

Transplantation with human placental stem cells improves diabetes complications in rats

August 30 2016

In an effort to determine if stem cell therapy can prevent or improve a condition called "diabetic foot" caused by poor blood flow in patients with diabetes, a team of researchers in China has found that transplanting human placenta-derived mesenchymal stem cells (MSCs) into rats modeled with diabetes can affect blood vessel growth, potentially improving blood flow and preventing critical limb ischemia (CLI), a condition that results in diabetic foot and frequently leads to amputation.

The study will be published in a future issue of *Cell Transplantation* and is currently freely available on-line as an unedited, early epub.

"CLI describes an advanced stage of peripheral artery disease characterized by obstruction of the arteries and a markedly reduced [blood flow](#) to the extremities. CLI is associated with high rates of mortality and morbidity, putting the patients at high-risk for major amputation," said study co-author Dr. Zhong Chao Han of the Beijing Institute of Stem Cells, Health and Biotech. "Mesenchymal stem cells are ideal candidates for transplantation because they have both angiogenic (potential to form new blood vessels) and immunomodulatory properties and are capable of differentiating into three different lineages. The utility of placenta-derived MSCs is poorly understood, so we sought to investigate the efficacy of combined regular therapy and cell therapy in treating diabetes-related CLI."

According to the researchers, human placenta was obtained from full-

term cesarean section deliveries with written informed consent of the mother. The use of human-derived cells was approved by the Institutional Biomedical Research Ethics Committee of the Chinese Academy of Medical Science and Peking Union Medical College.

After injection into rats surgically modeled with CLI, the stem cells were traced and counted at various points in time. The researchers found that the stem cell counts decreased dramatically over time, but a few cells differentiated into [vascular cells](#). The infused cells also secreted cytokines, which are small proteins secreted by cells that have a specific effect on the interactions and communications between cells.

"We believe that cytokines secreted by MSCs attract endothelial cells, a type of cells that make up the tissues lining the interior surface of blood vessels," said the researchers. "These cells participate in building new vascular tissues and also inhibit inflammation."

The researchers concluded that their experimental data implied that MSCs improved ischemia recovery in diabetic rats via direct cell differentiation and paracrine (protein-mediated) mechanisms, although the two mechanisms exist simultaneously. The paracrine mechanisms, said the researchers, were likely more important than direct cell differentiation.

"So far, MSC therapy represents a simple, safe and effective therapeutic approach for diabetes and its complications," the researchers concluded. "Our studies lay the groundwork for the transition from the experimental bench to the clinical bedside."

"Diabetes is becoming more prevalent across the globe and [stem cell therapy](#) may be a vital approach to serious vascular complications," said Dr. Maria Carolina Oliveira Rodrigues of the Ribeirão Preto Medical School - University of São Paulo, Brazil and section editor of Cell

Transplantation. "Future studies should aim to expound upon previous findings in MSC transplantation studies and confirm the efficacy of placenta-derived MSCs for CLI."

More information: , Transplantation of human placenta derived mesenchymal stem cell alleviates critical limb ischemia in diabetic nude rat, *Cell Transplantation* (2016). [DOI: 10.3727/096368916X692726](https://doi.org/10.3727/096368916X692726)

Provided by Cell Transplantation Center of Excellence for Aging and Brain Repair

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