Placental stem cells reduce disease in a laboratory model of MS

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An Australian research team led by Professor Claude Bernard and Dr Natalie Payne, working with colleagues at the Australian Regenerative Medicine Institute at Monash University in Victoria, have been investigating the potential of a variety of different types of stem cells for their ability to modify the immune response in MS, and assist with repair.

Dr Payne has received funding from MS Research Australia, including a travel award in 2014 and most recently an incubator grant in 2015 to pursue this line of research.
In a study published this month in the *Journal of Neuroinflammation*, they have shown that stem cells derived from the placental tissues that support a growing foetus in the womb may have the ability to suppress the immune system and reduce the disease process in mice with an MS-like illness.
The cells, known as human amnion epithelial cells (hAECs) are obtained from the placenta after birth and have some potential advantages over other types of stem cells. These cells are readily obtained in large numbers from the placenta, which is generally discarded after the birth of a baby, and they are also relatively unlikely to be rejected when infused into a patient.

Like embryonic stem cells, the placental cells have the ability to specialise into a wide range of other cell types for example muscle, skin, or nerve cells. However, because the placental stem cells are obtained from essentially waste tissues following birth, they are not associated with the same ethical concerns as embryonic stem cells.

The research team have shown, in a detailed series of experiments, that hAECs isolated from human placentas are able to suppress the activity of T immune cells grown in a dish in the laboratory, and reduced the quantity of inflammation-promoting chemicals released by the cells.

They also found that when these cells are infused into mice at the onset of an MS-like illness known as experimental autoimmune encephalomyelitis (EAE), they are able to suppress the further development of the disease. They showed that this response in mice was associated with a reduction in inflammatory T-cells and an increase in the number of ‘calming’ T regulatory cells that moderate inflammatory processes.

hAECs are just one type of stem cell being investigated by the Melbourne team, and others around the world, for their immune-modifying and regenerative properties. Other types of cells include mesenchymal stromal cells (MSCs) which can be derived

from fat, as well as induced pluripotent stem cells (iPSC) which can be made by resetting adult cells to behave more like embryonic cells.

Consistent with the results of this study, research to date suggests that all these types of stem cells are able to reduce the inflammatory process involved in MS. While other stem cell types have not yet been compared directly with hAECs, this study suggests that lower numbers of the placental cells needed to be infused, compared to other types of stem cells, in order to obtain an effect on disease severity.

These stem cells do not appear to be integrating into damaged tissues to directly affect repair, but there is some evidence emerging from other studies that they may assist the repair process by calming the inflammation and making the environment around the damaged tissue more ‘permissive’ for repair processes.

The research is not ready for testing in humans as yet, but these results add to the growing evidence that it may be possible in the future to use stem cells to calm inflammation in MS and give the brain and spinal cord the opportunity to repair.