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Stem Cell Therapy for Pulmonary Fibrosis**Laura Chen**

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Idiopathic pulmonary fibrosis (IPF) is a progressive interstitial lung disease characterized by excessive extracellular matrix deposition, declining lung function, and poor long-term survival. Although anti-fibrotic medications can slow disease progression, they cannot reverse established fibrosis or restore damaged lung tissue. Regenerative medicine has emerged as a promising avenue for addressing these limitations through stem cell-based interventions. This presentation examines the therapeutic potential of mesenchymal stem cells (MSCs) and induced pluripotent stem cell (iPSC)-derived alveolar epithelial cells in promoting lung regeneration. MSCs exert potent immunomodulatory and anti-inflammatory effects by secreting cytokines, growth factors, and extracellular vesicles that suppress fibroblast activation, reduce oxidative stress, and stimulate endogenous tissue repair. Meanwhile, iPSC-derived alveolar cells offer the possibility of replacing damaged lung epithelium and restoring gas exchange function.

Recent preclinical studies have demonstrated that stem cell therapies reduce collagen deposition, attenuate inflammatory signalling, improve alveolar architecture, and enhance

pulmonary function. Early-phase clinical trials have reported favourable safety profiles and encouraging improvements in respiratory capacity, although larger randomized studies are required to establish long-term efficacy. Challenges remain in optimizing cell sourcing, manufacturing under Good Manufacturing Practice (GMP) standards, delivery methods, and patient selection. Advances in biomaterial scaffolds, extracellular vesicle therapeutics, and gene-edited stem cells may further enhance treatment outcomes. Stem cell-based regenerative therapies have the potential to transform the management of pulmonary fibrosis by targeting the underlying mechanisms of tissue damage rather than merely slowing disease progression..

Biography

Laura Chen is a pulmonologist and regenerative medicine researcher at the National University of Singapore. Her work focuses on stem cell therapies for chronic lung diseases, tissue engineering, and translational respiratory medicine. She has led several international collaborations in pulmonary regenerative research and has authored over 100 peer-reviewed scientific publications.