

Past, Present, and Future of Cell Replacement Therapy of Parkinson's Disease

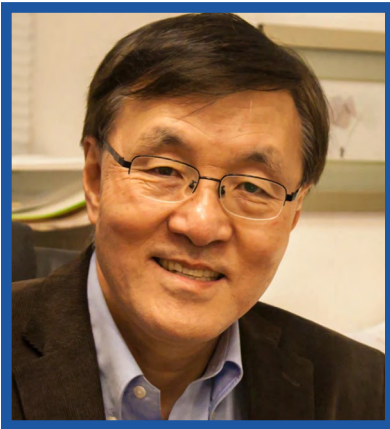
February 4

Tuesday, 12:30 pm

Billings Building

Rosedale Room

SPEAKER:



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Host: Sunghee Cho, Ph.D.

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Abstract

Given that the primary motor dysfunction in Parkinson's disease (PD) results from the selective degeneration of midbrain dopamine neurons, cell replacement therapy represents a promising therapeutic approach. This potential has been demonstrated in multiple studies using human fetal mesencephalic

cell transplantation. To address the limitations associated with fetal cell sources, we are developing and optimizing human iPSC-based transplantation for autologous, personalized cell therapy. Recently, we achieved a significant milestone by treating the first PD patient using the patient's own iPSCs-derived dopamine neurons. However, this clinical study has also highlighted new challenges that require attention. Notably, we observed that the surgical procedure, termed "needle trauma," induces acute and severe innate immune responses that disproportionately affect grafted dopamine neurons.

In this presentation, I will discuss our current progress in cell replacement therapy and our ongoing Phase I/II clinical trial for PD patients, and complementary neuroprotective drug strategies aimed at maximizing therapeutic outcomes for patients.

Publications

1. Schweitzer JS, Song B, Herrington TM, Park T-Y, Lee N, Ko S, Jeon J, Cha Y, Kim K, Li Q, Henchcliffe C, Kaplitt M, Neff C, Rapalino O, Seo H, Lee I-H, Kim J, Kim T, Petsko GA, Ritz J, Cohen BM, Kong SW, Leblanc P, Carter BS, and Kim KS (2020) Personalized iPSC-derived Dopamine Progenitor Cells for Parkinson's Disease. *N Eng J Med*. 382(20):1926-1932. PMID: 32402162. (featured by Parmar M. and Bjorklund A., *Cell Stem Cell* (2020) 27:8-10; featured by Hannah Stower in Research Highlight, *Nat. Medicine* (2020) 26:822; selected as one of 25 major discoveries in stem cell research by ISSCR in 2022 (Lendahl, 100 plus years of stem cell research-20 years of ISSCR, *Stem Cell Reports*, 2022, 17:1248).
2. Park T-Y, Jeon J, Lee N, Kim J, Song B, Kim J-H, Lee S-K, Liu D, Cha Y, Kim M, Leblanc P, Herrington TM, Carter BS, Schweitzer JS, Kim KS (2023) Co-transplantation of autologous TREG in Parkinson's disease cell therapy. *Nature* 619(7970):606-615. PMID: 37438521. (featured in News & Views, Tang Q, *Nature* 619 (7970):470-472).
3. Jeon J, Cha Y, Hong YJ, Lee I-H, Jang H, Ko S, Naumenko S, Kim M, Ryu HL, Shrestha Z, Lee N, Park T-Y, Park H, Kim SH, Yoon K-Y, Song B, Schweitzer J, Herrington TM, Kong SW, Carter B, Leblanc P, Kim KS (2025) Pre-clinical safety and efficacy of human induced pluripotent stem cell-derived products for autologous cell therapy in Parkinson's Disease. *Cell Stem Cell* In press.

