



371 Million Have It!

- There are at least 371 million people around the world who have diabetes
- At least 1.2 million Australians have this disorder
- The number of Australians with type 1 diabetes is 149,000, many of whom are children
- The annual health care cost for diabetes in Australia is \$1.1 billion

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Chinese Academy of Science & CSIRO Collaboration



Professor Liangxue Lai of the Guangzhou Institute of Biomedicine and Health at the Pig Farm. He is wearing an operating gown and mask prior to going to theatre.

The Diabetes Therapy Project being conducted at the CSIRO has a new partner, the Chinese Academy of Science. Professor Liangxue Lai of the Guangzhou Institute of Biomedicine and Health is testing the biological re-

activity of CSIRO's micro-capsules in pigs.

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

Changes are being made to the capsules at CSIRO by polymer chemist Dr Tim Hughes and others to try and overcome this problem.

Professor Bernie Tuch, who is the leader of the Project, flew to Guangzhou in June last year with the

first lot of microcapsules. They were transplanted into 4 pigs, and the capsules retrieved over the next 2 months.



Entrance to the Xingwang Pig Farm in Guangzhou.

It is planned to return to Guangzhou in 2013, and transplant modified micro-capsules to reduce the fibrotic reaction.

Overseas Visitors



(r to l) Professor Michael Walker, from the Dept Biological Chemistry, Weizmann institute in Israel, and Professor Bernie Tuch, in the foyer of CSIRO in North Ryde.

We were graced with the presence of several international visitors during this past year, all of whom provided opportunities for further collaboration. In May, Professor Michael Walker came with several

colleagues from the Weizmann Institute in Israel, to talk on *Selective gene expression in pancreatic beta cells*.

Shortly thereafter there was Professor Alan Trounson, President of the Californian Institute of Regenerative Medicine. He came to an intimate meet and greet session at CSIRO, interacting with those differentiating human embryonic stem cells into insulin-producing cells.

Finally, in November, Dr Allan Robins came and spoke on *Treatment of dia-*

betes with human stem cells: The Californian experience. His company, ViaCyte Inc is trying to obtain approval to commence a clinical trial with a cellular therapy for diabetes.



(r to l) Dr Allan Robins, Senior Vice President of Science & Technology of the Californian company, ViaCyte Inc and Professor Bernie Tuch, outside CSIRO in North Ryde.

USA connections

Arcadia University is located on the outskirts of Philadelphia in the USA state of Pennsylvania. A component of the undergraduate courses there is to spend a semester in Australia. Ashley Hertzog, nearing the completion of her BSc course at that University, has just completed 3 months training at CSIRO.

Her project was to look at the metabolism of human embryonic stem cells as they were differentiated to produce insulin. To do this, she analysed culture medium conditioned by the cells using the technique of gas chromatograph mass spectrometry.

Able supervised by Dr Damian Frank from CSIRO Animal, Food & Health Sciences, Ashley thoroughly enjoyed her stay. She was so sufficiently enthralled by her experience that she has expressed a desire to return and carry out a higher degree, once she graduates later this year.



R to L: Ms Ashley Hertzog and Dr Damian Frank, at work.

"We would be delighted to have Ashley continue her studies with us in the

future", said Dr Frank, in farewelling Ashley.

The Foundation has a connection with another tertiary USA institution, namely the University of Illinois at Chicago.

Between 2008 and 2011, there was an excellent collaboration with Professor Jose Oberholzer from that University, and associated colleagues from Slovakia, Norway and Switzerland. They were all part of the Chicago Project the aim of which was to perfect the encapsulation of surrogate beta cells for the treatment of insulin-dependent diabetes. Publications in peer-reviewed journals are still being pro-

duced from this collaboration.

During the year, we were visited by Professor David Hunkeler formerly head of the Encapsulation Division of the Chicago Project.



R to L (front to back): Prof David Hunkeler, Dr Vijay Vaithilingam (post-doctoral fellow), Mr Bill Sahlie (colleague) and Prof Bernie Tuch, during a catch-up dinner held in May.

Past and present



The CSIRO team working on the Diabetes Therapy Project. R to L: Dr Vijay Vaithilingam, Prof Bernie Tuch, Ms Denise Lewy, Dr Meg Evans, Ms Malsha Wickrama-ratna, Dr Tim Hughes, Ms Gail McFarland & Ms Penny Bean.

The Foundation began its activities in 2001 in the Diabetes Transplant Unit (DTU) at the Prince of Wales Hospital/University of New South Wales.

With the closure of that Unit in 2009, the Foundation moved most of its support to the Biomedical

Materials & Devices Theme at CSIRO. Here the team is continuing its efforts to produce an encapsulated beta cell surrogate that can be used in future clinical trials as a therapy for insulin-dependent diabetes.

During this last year, the team at CSIRO has made progress in achieving its goal. Modifications have been made to the microcapsules in which the surrogate insulin-producing cells are placed, to make them more biocompatible when transplanted into small laboratory animals.

As well, much has been learnt in how human embryonic stem cells might be of use in producing new insulin-producing cells.

Assisting in the process of differentiating the stem cells into becoming insulin-producing cells was Dr Justin Lees, who was a post-doctoral fellow at the DTU. He is now furthering his career in the Oncology Research Unit at the Children's Hospital at Westmead.

Dr Lees, and another colleague from the DTU, Dr Leon McQuade, recently visited CSIRO for an up-

date of progress. Dr McQuade was the first scientist to culture human embryonic stem cells at the DTU, almost a decade ago. He is now a Senior Research Officer at the Australian Proteomics Analysis Facility at Macquarie University.



R to L: Dr Leon McQuade, Professor Bernie Tuch & Dr Justin Lees in the foyer of CSIRO at North Ryde