Public release date: 19-Mar-2008
[Print Article | E-mail Article | Close Window]

Contact: Naoya Kobayashi
immortal@md.okayama-u.ac.jp
81-862-357-485
Cell Transplantation Center of Excellence for Aging and Brain Repair

Coming soon: Cell therapies for diabetes, cancer?

Tampa, Fla. (March 19 , 2008) – Therapies using stem cell transplants are advancing promising treatments for such conditions as Alzheimer's Disease, neurological diseases and spinal cord injury, and heart disease. Now, scientists think that stem cell transplants may ultimately benefit those who suffer from diabetes or cancer. However, important questions need answers: Given the shortage of human pancreatic islet tissue, can stem cells be used to provide insulin cells that can be stored and secreted from a bioartifical pancreas? Can islet cells be frozen for long periods of time, retain their integrity and be transplanted? If tumors contain cancer stem cells, how can the stem cells be targeted and destroyed to provide improved therapies?

To raise and help answer some of these questions, the current double issue of CELL TRANSPLANTATION (Vol.17, Nos. 1&2) is devoted to research presented at the Japan Society of Organ Preservation and Medical Biology (JSOPMB) meeting in Tokyo in November, 2006. The research within the pages of this special issue demonstrates how stem cell research in Japan is pushing towards therapies for diabetes and cancer and beyond.

According to Naoya Kobayashi, MD, PhD, of the Department of Surgery, Okayama University Graduate School of medicine and Dentistry and Special Editor of the Japanese issue of CELL TRANSPLANTATION, the shortage of donor organs for transplantation is a "big challenge," but research on stem cells and artificial cells for transplantation are "encouraging" and may provide valuable therapeutics for a host of diseases, including diabetes and cancer.

Artificial pancreas for diabetes sufferers

The construction of a safe and functional bioartifical pancreas (BAP), complete with cells that can secrete insulin in response to blood sugar concentrations, can be developed using stem cells as alternatives to normal human pancreatic islets, which are in short supply. The multipotency and active proliferation properties of stem cells, allows scientists to work on methods of inducing adult stem cells to differentiate into pancreatic cells.

"We are trying to design and develop a subcutaneously implant bag-type of BAP," said Dr. Kobayashi. "In tests on animal models, subcutaneously implanted BAPS have shown excellent induction of new blood vessels."

Alternative ways of circumventing the short supply of viable human pancreatic islet tissue by allowing storage of cells are also being explored.

Freezing islet cells to save them

Cryopreservation (freezing) of pancreatic islet cells from non-heart beating donors has been studied in animal models. Studies have shown that islet structure was well maintained after thawing, although the number of islets decreased. Techniques for freezing human islet cells from non-heart beating donors are being developed with an emphasis on evaluating the thawed islet morphology, possible contamination and quality of endocrine function.

Cancer stem cells: Key to a cure?

Researchers have proposed that cancer cells, like normal cells, include stem cells that are able to differentiate.

"Many questions surround this proposal," observes Dr. Kobayashi. "For example, do cancer stem cells exist in all cancers? Have normal stem cells become malignant, though mutation or some other process? What are the markers for cancer stem cells? Are cancer stem cells resistant to existing treatments?"

Current research is aimed at not only answering these questions, but also whether reducing the number of stem cells may lead to a reduced cancer risk.

"Tamoxifen, used to successfully prevent primary breast cancer, works by reducing the number of stem cells," comments Dr. Kobayashi.

Researchers speculated that if a substance specific to cancer stem cells can be discovered, cancer will be able to be detected at an earlier stage. However, even if cancer has been successfully treated, if a single cancer stem cell remains cancer, could spread and form new tumors.

Also, it appears that cancer stem cells have the ability to repair DNA damage more effectively than do cancer cells, thus adding to a tumor's drug resistance. Thus, treatment strategies based on the existence of cancer stem cells - which are reported to be resistant to standard anti-cancer drugs - may take a leap forward when stem cells can be targeted.

"A further question arises as to whether only cancer stem cells can be targeted without damaging normal stem cells," added Dr. Kobayashi.

Artificial cells

Although human adult stem cells are ideal for cell therapy via transplantation, keeping available cells alive over the long term is difficult.

"We are making efforts to economically establish "reversible immortalized" human cell lines that can be grown in tissue cultures and used for future gene transfers," explained Dr. Kobayashi. "Achieving immortalization, a two-stage process, is not without challenges."

According to Dr. Kobayashi, research focusing on "reversible immortalization" is being carried out to make safe and secure cell lines with the immortalization gene able to be removed once cell proliferation has been achieved.

###

These are only a few of the many articles devoted to cell therapy development by this prestigious Japanese Society. It highlights the world-wide effort to provide regenerative medicine treatments for many chronic and debilitating diseases, said Camillo Ricordi, MD, Co-Editor-in-Chief of CELL TRANSPLANTATION, at the Diabetes Research Institute, University of Miami School of Medicine.

* The editorial offices for CELL TRANSPLANTATION are at the Center of Excellence for Aging and Brain Repair, University of South Florida College of Medicine, and the Diabetes Research Institute, University of Miami Miller School of Medicine. Contact, Camillo Ricordi, MD at ricordi@miami.edu.