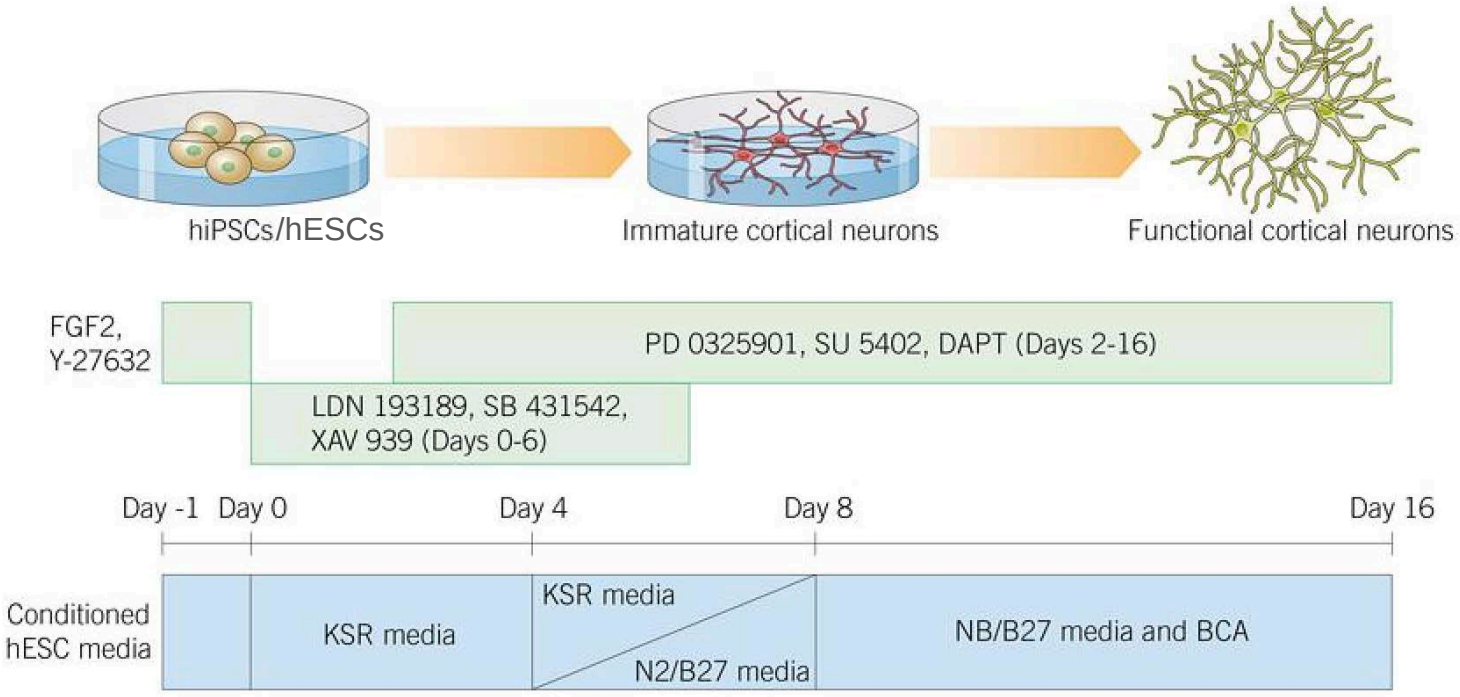
Johns Hopkins Engineering

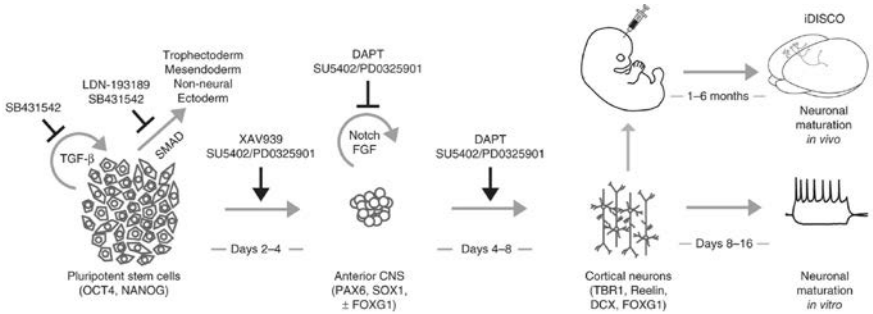
Methods in Neurobiology

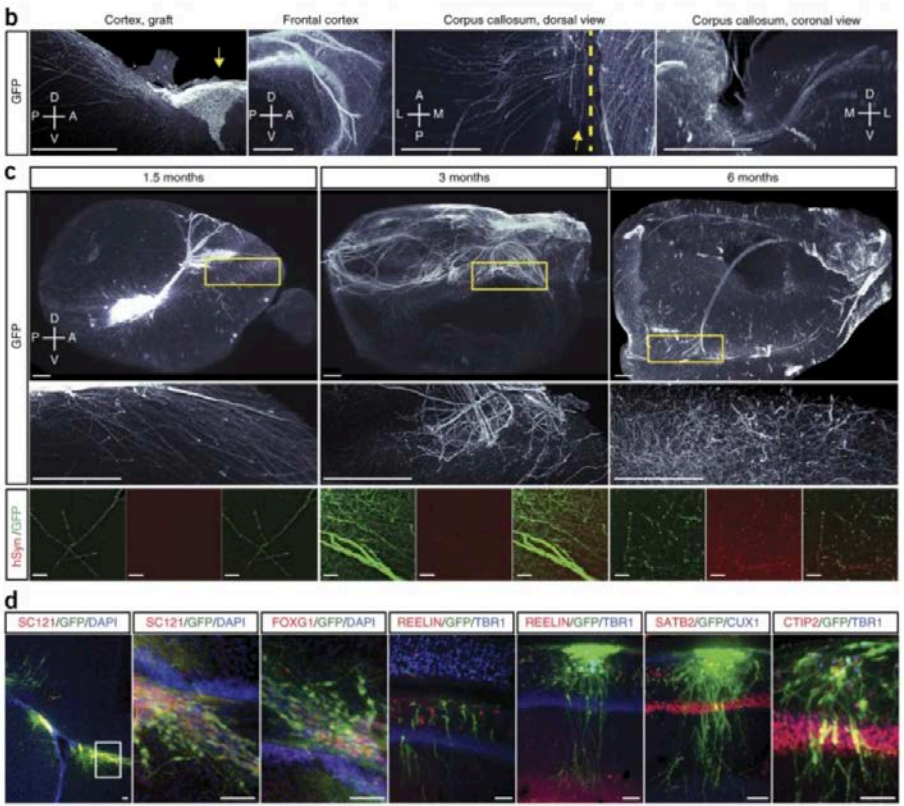
Experimental Approach to Cell Engineering and Reprogramming

Differentiation protocols for hPSCs into neural precursors



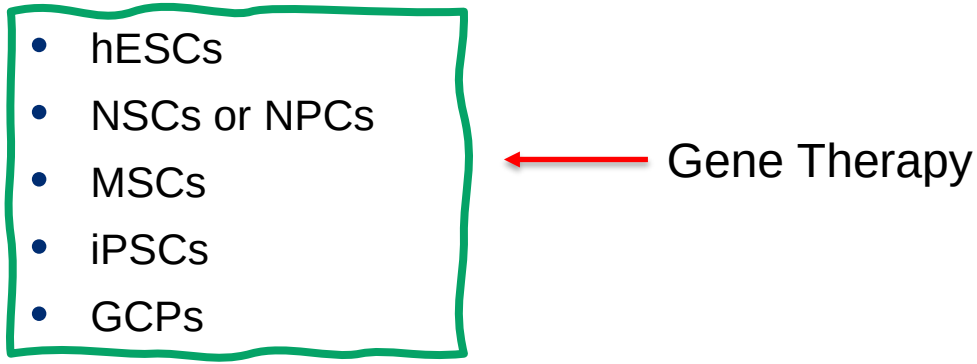
Example of allogeneic cell therapy



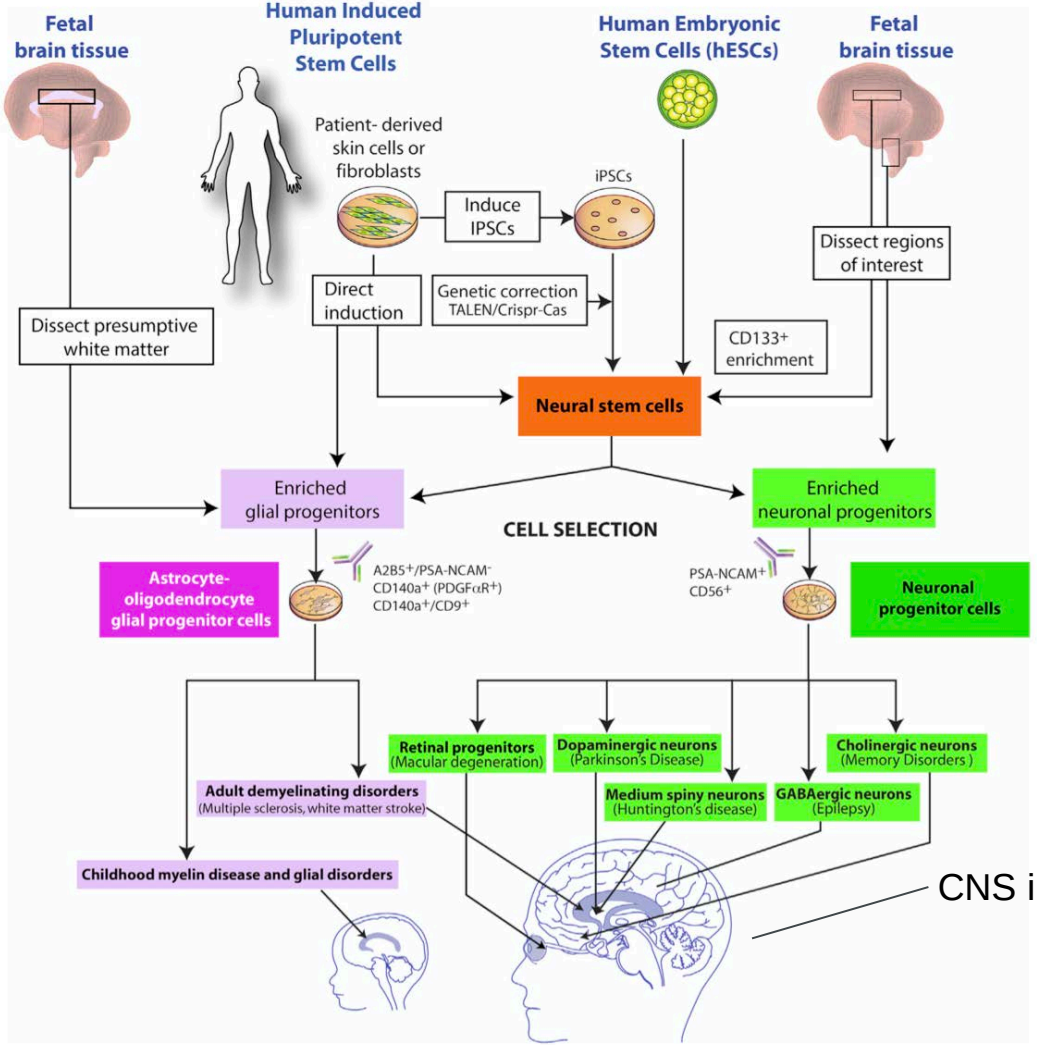


Autologous vs allogeneic therapy in the NS

Allogeneic	Autologous
Uses stem cells from a donor whose human leukocyte antigens (HLA) are acceptable matches to the patient's.	Uses a person's own stem cells

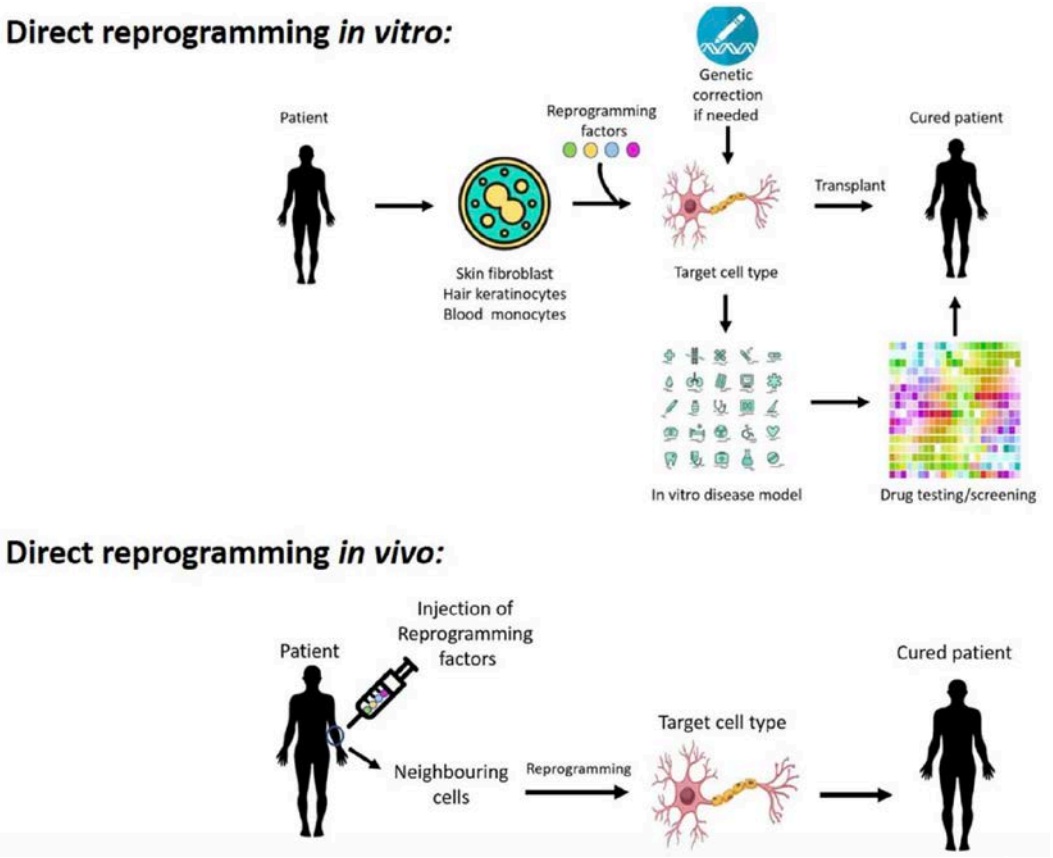


Applications of cell reprogramming in the CNS

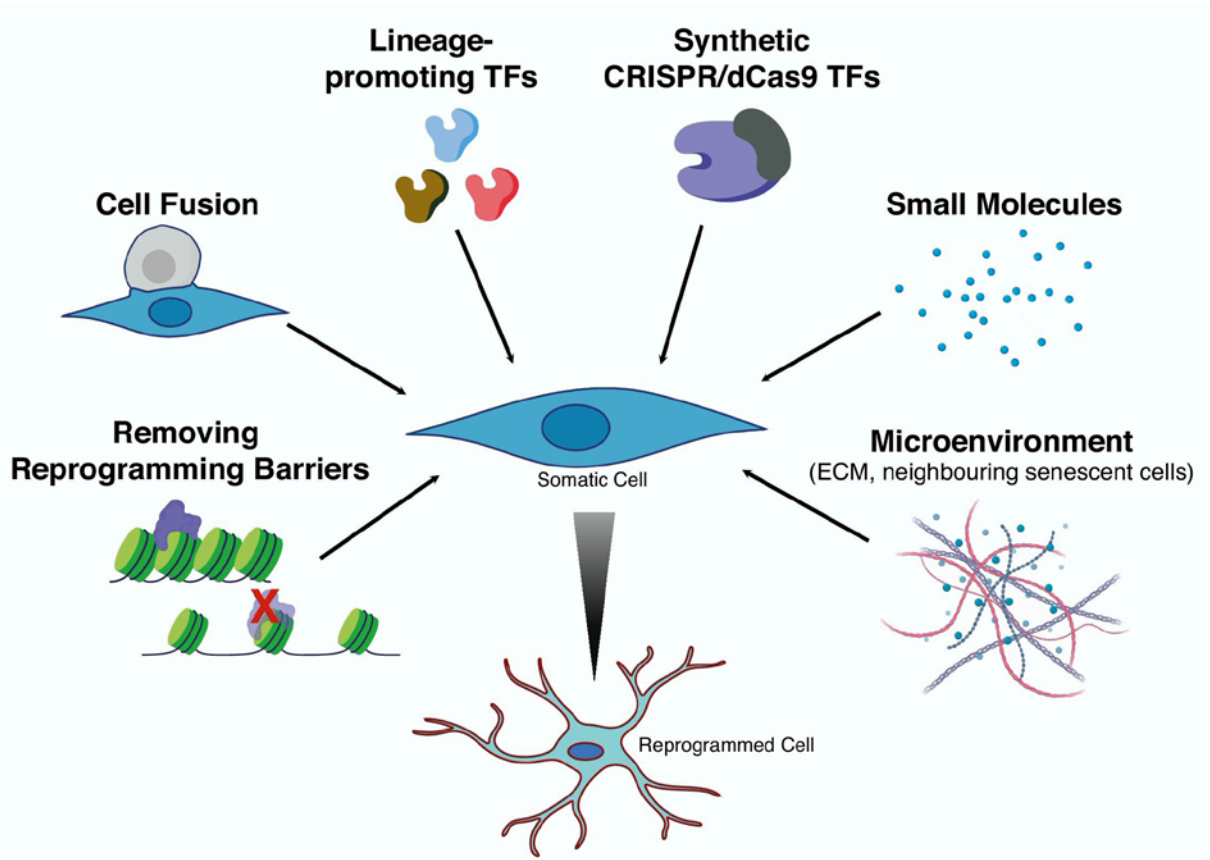


clinicaltrails.gov

In vivo cell reprogramming

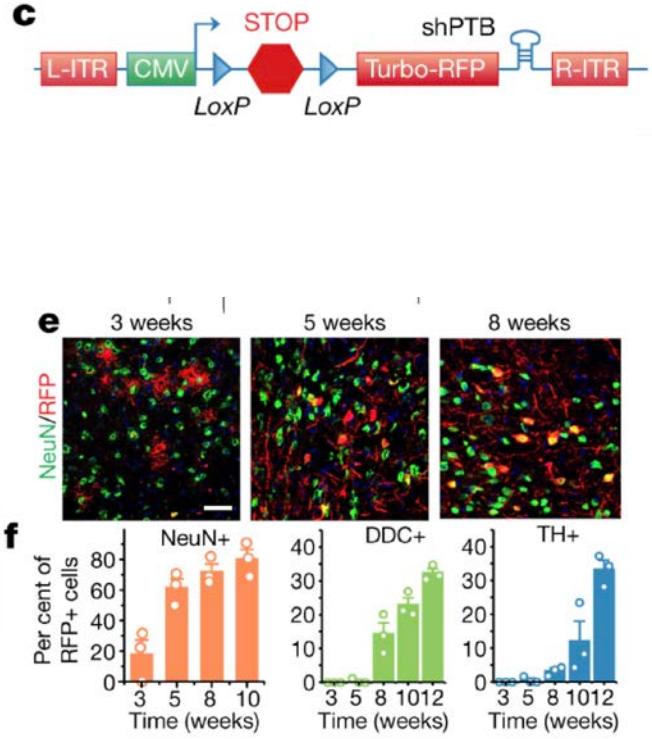


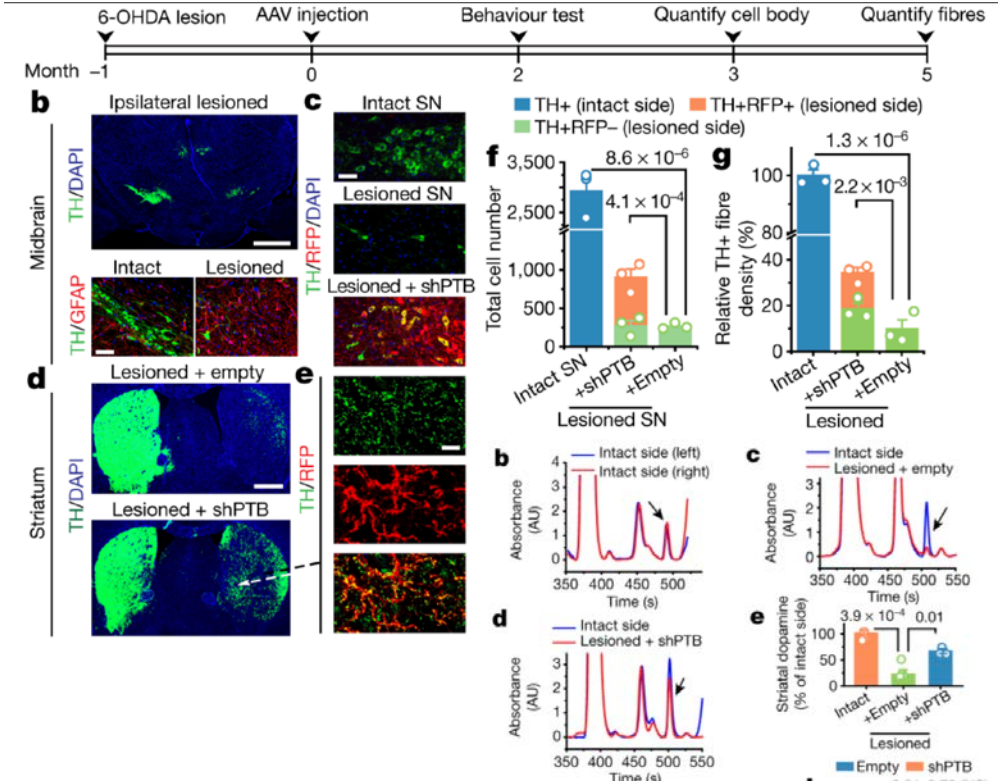
In vivo cell reprogramming



Delivery Methods
Viral transduction
Small Molecules/miRNA
Nanoparticles
CRISPR/CAS9
Nano-transfection

Reversing a model of Parkison's Disease with *in situ* cell reprogramming





Qian H et al Nature 2020

References

Slide	Reference
2	Small Molecules for Neural Induction of Stem Cells 2018. Tocris https://www.tocris.com/resources/tocris-blog/small-molecules-neural-induction-stem-cells
3	Qi, Y., Zhang, X., Renier, N. *et al.* Combined small-molecule inhibition accelerates the derivation of functional cortical neurons from human pluripotent stem cells. *Nat Biotechnol* **35,** 154–163 (2017).
5	Goldman SA. Stem and Progenitor Cell-Based Therapy of the Central Nervous System: Hopes, Hype, and Wishful Thinking. *Cell Stem Cell*. 2016;18(2):174-188.
6	Fang L, El Wazan L, Tan C, et al. 2018 Potentials of Cellular Reprogramming as a Novel Strategy for Neuroregeneration. *Front Cell Neurosci*. 2018;12:460.
7	Ofenbauer, A., Tursun, B. 2019 Strategies for in vivo reprogramming. Current Opinion in Cell Biology 61: 9-15.
8	Qian, H., Kang, X., Hu, J. *et al.* 2020 Reversing a model of Parkinson's disease with *in situ* converted nigral neurons. *Nature* 582**,** 550–556.