNEL positive cells for the control, PCL, and PLGA conditions at 14 days. There was an increase in B3T (neurons) for PCL when compared to the control, and a decrease in cell viability for PLGA.

When comparing SC results at 7 and 14 days, the percentage of β3-tubulin immunopositive cells under the PCL condition increased for both experiments, while the cells under the PLGA condition showed the same trends for the four stains at 7 and 14 days.

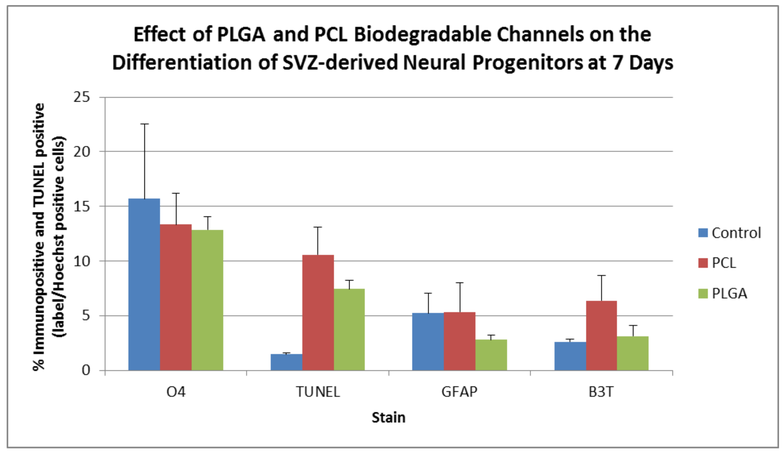


Figure 5. The percentage of SVZ immunopositive and TUNEL positive cells for the control, PCL, and PLGA conditions at 7 days. There was an increase in B3T (neurons) for both PCL and PLGA when compared to the control.

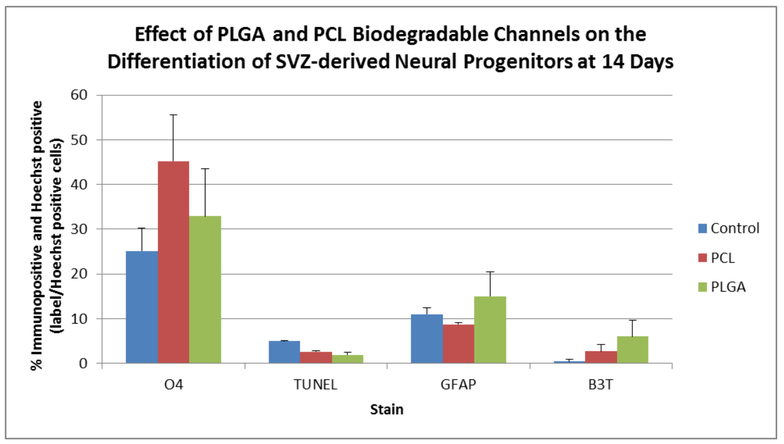


Figure 6. The percentage of SVZ immunopositive and TUNEL positive cells for the control, PCL, and PLGA conditions at 14 days. There was an increase in B3T (neurons) for both PCL and PLGA when compared to the control.

When comparing SVZ results at 7 and 14 days, the percentage of β3-tubulin immunopositive cells increased for both the PCL and PLGA conditions in both experiments when compared to the control.

CONCLUSIONS

Experimental data suggests that the presence of PCL channels supports the *in vitro* differentiation of SC-derived NPCs into neurons, while the presence of PLGA decreases the viability and suppresses the *in vitro* differentiation of SC-derived NPCs. The data also suggests that the presence of PCL and PLGA channels supports the *in vitro* differentiation of SVZ-derived NPCs into neurons.

FUTURE DIRECTIONS

- To further assess the effects of the degradation of PCL , PLGA, and other biomaterials on NPC differentiation and survival .
- To develop a biomaterial which, upon its degradation, would have minimal disruptive effects on an *in vivo* environment.

ACKNOWLEDGEMENTS

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