

NEWS RELEASE

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NTU PARTNERS NATIONAL HEART CENTRE TO FACILITATE COMMERCIALISATION OF BIOMEDICAL TECHNOLOGY

Nanyang Technological University (NTU) and the National Heart Centre (NHC) have agreed to work on furthering research and development of cardiovascular technology, with the goal of bringing such research to successful commercialisation. Commercialisation will mean turning research into new and better biomedical devices that will improve patients' lives.

The partnership brings together the NTU School of Materials Science and Engineering's (MSE) expertise in biomaterials technology and NHC's proficiency in cardiovascular clinical services.

Under the partnership, the School will develop biomedical technology and its related devices, on which NHC will then conduct clinical trials. Following successful trials, commercialisation of the devices is expected.

Already, the School has a project lined up for collaboration with NHC. Recently the School signed an agreement with Merlin MD (a biomedical company) to develop a drug-eluting coating for Merlin's CE-marked X*Calibur Coronary Stent. The stent will then undergo clinical trials at NHC. (Please see attached factsheet for further information on drug-eluting stents).

This project presents a model that combines the R&D strength of NTU, medical capabilities of NHC and the marketing network of Merlin MD, and could well be a winning formula for growing the biomedical industry here in Singapore. (Please see attached factsheet for further information.)

Professor Freddy Boey, Dean, NTU's School of Materials Science and Engineering, said: "In Singapore, the biomedical sciences industry has been identified as a key growth engine for the economy. By offering combined R&D and clinical services, the two organisations could help attract international biomedical companies to Singapore and support the country's push to be a biomedical hub."

"NTU has always been at the forefront of biomedical technology, having developed and patented many such technology and devices. However it is even more important to be able to turn new technology into new products that will benefit patients."

"By coupling NTU's proven expertise in developing biomedical technology and devices, with NHC's capabilities and facilities for conducting clinical trials, we are now able to offer the industry a partnership that facilitates the development of new products that will benefit patients. Our first project with Merlin will demonstrate the viability of this partnership."

He added: "NTU's students will also benefit from the training, knowledge creation and career opportunities. Two of our graduates who worked with us are employed by Merlin and I believe other biomedical companies will also find our graduates suitably trained."

Associate Professor Koh Tian Hai, Medical Director, NHC, said: "In the field of Cardiology, technology has begun to play an increasing role in many of the treatments we use today. Research Units such as our Research and Development Unit and the NTU's School of MSE play pivotal roles in the synchrony and integration of biology, technology and most importantly information, for the rapid development of such technology for our patient's benefit."

He continued, "I am extremely pleased that such collaboration is thriving locally as this will only serve to promote the image of Singapore as a biomedical hub with a broad range of expertise, including developmental and translational cardiovascular research."

The partnership between the two organisations was formalised today under a memorandum of understanding signed by Associate Professor Koh Tian Hai, Medical Director, NHC and Professor Freddy Boey, Dean, NTU's School of Materials Science and Engineering.

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About Nanyang Technological University

Nanyang Technological University (NTU) is an established tertiary institution with 12 Schools, including three new schools -the School of Humanities and Social Sciences, School of Art, Design and Media, and School of Physical and Mathematical Sciences.

NTU has a distinguished lineage with roots that go back to 1955. Today, we are a research-intensive university ranked among the top 50 in the world. Our strength in science and engineering is acknowledged globally. We have a business school with an MBA programme that is among the top 100 in the world, an internationally-acclaimed National Institute of Education, one of the best communication and information schools in Asia, and a biological sciences school at the forefront of Singapore's life sciences initiative. The Institute of Defence & Strategic Studies is a world authority on terrorism.

Our New Undergraduate Experience featuring a holistic education including residential living and international experience has received external endorsement for its comprehensive curriculum featuring a rich selection of minors.

For more information, visit <http://www.ntu.edu.sg/>

ABOUT NHC and its RESEARCH and DEVELOPMENT UNIT

National Heart Centre (NHC) is a 185-bed national and regional referral centre for cardiovascular medicine in Singapore. It provides one-stop comprehensive preventive, diagnostic, therapeutic and rehabilitative cardiac services to local and overseas patients.

Evolving over the years into an institution with significant international reputation for its clinical services, research and medical advances, NHC became autonomous on 1 January 1999 and is a member of Singapore Health Services (SingHealth).

Managing an annual workload of more than 80,000 outpatients and cardiac procedures each, and over 6,000 surgeries and 8,000 inpatients, NHC is dedicated to providing excellence in healthcare through cost-effective and best care possible at the best value.

As part of the vision to become a world-class cardiac care facility, the National Heart Centre (NHC) is fully committed to research, both in the clinical and basic sciences. NHC recognises the importance of establishing a strong basic science research programme with translational capabilities, to bring locally developed technology rapidly to clinical use.

Its Research and Development Unit (RDU), staffed by Clinicians and Scientists and with a state of the art research infrastructure, is the ideal platform to perform pre-clinical testing before First-in-Man trials, which can be administered by the Clinical Trials Unit (CTU).

First established in 2001, the RDU's vision and mission is to 'facilitate the identification of innovative and promising ideas through the rigors of the research process, and to deliver successful ones to the practising cardiologist and patient.'

With wet lab facilities housed at NHC and the SingHealth Research Centre, the RDU has built up solid core research facilities for cellular and molecular experiments and imaging. Using Zeiss immunofluorescence and laser confocal scanning microscopes, we are able to visualise minute and detailed images of stem cells, used for repair of the damaged heart.

Applying our knowledge in clinical imaging, we have established the region's first stand alone ***Experimental Imaging Suite***, with capabilities to perform angiography, electrical mapping and cardiac ultrasound and other forms of bioimaging in both small and large experimental models. This strong core equipment structure, staffed by experienced researchers and technologist, has allowed RDU to test innovative treatments such as stem cell therapy for repair of damaged hearts. This capability has also allowed the RDU to perform product evaluation for industry partners and the Unit's testing of Merlin MD's coronary stent technology enabled them to rapidly achieve their CE Mark.

Materials science is an important aspect of devices used in stents and other cardiac devices and collaboration with NTU's School of MSE enables us to share in their expertise in Alloys, Polymers and Nanotechnology. As practising cardiologists and end-users of many cardiac devices in use today, the clinicians at NHC are well positioned to give clinical, scientific and biological input in the development of such products.

This MOU serves to further strengthen the interaction between clinicians, scientists and engineers, which the RDU believes is the spark needed in creating innovative devices and therapy for the wide range of cardiovascular diseases that confronts patients today.

FACTSHEET

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About the NTU-NHC MOU

This MOU allows NHC and NTU to work towards the common vision of enhancing the research and academic excellence and developing intellectual property for future commercialisation, through collaboration between the Research and Development Unit, NHC and the School of Materials Science & Engineering, NTU, in the development of cardiovascular research, technology and education.

About the cardiovascular device and stent market

The cardiovascular device market worldwide is currently estimated to be worth about US\$40 billion, with a growth rate of about 5% per annum. The worldwide stent market alone is estimated to be worth about US\$5 billion currently.

The biomedical sciences industry contributes close to 6% to the GDP.

NTU and NHC hope that their combined competencies will allow them to further tap this growing niche market. By attracting international biomedical companies to Singapore, the move also supports the country's push to be a biomedical hub.

About drug-eluting stents

Percutaneous Transluminal Coronary Angioplasty (PTCA) is a treatment commonly used to treat patients with coronary artery disease today. It is a process where a narrowed artery is opened up with a balloon. The PTCA procedure is usually followed by the insertion of a stent to act as scaffolding to provide support inside the artery and reduce the likelihood of artery collapsing or re-narrowing after the procedure. When bare stents are used, its very presence or the procedure often causes cells to grow and reblock the stented vessel, sometimes with fatal results. The most promising recent advance has been the use of drug eluting stents (DES), with the drug released to ensure

these cells do not proliferate reclose the stented area. Introduction of drug eluting stents has dramatically decreased the restenosis (re-narrowing of the artery) rates. Stents have been implanted in a large number of patients worldwide with good short and long term results.

The recent approval of drug-eluting stent from Boston Scientific and Cordis has changed the competitive landscape for coronary stent market, paving the way for the use of these stents against bare stents. It is estimated that by 2010, 80% of stents used will be drug-coated. A biodegradable drug eluting coated stent that can provide a superior drug dosage profile over a longer sustained period will provide optimal patient care and perhaps even widen the scope of the market.

About NTU's collaboration with Merlin MD

NTU has signed a collaborative agreement with Merlin MD to develop a drug-eluting stent.

The project is led by Professor Freddy Boey and Professor Subbu Venkatraman, Dean and Vice Dean of NTU's School of Materials Science & Engineering respectively, and is supported by EDB. The collaboration combines the School's strong capability in biodegradable drug eluting stent technology with *The Johns Hopkins University's* patented anti-restonosis drug. The stent will be commercialized by Merlin MD in Singapore.

This project rides on the technology of the fully biodegradable multi-layered drug-eluting stent that was recently developed and patented by Prof Boey and Prof Venkatraman. The stent developed by the two professors was a world-first. They have developed a method of coating a stent with multiple layers of a biodegradable polymer for drug elution at different release rates via a controlled release methodology. Each layer can release the drug at a different release profile. This enables the stent to be designed to optimise the release characteristics for a given drug or combination of drugs. The National Heart Centre (NHC) will help to perform both animal and human clinical trials for the stent.

About Merlin MD

Merlin MD is a Biomedical company with headquarters in Singapore and has a 12,000 sq ft facility for development and manufacturing of medical devices for treatment and prevention of cardiovascular and neurological diseases. Merlin

MD received over S\$10 million in investments, with the Biomedical Sciences Investment Fund being one of the investors.

Merlin MD entered into an exclusive agreement with The Johns Hopkins University in Baltimore, for a novel compound used in drug delivery for the treatment of vasculature disease. Merlin's strategy is to leverage Singapore as a strategic base, with its high quality medical device manufacturing capabilities, strong brand value, growing biomedical capabilities and medical expertise and infrastructure to provide innovative but cost effective medical devices for physicians to better treat patients. Merlin have already received CE Mark approval for its 1st commercialised X*Calibur Coronary Stent and Delivery System and started revenue stream in Asia.

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