Australian Foundation for Diabetes Research

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NEWSLETTER

January 2017

415 Million Have It!

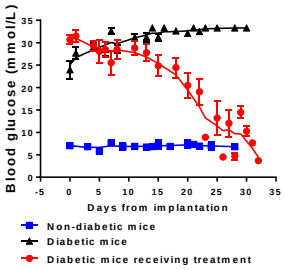
- There are at least 415 million people in the world with diabetes, of whom ≥ 1.2 million are Australians
- 389,270 Australians administer insulin daily
- The annual health care cost for insulin dependent diabetes in Australia is at least $1.9 billion
- AFDR is committed to developing a cell based therapy to replace the need for insulin injections.

If you would like to contribute to this vital research please fill in the form attached. All donations over $2 are tax deductible.

Bequests are most welcome.

Delivery Device

During the past year the Australian Foundation for Diabetes Research (AFDR) has made major progress with the *Bioengineered Diabetes Therapy Project* it is supporting at The University of Sydney (USYD), in conjunction with colleagues at Queensland University of Technology.
A device has been made to contain insulin-producing cells which when transplanted into diabetic mice normalizes blood sugar levels.



Blood sugar levels of mice transplanted with a device containing insulin-producing cells, which functions without the need for anti-rejection drugs.

"The beauty of the device is that it does not require anti-rejection drugs", said Professor Bernie Tuch, an AFDR Director.

The device is being taken through two further diabetic pre-clinical studies to test its robustness. If it continues to normalize blood sugar levels in diabetic rodents, it is planned to test the device in the clinic.

An application has been made to the Dept Industry, Innovation and Science under the Global Innovation Linkage Program for matching funds to complete the pre-clinical studies.

"We are quite excited about the possibility of using the device seeded with insulin-producing cells to treat insulin-dependent diabetes", said Professor Tuch. "Discussions are occurring with companies who have access to insulin-producing cells for this purpose", he said.

Book Chapter

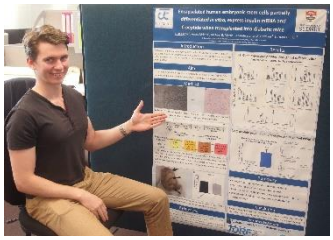
Dr Auvro Mridha at his desk writing part of a book chapter on tissue engineering as it relates to diabetes.

The post-doctoral fellow working on the *Bioengineered Diabetes Therapy Project,* Dr Auvro Mridha, and his colleagues have written a book chapter entitled *Bioengineering Approaches to Islet Transplantation for Management of Diabetes.* This has been accepted for publication in *Comprehensive Biomaterials II,* which is being printed by the company Elsevier.

German Stem Cell Conference

Luke Carroll is now in the 4th year of a PhD at USYD. In 2016, he expressed a strong desire to present his research findings with encapsulated human embryonic stem cells to an overseas audience. An abstract he wrote was accepted for presentation at the 4th Annual Conference of the German Stem Cell Network in Hanover.

Mr Carroll, who has been supported by both the AFDR and CSIRO, where he started his PhD, was thrilled to attend the Conference. There he met with colleagues who were carrying out parallel research, and laid the foundation for possible post-doctoral studies in the future.



Mr Luke Carroll standing next to the poster he presented at the German Stem Cell Network Meeting in Hanover.

Indian Connection

A year ago, Dr Vijay Vaithilingam, a member of the AFDR, returned to India with his wife to commence a family. He exchanged a career in research in Sydney with running the

family's agricultural science business in Pondicherry. He now has two children, a 2 year old daughter, Rakshitha, and a 3 month old son, Skandan.

Dr Vijay Vaithilingam with his wife Priya, and elder child Rakshitha, at home in Pondicherry, India.

Two manuscripts which Dr Vaithilingam had written while in Sydney, have now been published. In the *Journal of Diabetes Research,* he describes how to monitor encapsulated insulin-producing cells by the technique of magnetic resonance imaging. And in *Cell Transplantation,* he describes how transplanting stem cells with encapsulated insulin-producing cells makes the graft more immunologically accepted by the recipient.

Visit to Singapore

Dr Tanii Tabiin completed his PhD in Sydney at the University of New South Wales in 2002 supervised primarily by Professor Tuch. Subsequently he moved to the USA for further studies, and then returned home with his family to Singapore, where he has been working for the Government's Agency for Science, Technology and Research. He is now the Chief Business Development Officer of the start-up company, MiRXES Pte Ltd.

Dr Tanii Tabiin and Professor Bernie Tuch at the National University of Singapore.

Professor Tuch recently caught up with Dr Tabiin during a brief visit to Singapore. The meeting was mutually beneficial, with Dr Tabiin obtaining details of medical personnel in Australia with whom MiRXES wished to liaise. Professor Tuch was connected to a company in Singapore with research funds that might be able to support the Bioengineered Diabetes Therapy Project at USYD.

Israeli Visitor

In December, we were graced by the visit of the Israeli biomedical engineer Professor Shulamit Levenberg. She comes from the Stem Cell and Tissue Engineering Laboratory of the Technion Institute in Haifa, This was her third visit to Australia. She has made an international name for herself, using scaffolds to grow and differentiate human embryonic stem cells.

Professor Levenberg has also used these vascularized scaffolds to make insulin-producing cells more functional, when transplanted into diabetic recipients.

Professor Tuch took the opportunity to catch up with Professor Levenberg during her visit. They discussed the device which he and colleagues have bioengineered in Sydney to implant cells without using anti-rejection drugs, and explored whether the Israeli scaffolds might be of assistance.

R to l. Mr Peter Hersh of Australian Technion Society, Professor Shulamit Levenberg from the Technion Institute in Israel, and Professor Bernie Tuch at a business lunch in Sydney.

Embryonic Stem Cell Line Shared

One of many projects which the AFDR seeded funds into was the creation of two human embryonic stem cell lines, Endeavour-1 and Endeavour-2. These were produced in the Diabetes Transplant Unit at the Prince of Wales Hospital, in conjunction with IVF Australia, under licence from the National Health and Medical Research Council.

The AFDR supports the use of these cell lines for research purposes. It has provided Endeavour-1 cells to PhD student Luke Carroll at The University of Sydney for the purpose of differentiating them into insulin-producing cells.

It has also provided them to colleagues at the Northern Sydney Local Health District for investigation of neurodegenerative and neurogenetic disorders. A colleague at CSIRO received them for comparative gene expression studies of cancer stem cells. At St George Hospital, the cell line has been obtained for scientific research into the formation of platelets, whilst at the Westmead Institute for Medical Research, it is being used to differentiate into cardiac muscle cells.

The most recent use of Endeavour-1 has been at The University of Sydney to understand the molecular mechanisms that occur during differentiation of human embryonic stem cells, to neural cells.

A cluster of human embryonic stem cells (brown in colour) growing on human fibroblasts in a culture dish.

The AFDR has provided the cell line at no cost to the researchers, on the understanding it is being used neither for commercial purposes nor in human studies.