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TISSUE-SPECIFIC STEM CELLS

Efficient Serum-Free Derivation of Oligodendrocyte Precursors from Neural Stem Cell-Enriched Cultures

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Abstract

Oligodendrocytes derived in the laboratory from stem cells have been proposed as a treatment for acute and chronic injury to the central nervous system. Platelet-derived growth factor-receptor alpha (PDGFR α) signaling is known to regulate oligodendrocyte precursor cell numbers both during development and adulthood. Here, we analyze the effects of PDGFR α signaling on central nervous system (CNS) stem cell-enriched cultures. We find that AC133 selection for CNS progenitors acutely isolated from the fetal cortex enriches for PDGF-AA responsive cells. PDGF-AA treatment of FGF2-expanded CNS stem cell-enriched cultures increases nestin+ cell number, viability, proliferation, and glycolytic rate. We show that a brief exposure to PDGF-AA rapidly and efficiently permits the derivation of O4+ oligodendrocyte-lineage cells from CNS stem cell-enriched cultures. The derivation of oligodendrocyte-lineage cells demonstrated here may support the effective use of stem cells in understanding fate choice mechanisms and the development of new therapies targeting this cell type.

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Key Words. oligodendrocytes, multipotent stem cells, platelet-derived growth factor, glycolysis, extracellular signal-regulated MAP kinases, phosphatidylinositol 3-kinase

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