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Singapore builds detailed map of developing human brain, opening new pathways for Parkinson's treatment

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Duke-NUS scientists have built one of the largest and most comprehensive maps of the developing human brain

Parkinson's disease is Singapore's second most common neurodegenerative disorder, affecting about three in every 1,000 people aged 50 and above. The condition damages midbrain dopaminergic neurons—cells that release the chemical dopamine to control movement and learning. Restoring these cells could one day help alleviate symptoms such as tremors and mobility loss.

To better understand how these neurons develop when grown in a laboratory, the Duke-NUS team built a two-step mapping framework called BrainSTEM (Brain Single-cell Two tiEr Mapping). Working with partners, including the University of Sydney, they analysed nearly 680,000 cells from the fetal brain to map the entire cellular landscape.

The second higher-resolution projection focuses on the midbrain—pinpointing dopaminergic neurons with greater precision. This "comprehensive reference map" now provides scientists worldwide with a standard to evaluate the accuracy of midbrain models, compared to the real human brain.

The study, which was recently published in the journal *Science Advances*, found that many methods used to grow midbrain cells also produced unwanted cells from other brain regions. This shows that both the lab techniques and the data analysis need improvement to detect and remove these off-target cells.

The team will provide their brain atlases as an open-source reference and the multi-tier mapping process as a ready-to-use package.

With BrainSTEM being a framework that can be applied to sieve out any cell type in the brain, labs worldwide can deploy it to deepen insights, refine workflows and accelerate discovery across neuroscience.