



382 Million Have It!

- There are at least 382 million people in the world with diabetes, of whom ≥ 1.2 million are Australians
- 343,000 Australians administer insulin daily
- The annual health care cost for insulin dependent diabetes in Australia is \$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.

Note our new website:
www.afdr.org.au

Overseas Collaborations: India and China



Associate Professor Sudha Warriar of the Manipal Institute of Regenerative Medicine India visiting Coogee during her trip to Sydney in August.

India:

The Diabetes Therapy Project being conducted at the CSIRO benefits from connections with international experts. This year, we were visited by A/Professor Sudha Warriar from the Manipal Institute of Regenerative Medicine in Banagalore, India.

She is attempting to create insulin-producing cells from the fetal lining of the placenta, called the amnion, obtained follow-

ing delivery of a baby.

The collaboration with Professor Warriar and colleagues requires her to send the insulin-producing cells created to Sydney. Here the cells will be placed in alginate microcapsules, and their efficacy tested in diabetic mice.

The advantage of using these human cells is to provide an alternative to a limited supply of islets, obtained from the pancreas of donors after their death.

China:

The other international collaboration in 2013 was with Professor Liangxue Lai of the Guangzhou Institute of Biomedicine and Health in Southern China.

Here microcapsules are being transplanted into pigs, which are biologically closer to humans.

Professor Bernie Tuch, who is the leader of the Project, flew to Guangzhou in June to retrieve microcapsules that had been transplanted into pigs the previous year.

It is hoped that these capsules will protect the enclosed insulin producing cells being transplanted into diabetic recipients from immune destruction.

A problem experienced in a previous human clinical trial, with encapsulated human islets, was a fibrotic reaction to the capsules, thereby causing loss of viability of the islets.



Meishan pigs used in Guangzhou for implantation of microcapsules.

Diabetes Stem Cell Scholarship



New PhD student, Luke Carroll, with supervisor Professor Bernie Tuch

The Foundation has teamed up with CSIRO to create a *Diabetes Stem Cell Scholarship*, to be implemented through Monash University.

The recipient of the Award is Mr Luke Carroll who completed his Bachelor of Science with Honours Degree at the University of Queensland in 2011. He has worked in Sydney

since then, at the Kolling Institute, where he gained experience in culturing human pluripotent stem cells.

At CSIRO he will work with others on the Diabetes Therapy Project, seeking to optimize the formation of mature insulin-producing cells from human embryonic stem cells.

Distributing embryonic stem cell line

In 2013 the Foundation distributed aliquots of the human embryonic stem cell line, Endeavour-1, to two other stem cell research groups in Sydney.

It is this cell line which is being used at CSIRO in the Diabetes Therapy Project.

In 2004, the Foundation provided seed funds for the development of such cell lines, approval for which was obtained from the NHMRC Embryo Licensing Committee.

Director of the Foundation, Mr Steven Nemes, said: "By distributing the lines to other researchers, we are honouring our original intention that the lines be used to benefit and assist others."

Should the cells be used for commercial purposes, however, the Foundation and the other two entities involved in their creation, IVF Australia and the South Eastern Sydney Area Health Service, will be entitled to royalties.



Dr Steven Gao from the Kolling Institute at Royal North Shore Hospital with Endeavour-1 stem cells he has just received for his research. In the background is Dr Vaithilingam, a scientist working on the Diabetes Therapy Project at CSIRO.

Benefactors

During this past year, we have hosted a number of the Foundation's benefactors at CSIRO.

Our goal was to show them the work that was taking place to produce an encapsulated cell therapy that would replace the need for insulin administration in those with insulin-dependent diabetes.

One such visitor was Mr Malcolm McIntyre and his grandson Alexander, who has type 1 diabetes and is a student of Knox Grammar School.

The visitors saw the embryonic stem cells which were being cultured, and the microcapsules in which the cells are placed before being transplanted into diabetic animal recipients.

Mr McIntyre and his wife Carole have been long-standing supporters of the Foundation and are watching with interest progress being made. They are keen to see a diabetic stem cell therapy trialed in Australia.



R to L: Mr Malcolm McIntyre, grandson Alexander, and Professor Bernie Tuch at CSIRO North Ryde, outside the tissue culture laboratory.

Diabetes Therapy Project at CSIRO



The CSIRO team working on the Diabetes Therapy Project. R to L: Dr Meg Evans, Dr Tim Hughes, Ms Malsha Wickramaratna, Prof Bernie Tuch, Ms Penny Bean, Mr Sumeet Bal, Ms Denise Lewy, Dr Vijay Vaithilingam, Ms Sabu Lakhey & Dr Tony Rowe.

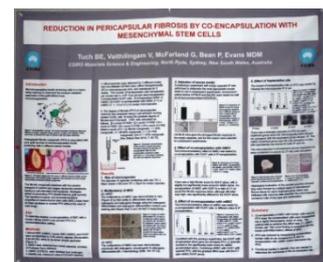
Progress has been made this past year at CSIRO in developing a stem cell based therapy and protecting it from the immune system of diabetic recipients.

Experimental scientist, Ms Penny Bean, has shown that the density at which pluripotent stem cells are seeded onto tissue culture plates is important in determining whether they will differentiate towards insulin-producing cells. Checking the genetic stability of the cells also is important, she has found. Dr Vijay Vaithilingam has been placing cells inside alginate microcapsules and transplanting these into mice. He has found that the foreign body inflammatory reaction, which confounded the encapsulated human islet

trial in 2006-9, can be reduced by transplanting the cells beneath the skin, as compared to next to the pancreas. A second complementary approach to reduce this reaction is to co-encapsulate with anti-inflammatory mesenchymal stem cells. Dr Vaithilingam is now pursuing these strategies in diabetic rodents.

The preliminary outcome of these experiments was presented in Boston at the 11th Annual Scientific Conference of the International Society for Stem Cell Research.

Also presented, in Califor-



The poster presented at the Annual Scientific Meeting of the ISSCR, Boston during June.

nia at the 14th World Congress of the International Pancreas and Islet Transplant Association, were data on non-invasive tracking of the encapsulated cells with magnetic resonance imaging once they were transplanted.