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Among the world's best in just 10 years

NUS' department of bioengineering has been making waves and leaving its mark in the global arena

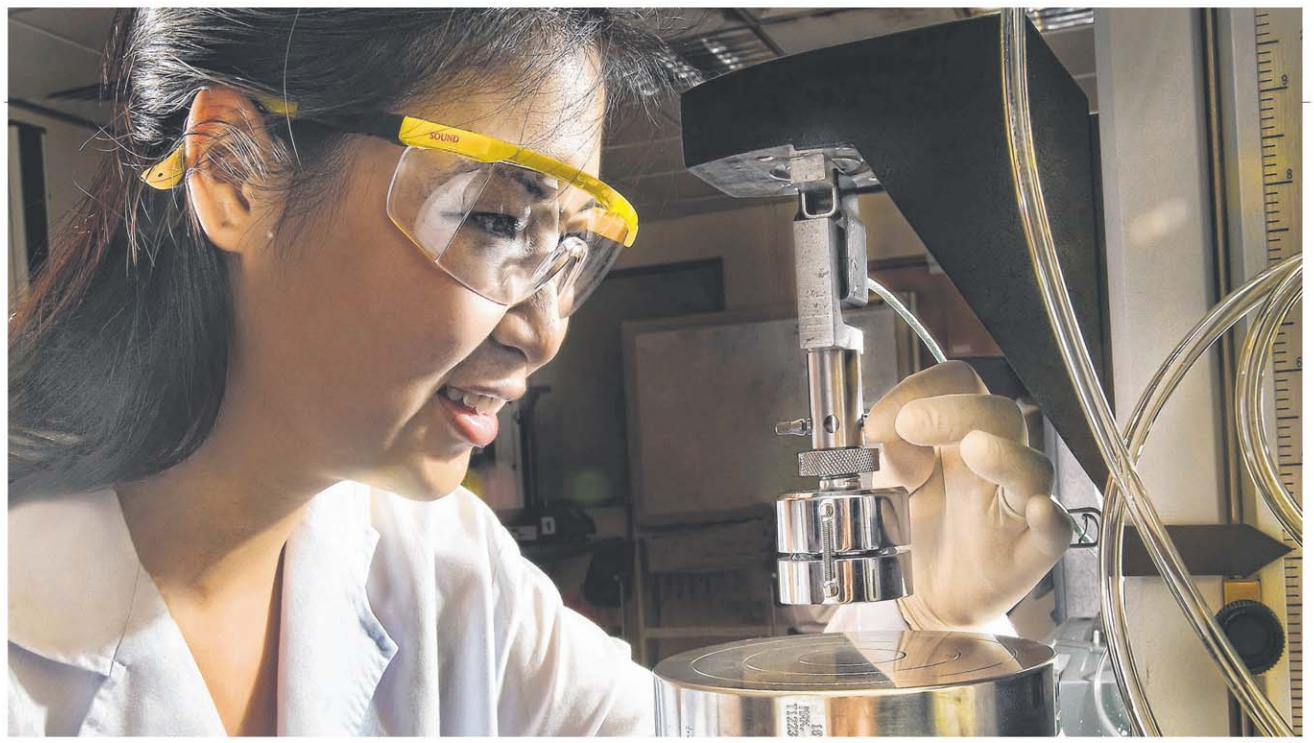

PHOTO: NUS

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Senior Correspondent

In just 10 years, the National University of Singapore's department of bioengineering has propelled itself into the top ranks of similar research institutes worldwide.

The department – with studies ranging from better cancer treatments to shoes that save diabetics from amputations – already has three promising spin-offs borne from research.

Bioengineering, a marriage of chemistry, physics, biology, mathematical sciences and engineering, can help improve disease diagnosis and treatment.

"Our research has been making waves and it has left significant marks in the global arena," said Professor James Goh, who is the department's head.

For instance, he said, the department's researchers had developed novel imaging systems which are non-invasive in detecting tumours such as breast cancer.

Since it was formed in 2001, the department has received more than $54 million in research grants. Its researchers have also filed a respectable 105 patents.

In fact, imaging technology developed by researchers there has been licensed by microscope giant Carl Zeiss for an undisclosed sum, believed to be among the highest granted to NUS.

And a check on the number of times its research is cited by other scientists – an indication of how impactful the work is – shows that the department is now among the top 10 in the world according to this ranking.

Professor Ning Gangmin, chair of Zhejiang University's Department of Biomedical Engineering in China, said that its NUS counterpart has grown fast, with successes in research and education.

"With a young and proud history, it has been internationally recognised as an important institution," he said.

At its 10th anniversary celebrations this Saturday, the department is holding an open house and will showcase a book on its role and achievements over the last decade.

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NUS' bioengineering department is headed by Professor James Goh

FROM BABIES TO THE ELDERLY: RESEARCH TO CHANGE LIVES

■ Predicting fractures better

A team at the National University of Singapore (NUS) has come up with a method to better predict fractures, based on measuring the shock absorption of the bones.

Shock absorption, or viscoelasticity, tends to deteriorate as people get older.

Dr Lee Tae Yong, who heads the Laboratory of Biomedical Mechanics and Materials at NUS, has made good progress in the study.

He and his team first tried out the new method on laboratory rats. They found that their model predicts such fractures at 70 per cent accuracy, compared to 40 per cent for current models.

Such predictions are important so that at-risk groups can get early warning and protection before any injury to bones occurs.

The team is also working on predicting hip fractures.

Such research is critical in an ageing world.

The number of hip fractures here has risen from 1,300 in 1998 to more than 2,000 in 2008, and is expected to hit 9,000 by 2050.

About 30 per cent of patients die in the first year after a hip fracture from complications such as deep vein thrombosis and infection.

■ Anti-ageing, wound healing

Small wonder. That well describes nanofibre technology, which can do wonders from anti-ageing treatment to healing burns and wounds.

Singapore-based scientists found that nanofibre meshes – fibres many times smaller than human hairs – works well on the skin's surface. It could lead to products such as extended-wear facial masks, anti-ageing treatment stickers and dermal patches for burns or difficult wounds.

A National University of Singapore (NUS) spin-off outfit Clearbridge NanoMedics first developed the technology based on nanofibres which are compatible with the skin and can be reabsorbed.

The company said nanofibres could also be made to encapsulate collagen or other skin-enhancing ingredients, in skin creams, for example.

There is also the potential of time-release to allow nourishing compounds such as vitamins, sunscreen or other desirable ingredients and drugs to be delivered directly to the skin at an optimum rate.

The company's co-founder, Professor Lim Chwee Teck, is also developing a nanofibre mat containing fibroblast cells, which give rise to connective tissue. The result is speedier wound healing.

Professor Lim holds joint appointments at NUS' departments of bioengineering and mechanical engineering. His research was cited by the MIT Technology Review magazine as one of the top 10 emerging technologies of 2006.

■ Detecting hyperactivity in kids

By comparing the brains of healthy children and those with attention deficit hyperactivity disorder (ADHD), researchers here hope to detect such conditions early and find ways to prevent them.

This study is currently being done on 200 healthy six-year-old children who do tests on attention, memory and impulse control.

By comparing these images with those of children affected by ADHD, Dr Qiu Anqi and her team at the National University of Singapore's bioengineering department hope to develop a computerised 3-D model to help doctors better understand the causes of ADHD.

It will also help in detecting babies who will be born with the condition, and perhaps find a way to arrest the development of such disorders.

ADHD is a condition of the brain that makes it difficult for children to control their behaviour. It is one of the most common chronic conditions of childhood.

Worldwide, ADHD is present in 3 per cent to 5 per cent of children. Many are treated with the drug Ritalin.

Dr Qiu's research focuses on developing neuroimaging analysis algorithms to explore changes in the brain's structure and function using magnetic resonance imaging.

■ Better cancer detection, treatment

A machine which traps "loose" tumour cells circulating in the blood stream, allowing for better cancer treatment and detection, is being marketed by National University of Singapore (NUS) spin-off Clearbridge BioMedics.

Such rogue tumour cells are like the proverbial needle in the haystack.

With only one circulating tumour cell out of every billion blood cells in cancer patients, such cells are extremely elusive and difficult to nab.

The Singapore-designed machine works by running blood samples through a biochip laced with microstructures to filter out the tumour cells from the regular ones.

Doing so allows doctors to personalise treatments for patients and to manage the progression of the disease.

A possibility ahead is its use for cancer screening.

The company is already profitable, having snagged more than $500,000 in secured contracts since it was incorporated in 2009.

Complementing such work at Clearbridge BioMedics is another breakthrough by NUS professor Lim Chwee Teck and his team: A method that uses special software to track the behaviour of cancer cells as they travel in the body.

This allows doctors to distinguish cancer cells from normal cells, and to see if patients are responding well to treatment.