

PSCs– Perivascular Stem Cells as a purified mesenchymal stem cell population for enhanced bone tissue engineering

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While autologous bone graft is the golden standard for bone repair, adipose-derived Mesenchymal Stem Cells have been demonstrated to be an ideal source of stem cells for bone tissue engineering. However the Stromal Vascular Fraction (SVF) of adipose tissue is a heterogeneous cell population that can result in unreliable bone growth. Our laboratories have identified Perivascular Stem Cells (PSCs) as a candidate homogenous cell source. PSCs are readily isolatable from adipose tissue via FACS and have been previously shown to be indistinguishable in phenotype to MSCs. PSCs consist of two distinct populations: 1) pericytes (CD146+, CD34-, CD45-), surrounding capillaries and microvessels, and 2) adventitial cells (CD146-, CD34+, CD45-), within the tunica adventitia of large veins and arteries. In the present study, we used an intramuscular ectopic bone model and a calvarial defect model in SCID mice, to evaluate PSC-mediated bone formation and repair *in vivo*. Bone growth was evaluated using micro-computed tomography, histology and immunohistochemistry. Patient-matched PSCs formed significantly more bone in comparison with traditionally derived SVF by all parameters. We also examined the additive or synergistic effects of hPSCs when combined with the novel craniosynostosis-associated osteoinductive protein, NELL-1. Our results demonstrated an additive effect of PSC+NELL-1 on bone formation. NELL-1 is hence a candidate growth factor able to induce PSC osteogenesis. Together, our results suggest that PSCs are a new cell source for future endeavors in skeletal regenerative medicine and with NELL-1, form a potential stem cell-based therapeutic with potentially increased safety, purity, identity, potency, and efficacy.

Biography

Dr. Aaron W. James has completed his MD from the University of California, San Francisco and conducted pre-doctoral research at Stanford University. He is currently a postdoctoral researcher in the laboratory of Dr. Chia Soo within the Department of Orthopaedic Surgery, David Geffen School of Medicine at UCLA. The focus of his research has been in the field of translational and regenerative medicine, particularly in bone repair and regeneration. Dr. James has published over 70 papers in reputed journals and has presented his research at many national and international conferences.

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