



Institute of
Medical Biology

National University Health System
Yong Loo Lin School of Medicine • National University Hospital • Faculty of Dentistry



PRESS RELEASE

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A*STAR AND NUS RESEARCHERS SCORE BREAKTHROUGH IN DEVELOPING UNLIMITED NUMBER OF PURE INSULIN-PRODUCING CELLS

Novel stem cell technique is effective in treatment of diabetes

1. Researchers from the Institute of Medical Biology (IMB) under the Agency for Science, Technology and Research (A*STAR) and the Yong Loo Lin School of Medicine (YLLSoM) at the National University of Singapore (NUS) have scored a breakthrough in developing an unlimited number of pure insulin-producing cells from mouse embryonic stem cells (ESCs)¹. The team of researchers was co-led by Dr Lim Sai Kiang, a principal investigator with IMB and a research associate professor at the Department of Surgery, YLLSoM, NUS, and Dr Li Guodong, a research associate professor at National University Medical Institutes, YLLSoM, NUS.

2. These pure insulin-producing cells, which have the same sub-cellular structures as the insulin-producing cells found in the pancreas², are highly effective in treating diabetes. Experiments by Dr Lim and Dr Li's group showed that when transplanted into diabetic mice with high blood glucose levels, the pure insulin-producing cells would cause the blood glucose levels of the animals to decrease. The experiments also showed that the subsequent removal of the transplanted cells from the diabetic mice would restore the blood glucose to its original level.

¹ Embryonic stem cells (ESCs) represent an unlimited source of cells that have the capacity to develop into every cell type in the body.

² Electron microscopy specialists from Switzerland had confirmed that the ESC-derived insulin-producing cells generated by the Singapore group have the same sub-cellular structures as those insulin-producing cells naturally found in the pancreas.

3. In addition, it was discovered that none of the diabetic mice involved in the transplants developed teratoma, a type of tumour often associated with ESCs, which could complicate their use in therapeutic treatment. Furthermore, the pure insulin-producing cells managed to retain their insulin-production and glucose-sensing capacity over time.

4. The researchers' achievement provides proof of principle that this strategy could be applied to human ESCs to obtain similar pure insulin-producing cells. Congratulating the authors on their findings, Professor Gordon Weir, Director of the Clinical Islet Transplantation Program at Harvard Medical School, who also holds appointments at the Harvard Stem Cell Institute and Joslin Diabetes Centre, said, "The amount of careful work done by this group of researchers is impressive. We need something to put into diabetic patients to treat their condition, and these findings tell us interesting things about the development of beta³ cells."

5. The strategic approach by the group offers avenues for further research in the treatment for diabetes. Said Dr Lim, "Our ability to isolate and then multiply insulin-producing cells from differentiating ESCs provides an unlimited supply of pure insulin-producing cells to study in unprecedented detail many aspects of these cells."

6. Added Dr Li, "Besides providing a tool to facilitate basic research in test tubes and animals, these insulin-producing cells may be also used to replace the isolated native pancreatic cells that are hard to obtain in a large amount, for pharmacological tests".

7. These latest research findings have been published in two separate papers in the 2008 online version of the journal *Stem Cell Research*. The findings published in one of the papers (dated 31 July 2008) were also recognised as one of the "Novel and Newsworthy Top Ten" in Cell Biology at the annual scientific meeting of the American Society for Cell Biology (ASCB) in 2005. The research was supported primarily by grants from A*STAR's Biomedical Research Council, Juvenile Diabetes

³ Beta cells make and release insulin, and reside within the islets of Langerhans in the pancreas. Destruction of beta cells is the main cause of Type I diabetes mellitus.

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Notes to the Editor:

The research findings described in the press release can be found in the 2008 online issue of ***Stem Cell Research*** under the following titles:

(i) Generating mESC-derived insulin-producing cell lines through an intermediate lineage-restricted progenitor line. *Stem Cell Research* 2008, in press and available online 8 August 2008.

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(ii) Derivation of functional insulin-producing cell lines from primary mouse embryo culture. *Stem Cell Research* 2008, in press and available online 31 July 2008.

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About the Institute of Medical Biology (IMB)

The Institute of Medical Biology is a member of the Agency for Science, Technology and Research (A*STAR). With its roots in the Centre for Molecular Medicine since 2004, it became the Institute of Medical Biology in 2007, with a mission to study mechanisms of human disease in order to discover new and effective therapeutic strategies for improved quality of life. IMB is developing internationally excellent research programmes working closely with clinical collaborators, targeting the challenging interface between basic science and clinical medicine, and aiming to promote increased and effective throughput of research from bench to bedside. Its growing portfolio of strategic research topics aims to promote translational research on the mechanisms of human diseases with a cell to tissue emphasis that can help identify new therapeutic strategies for disease amelioration, cure and eradication.

For more information on IMB, please visit www.imb.a-star.edu.sg

About the Agency for Science, Technology and Research (A*STAR)

A*STAR is Singapore's lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based Singapore. A*STAR actively nurtures public sector research and development in Biomedical Sciences, Physical Sciences and Engineering, with a particular focus on fields essential to Singapore's manufacturing industry and new growth industries. It oversees 22 research institutes, consortia and

centres, and supports extramural research with the universities, hospital research centres and other local and international partners. At the heart of this knowledge intensive work is human capital. Top local and international scientific talent drive knowledge creation at A*STAR research institutes. The Agency also sends scholars for undergraduate, graduate and post-doctoral training in the best universities, a reflection of the high priority A*STAR places on nurturing the next generation of scientific talent.

For more information on A*STAR, please visit www.a-star.edu.sg

About the National University Health System

Established in January 2008, the National University Health System (NUHS) groups the National University Hospital and the National University of Singapore's Yong Loo Lin School of Medicine and Faculty of Dentistry under a common governance structure to create synergies to advance its tripartite mission of excellence in clinical care, translational clinical research and education.

For more information, please visit www.nuhs.edu.sg

About the National University Hospital

The National University Hospital (NUH) is a specialist hospital that provides advanced, leading-edge medical care and services. Equipped with state-of-the-art facilities as well as dedicated and well-trained staff, the NUH is a major referral centre that delivers tertiary care for a wide range of medical specialties including Cardiology, Gastroenterology & Hepatology, Obstetrics & Gynaecology, Oncology, Ophthalmology, Paediatrics and Orthopaedic Surgery. Backed by substantive expertise and experience, the NUH has been chosen by the Ministry of Health to develop two new national specialist centres to meet the growing need for cardiac and cancer treatments.

The NUH, together with the National University of Singapore's Yong Loo Lin School of Medicine and Faculty of Dentistry, are under the common governance of the National University Health System (NUHS). With combined capabilities and facilities (from the teaching hospital and medical faculty), the NUH will be able to meet the healthcare needs of patients, train future generations of doctors more effectively, and help develop solutions to our healthcare problems through research.

In 2004, the NUH became the first Singapore hospital to receive Joint Commission International (JCI) Accreditation, an international stamp for excellent clinical practices in patient care and safety. It was also the first hospital in Singapore to receive a triple ISO certification concurrently for Quality, Environmental, and Occupational Health & Safety Management Systems in 2002.

For more information, please visit www.nuh.com.sg

About the Yong Loo Lin School of Medicine

The Yong Loo Lin School of Medicine was established in 1905 as the first institution of higher learning in Singapore and the genesis of what would become the National University of Singapore.

The School of Medicine strives to fulfill its tripartite mission of providing excellent clinical care, training the next generation of healthcare professionals, and fostering research that will transform the practice of medicine. It plays a pivotal role in producing future leaders in healthcare delivery, discovery, and public service as well as in Singapore's Biomedical Sciences Initiative and Singapore Medicine.

The School's 17 departments in the basic sciences and clinical specialties work closely with the Alice Lee Centre for Nursing Studies, the Centre for Biomedical Ethics, and the Centre for Health Services Research to ensure that teaching and research are aligned and relevant to Singapore's healthcare needs. In January 2008, the School of Medicine, the Faculty of Dentistry and the National University Hospital were unified under the common governance of the National University Health System, further enhancing quality clinical care, education, and research.

For more information, please visit medicine.nus.edu.sg/corporate/

About the Faculty of Dentistry

The Faculty of Dentistry began as a Department of Dentistry within the King Edward VII College of Medicine in 1929. It was the first dental school to be established in a British colony in the east. The three departments of the Faculty - Oral and Maxillofacial Surgery, Restorative Dentistry and Preventive Dentistry - together with the Division of Graduate Dental Studies strive to fulfill the Faculty's mission of excelling in clinical care, research and education.

The Faculty works closely with the departments of the Yong Loo Lin School of Medicine and other teaching hospitals and institutions across Singapore in healthcare delivery and education and also partners departments in other Faculties of the University, public institutions and private enterprises in multi-disciplinary research activities.

In January 2008, under the common governance of the National University Health System, the Faculty of Dentistry, Yong Loo Lin School of Medicine and the National University Hospital were unified to further enhance translational clinical research, quality clinical care and education.

For more information, please visit www.dentistry.nus.edu.sg/