



Parkinson's  
Disease Society

## Cytoplasmic Hybrid Cells

Cytoplasmic hybrid cells offer a new way for scientists to obtain stem cells for research that may potentially lead to the development of new ways of treating Parkinson's in the future.

The number of human stem cells available for research is very small and this restricts our ability to carry out studies to help us understand how they grow and change to form nerve cells. Therefore, it is important to find a new way of obtaining stem cells in order to better figure out how they may be changed into the correct type of nerve cells that could ultimately be used for therapeutic transplantation.

**What are stem cells?** Stem cells are cells in the body that, under certain conditions, can be stimulated to change into different cell types, including nerve cells.

**Where are stem cells within the body?** Stem cells are mainly present in embryos where they change during development to give rise to cells that make up all of the organs in the body (eg liver, kidney, lungs and brain). Stem cells are also found in small amounts in certain tissues in an adult such as bone marrow.

### **Why are stem cells important in Parkinson's?**

Parkinson's occurs when the cells in the part of the brain that controls movement are lost. Ultimately, it is hoped that we can transplant nerve cells, which have been generated from stem cells, into these areas to replace the cells that have died.

**What are cytoplasmic hybrid cells?** A hybrid is a cell made up of elements of two different species. A cytoplasmic hybrid cell is generated when the genetic material (DNA) from one species is injected into cells from another

species from which the DNA has previously been removed. The part of the animal cell into which the human DNA is injected is called the cytoplasm, the watery environment inside the cell, hence the name cytoplasmic hybrid cells.

Some experiments that are currently planned involve the transfer of human genetic material into eggs from other species from which the DNA has been taken out. As the genetic material controls how the cell works, these hybrid cells could be considered to be essentially human in nature. They contain over 99% of human DNA.

### **Are there any ethical implications?**

The hybrid cells will be grown in the laboratory for up to 14 days when they form a small group of cells termed a blastocyst. The strict UK legislation already in place only allows this to be grown for the 14 day period in a laboratory during which time the stem cells can be removed and used for research purposes. The blastocyst will not, at any stage, be grown within the body.

### **Can these cells be used to treat Parkinson's?**

The cytoplasmic hybrid cells cannot be used for the treatment of Parkinson's as there is a very small amount of animal DNA remaining within them. However, they can tell us a lot about how stem cells work and how they can be transformed into the correct type of nerve cells that may ultimately be used for transplantation in Parkinson's. Steps to making cytoplasmic hybrid cells

1. Unfertilised eggs are removed from an animal e.g. cow.
2. The genetic material (DNA) is removed to leave a "shell".



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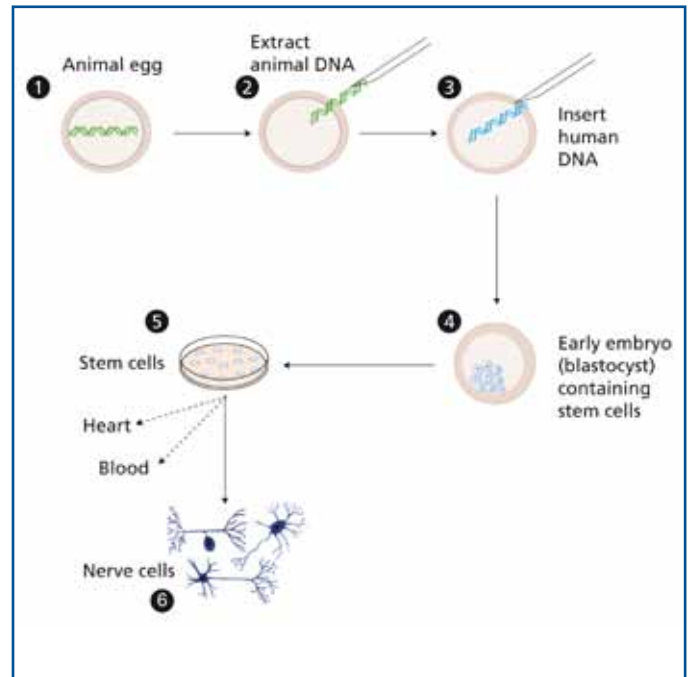
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- Human DNA, obtained from sources such as human skin cells, is inserted into the shell. This makes the cell, in effect, a human cell, similar to that which is formed when a sperm fertilises an egg.
- The cells are grown in the laboratory to form a small group called a blastocyst. This contains stem cells that ultimately will give rise to all cells in the body, including nerve cells.
- The stem cells are taken from the blastocyst and grown under specific conditions in the laboratory. This increases the number of the cells as they divide and multiply.
- While the stem cells can form many different types of cells in the body, in these studies specific laboratory conditions will be used to transform them into nerve cells.

These nerve cells will help us to understand:

- how stem cells grow into nerve cells
- how to grow nerve cells that produce dopamine, the chemical that is decreased in Parkinson's.

The cytoplasmic hybrid cells used in these studies will not be suitable for transplantation into the human brain as a treatment for Parkinson's. However, the information obtained will be very important in the development of future transplantation studies using nerve cells that have been generated from human stem cells.





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