NANYANG TECHNOLOGICAL UNIVERSITY

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FACT SHEET

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PROJECTS UNDER NANYANG INSTITUTE OF TECHNOLOGY IN HEALTH & MEDICINE

The projects under the eight different research categories demonstrate how NITHM can promote collaborations between clinical practitioners, scientists, industry players and NTU. Internally, the institute aim to also strengthen interactions between NTU's colleges, schools, and centres by forming interdisciplinary teams that tackle different aspects of health and medicine.

SENSING & DIAGNOSTICS

Project title: Developing next-generation sensors for cell detection
By: Prof Bo Liedberg, School of Materials Science & Engineering

The technology borne out of this research focus paves the creation of next-generation sensors that can detect molecules when applied in various environments, from an advanced laboratory to even an outpatient clinic located in the deepest tropical jungles.

For example, these sensors would be able to detect infectious diseases at an early stage, thereby benefitting tropical countries plagued by Malaria and other infectious diseases. The aim is to produce cost-effective diagnostic systems that can help physicians working in demanding conditions identify diseases quickly and accurately. The team is collaborating with private companies, one of them a local firm, to develop the "paper-based" sensor technology.

This project is largely interdisciplinary, roping the expertise of scientists from NTU's Engineering and Science colleges. It also interacts with the Centre for Biomimetic Sensor Science at the School of Materials Science & Engineering.

SYSTEMS BIOLOGY & MEDICINE
Project title: 'Onset of diabetes in Singapore population'
By: Assoc Prof Ravi Kambadur, School of Biological Sciences

This study aims to understand the basis for the onset of diabetes in the Singapore population. The research seeks to yield biomarkers to stratify local diabetic patients. This will allow for the creation of more targeted drugs for diabetes, thereby developing different effective treatment regimens for different patient populations.

With the help of clinical collaborators from Singapore General Hospital and National University Health System, overweight subjects with insulin resistance were recruited for the study. Their muscle biopsies were obtained, from which muscle tissues were created. The team is now identifying the differently-expressed genes during insulin resistance among these Singaporeans.

NANOMEDICINE
Project title: 'Ocular Therapeutic Engineering'
Prof Subbu Venkatraman, School of Materials Science & Engineering

Age-related Macular Degeneration (AMD) is an eye condition associated with ageing that gradually destroys sharp, central vision. In Singapore, it ranks among the top 4 causes of blindness and typically affects those above 50 years of age[1]. Although treatment is available, patients often reel from the pain of intravitreal (inside the eye) injections and face the risk of infection.

But scientists at NTU are now studying the possibility of using nano-scale drug carriers to deliver anti-bodies to the back of the eye, through subconjunctival (underneath membrane covering the white of the eye) injections instead. The team is based at NTU's Ocular Therapeutic Engineering Centre, where it collaborates closely with ophthalmologists from the Singapore Eye Research Institute and Tan Tock Seng Hospital.

[1] Health Promotion Board, Age-Related Macular Degeneration, http://www.hpb.gov.sg/HOPPortal/article?id=6216 (accessed 29 Mar 2012)

TISSUE ENGINEERING

Project title: Artificial liver platform for next-generation drug discovery and development
By: Assoc Prof Nam-Joon Cho, School of Materials Science & Engineering / School of Biological Sciences

About 150 million people are chronically infected with the hepatitis C virus, and more than 350,000 people die every year from hepatitis C-related liver diseases[2]. Current therapies are largely insufficient, but it is hoped that a new artificial liver platform developed in NTU, in collaboration with clinician-scientists, will provide new capabilities to develop improved anti-viral drugs.

The platform comes in the form of polymer hydrogels, which offer an excellent scaffold to host liver cells. Proof-of-concept studies have shown that these scaffolds enable the development of engineered 3D human liver tissues for studying liver biology and pathology in a more natural setting than standard 2D biology assays. So far, the team has been able to monitor the hepatitis C virus infection, achieving an important benchmark for future translational studies. Taken together, these strategies provide the functional capability to study infectious liver diseases, and to evaluate antiviral drug candidates using engineered liver tissues.

The artificial liver platform further addresses the lack of good in-vitro models of liver tissue, which are needed to assess whether drug candidates are toxic to the liver. This process is vital as it prevents hepatotoxicity, or chemical damage to the liver, which is typically evident only very late in the drug development process.

The team, formed by the School of Materials Science & Engineering and School of Biological Sciences, is collaborating with clinician-scientists from Stanford University and Singapore General Hospital.

[2] World Health Organisation, http://www.who.int/mediacentre/factsheets/fs164/en/ (accessed 28 Mar 2013)