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## **Proteoglycans and human mesenchymal and neural stem cells: Can we control lineage fate?**

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Human neural stem cells (hNSCs) and mesenchymal stem cells (hMSCs) are now routinely used in cell culture models, however, the processes and the mechanisms that regulate these cells are still largely unknown. Despite hMSC neural lineage potential, the current lack of understanding of lineage regulation limits their use in the development of human neurogenesis models as well as our understanding of how numerous neurological and brain disorders occur. The identification of the biomarkers required for maintaining neural stem cells in their undifferentiated state as well as those needed to direct lineage differentiation is central to understanding neurogenesis. How these processes are regulated will help to further unravel the structural complexity of the human brain, and the role of associated biological and other factors in neurogenesis. These also have important ramifications for the successful integration of newly formed neurons into existing/remaining neural circuits. The heparan sulfate (HS) and chondroitin sulfate (CS) proteoglycans (PGs) are widely distributed in the body and the nervous system, primarily in the extracellular matrix. Multiple studies have identified a role for these proteins during normal development of the nervous system as well as in the maintenance of stem cell pools in the adult. What has yet to be elucidated is how these PGs contribute to the control of neural lineage regulation, proliferation and differentiation? As NSCs can generate neurons, astrocytes and oligodendrocytes, these cells provide a promising model for understanding the process of neurogenesis. In addition, MSCs have neural lineage potential and may contribute to the localized microenvironment to mediate stemness as well as lineage specification. The identification of the factors regulating these cellular processes will complement broader research disciplines that could be applied to all fields of research and may provide new strategies for their efficient implementation in therapeutic applications.

### **Biography**

Larisa M Haupt is a Cell and Molecular Biologist with over 15 years' experience in Australia and internationally examining the role of the extracellular matrix in tissue remodeling and repair. She and her Neurogenesis and Stem Cell research team aim to understand the role of the cell microenvironment in human neurogenesis using human mesenchymal stem cells and human neural stem cells. Our ability to direct cells toward specific neural lineages will greatly enhance the use of these cells for multiple applications which in the long-term may influence how we manage the ageing process and neurodegenerative disorders including brain injury, Parkinson's disease and dementia? The production of lineage-specific neural cultures would enable the more effective use and delivery of these cells of relevance to multiple research areas and impact on their successful use in a wide variety of applications and services of advanced health delivery.

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