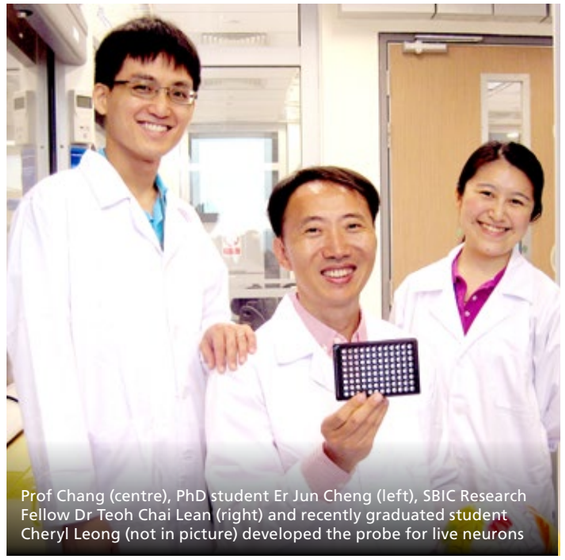
Fluorescent probe for live neurons



Prof Chang (centre), PhD student Er Jun Cheng (left), SBIC Research Fellow Dr Teoh Chai Lean (right) and recently graduated student Cheryl Leong (not in picture) developed the probe for live neurons

A chemical dye that fluoresces in living nerve cells, a world's first, can now enable researchers to look into neurological disorders in the body, such as Alzheimer's and Parkinson's disease.

Singapore scientists from NUS and the Agency for Science, Technology and Research (A*STAR) have invented a probe that can specifically label and image live neurons in the brain. This discovery can potentially be applied in diagnostic tools, surgical aids and drug delivery.

Neuron Orange (NeuO), an organic dye formulated by the team, allows real-time imaging of neurons both in the petri dish and within the organism. No prior chemical could stain live neurons exclusively, while antibodies are used only on dead nerve cells.

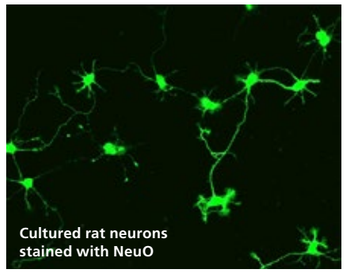
Little is known about the mechanisms controlling neurons' form and function owing to the lack of tools to visualise these nerve cells in their natural state.

The Singapore breakthrough, published in *Angewandte Chemie International Edition* early this year, overcomes current limitations. Although fluorescent proteins are able to view neurons, their complicated and laborious preparation deters general use. NeuO, however, can be easily introduced intravenously instead of having to genetically engineer an organism to express the protein.

Led by NUS Chemistry Professor Chang Young-Tae, the team developed and tested NeuO on zebrafish and mice. The non-toxic chemical crosses the blood-brain barrier and selectively stains neurons immediately. The fluorescence passes out of the body harmlessly in a few hours.

Prof Chang, who also heads the Laboratory of Bioimaging Probe Development in A*STAR's Singapore Bioimaging Consortium (SBIC), said his team adopted an innovative Diversity-Oriented approach, which differs from other probes that focus on specific targets. By screening large numbers of compounds on various cells, the team has established a huge library of more than 10,000 compounds, enabling rapid screening for subsequent tests on any type of cell.

The group has filed patents for both the approach and NeuO, and licensing is ongoing, Prof Chang disclosed. The compound is being shared with other research groups around the world for neurological investigation.



Cultured rat neurons stained with NeuO

Ethnicity associated with nose cancer

Nasopharyngeal cancer (NPC), also known as nose cancer, affects 9.5 in 100,000 people per year in Southeast Asia and East Asia, predominantly Chinese males. It is the eighth most common cancer among Singaporean men, occurring between 35 and 55 years of age.

However, little knowledge exists about non-Chinese patients.

An NUS study, a first involving multiple ethnicities, has found that the disease also affects 15 per cent of the non-Chinese population in Singapore. The discovery provides important intelligence of such links to NPC, potentially paving the way for developing targeted therapeutics against the cancer.

Previous research established that the Chinese in the region has genetic and environmental links to the cancer, with the Epstein Barr Virus variant showing a strong correlation. Hypotheses of causes include cultural dietary preference among Southern Chinese such as preserved food that might contain carcinogens, as well as immune response in viral-associated cancers.

Physicians from the NUS Yong Loo Lin School of Medicine, headed by Assistant Professor Lim Chwee Ming from Otolaryngology, retrospectively reviewed the charts of 558 NPC patients at the National University Hospital (NUH) from 2002 to 2012.

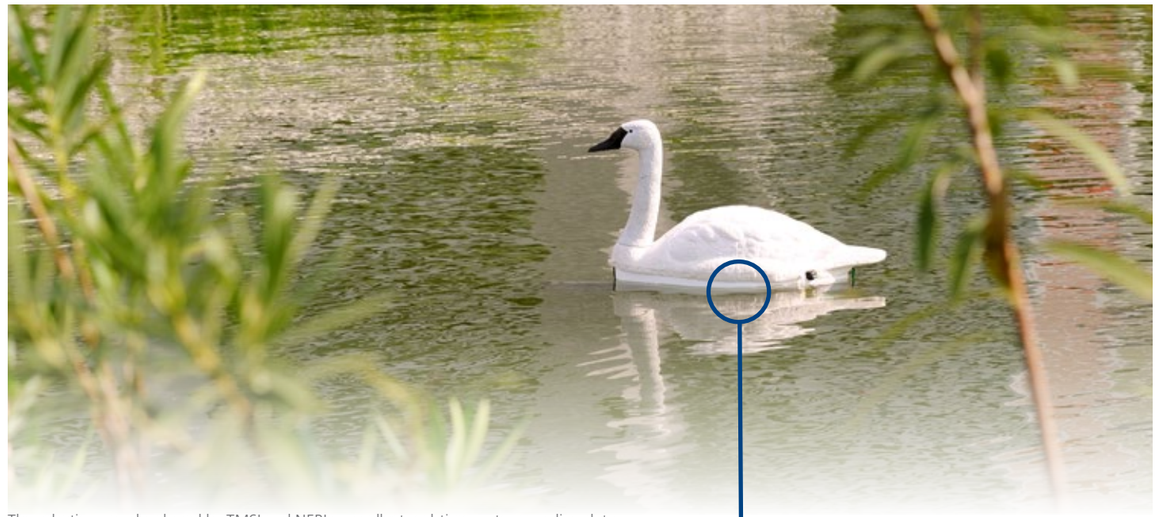
Although 85 per cent of the patients were Chinese, the number of non-Chinese subjects was still sizable, with Malays making up about 70 per cent of this group.

Many of the non-Chinese patients had advanced cancer when they first sought treatment, but there was no significant difference in the two groups' survival rates.

The report published in *PLOS* could enable scientists to focus on the Epstein Barr Virus for targeted treatment. Dr Lim pointed out that several groups at the National University Cancer Institute are working in this area.

He added that a clinical trial in cell therapy is currently underway at NUH. The collaboration involves NUS Adjunct Associate Professor Goh Boon Cher, Head of Haematology and Oncology at the Institute, and NUS Paediatrics Professor Dario Campana.

Robot swans patrol Singapore waters

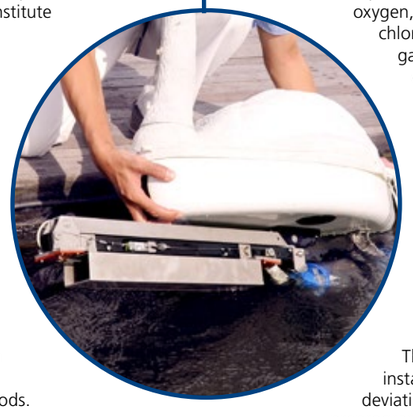


The robotic swan developed by TMSI and NERI can collect real-time water-sampling data

A flock of swans drifting on Pandan Reservoir in Singapore are on a mission, collecting real-time intelligence about the water.

The New Smart Water Assessment Network (NUSwan) project is a low-cost robotic platform that can offer water authorities an affordable and efficient alternative to the current laborious method of water sampling. This time-consuming and expensive operation requires a boat ride to fixed sampling locations.

NUSwan, developed by two NUS institutes — the Tropical Marine Science Institute (TMSI) and NUS Environmental Research Institute (NERI) — has recently been test-bedded at Pandan and Marina reservoirs. Data collected during this phase will be validated against that from other traditional monitoring methods.



Cost has been a barrier in getting field data, limiting scientists' understanding of the environment and relationship between numerous factors that are at play in complex ecosystems.

Lead researcher of the project Assistant Professor Mandar Chitre, TMSI's Acoustic Research Laboratory Head, believes that NUSwan "will be able to enhance our current capability and mitigate such a barrier".

Two of the swans are equipped to collect water parameters such as dissolved oxygen, pH levels and chlorophyll, while the third gathers atmospheric data, acting like a weather station. Data from the swans is streamed wirelessly to a server accessible via the Internet.

The swans can be loaded with different sensors and actuators, depending on need. They can also conduct instantaneous operations, deviating from their preprogrammed mission if the on-board probes sense an irregularity.

The Chinese National Engineering Center and the Shanghai Jiao Tong University have signed an agreement with NERI to test-bed the system in several rivers in Southern China. They are also exploring the possibility of using NUSwan for water surveillance in one of the world's largest reservoirs in China.