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Stem cell transplants for Parkinson's disease edging closer

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A major breakthrough in the development of stem cell-derived brain cells has put researchers on a firm path towards the first ever stem cell transplantations in people with Parkinson's disease. A new study presents the next generation of transplantable dopamine neurons produced from stem cells. These cells carry the same properties as the dopamine neurons found in the human brain.

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Credit: Image courtesy of Lund University

The experiments, performed in rat models of Parkinson's disease, reveal that the latest version of stem cell-derived dopamine cells fully mimic the characteristics and function of the dopamine neurons that are lost in Parkinson's disease. The potentially unlimited supply of transplantable cells, sourced from stem cell lines, opens the door to clinical application on a much broader scale. The results are published in the leading journal in the field, *Cell Stem Cell.*

"This study shows that we can now produce fully functioning dopamine neurons from stem cells. These cells have the same ability as the brain's normal dopamine cells to not only reach but also to connect to their target area over longer distances. This has been our goal for some time, and the next step is to produce the same cells under the necessary regulations for human use. Our hope is that they are ready for clinical studies in about three years," says Malin Parmar, who led the study conducted at Lund University and at MIRCen in Paris as part of the EU networks NeuroStemCell and NeuroStemcellRepair.

Brain cell transplants with fetal dopamine cells obtained from human embryos have already been performed on a few occasions, with varying results. In the past decade, the EU network TRANSEURO has been working hard to get a new and improved trial underway. That moment is now here. In the coming months a small number of patients will be transplanted with fetal cells in Lund, Sweden and Cambridge, UK.

The fetal dopamine cells that will be used within TRANSEURO, however, carry some restrictions. Firstly, there is the ethical concern of taking tissue from aborted fetuses. There is also the issue of availability of fetal cells, which is often scarce. The logistics surrounding the gathering of cells for any specific transplantation is partly down to luck and circumstance. These concerns will be resolved as the stem cell-derived dopamine cells become available in the clinic, making the treatment accessible for larger patient groups.

The collaborative efforts within EU networks NeuroStemcellRepair and TRANSEURO have put cell therapy on a faster track towards reaching patients. Getting stem cells to become functioning dopamine neurons, the method

of delivering them to a specific target, and learning how to get them to integrate in the brain, are all extremely complicated processes. The sharing of ideas and data has been integral to the success of these networks, says Professor Elena Cattaneo, coordinator for NeuroStemcellRepair.

"Collaborative research of this nature is so much more than the results it produces, especially if we consider its potential for expanding the boundaries of knowledge and dissolving cultural barriers. From this perspective, basic research and collaboration among nations stand out once more as something the scientific community should never distance itself from."

Story Source:

The above story is based on materials provided by **Lund University**. *Note: Materials may be edited for content and length.*

Journal Reference:

1. Shane Grealish, Elsa Diguet, Agnete Kirkeby, Bengt Mattsson, Andreas Heuer, Yann Bramoulle, Nadja Van Camp, Anselme L. Perrier, Philippe Hantraye, Anders Björklund, Malin Parmar. **Human ESC-Derived Dopamine Neurons Show Similar Preclinical Efficacy and Potency to Fetal Neurons when Grafted in a Rat Model of Parkinson's Disease**. *Cell Stem Cell*, 2014; 15 (5): 653 DOI: 10.1016/j.stem.2014.09.017
