

LUCENCE DIAGNOSTICS

Taking technology out of the lab

What mattered for Lucence Diagnostics' journey, above any specific business strategy, was simply the will to take something commercial, right to the patient. The firm's growing revenue and the uptake of its tests are validations of its technology.

SOME firms undertake research and development to develop new products for the market. Others, like genomic medicine company Lucence Diagnostics, originate from the lab themselves.

Founded in 2016, Lucence is a spin-off from A*Star's Institute of Bioengineering and Nanotechnology.

Says chief executive Tan Min-Han: "A technology that is sitting in the lab, that is not taken out and scaled up, is of obviously very different value (to patients) from one that has been taken out and scaled up."

An oncologist by training and a cancer researcher, Dr Tan was a central member of the research team whose work forms the basis for Lucence's testing services.

The key innovation was a test that uses blood sampling for late-stage lung cancer. Compared to the usual tissue biopsy, the blood sample test is less invasive, less painful, and yields results within a day instead of 10 days. Lucence has since been able to apply this testing approach to late-stage colon and pancreatic cancer too.

Such late-stage testing helps doctors with decision-making, such as choosing the right drugs for treatment. As Dr Tan puts it: "Selecting the right drugs also means sparing the patients the futility of the wrong drugs."

Lucence offers a second category of services: blood tests to screen for nasopharyngeal and breast cancer.

There are not many such tests available now, notes Dr Tan. Furthermore, Singapore and Malaysia have the highest incidence of nasopharyngeal cancer in the world – presenting an opportunity for specialisation.

Liver cancer and certain types of lung cancer are

also particularly prevalent in these territories, he adds.

"If we can solve these problems better than other people, this is where our business advantages are."

The firm is further pressing its advantage as a pioneer in this area by developing a single blood test for the early detection of multiple cancers. Going another step earlier, Lucence's third range of services involves genetic testing for cancer risk assessment.

GOING COMMERCIAL

In 2017, Lucence won S\$100,000 in the Slingshot@Switch competition for startups held by Spring Singapore, which has since merged with International Enterprise Singapore to form Enterprise Singapore.

It was also in 2017 that Lucence obtained licensing as a clinical laboratory, allowing it to offer its services to actual patients.

Since then, it has handled a couple of thousand patient samples, with its services available through specialists and general practitioner's clinics.

In September 2018, Lucence received an honourable mention for its commercialisation strategy in the Intellectual Property (IP) Office of Singapore's annual awards.

Yet what mattered for the firm's journey, above any specific business strategy, was simply "the will to take something commercial", right to the patient, says Dr Tan.

He sees the commercialisation process as involving three aspects: having a strong core technology; taking the technology from the research setting to a commercial one; and being able to deliver and grow.

The people who were involved in developing the technology should also be involved in its scaling up and delivery, as they have the deepest understanding of the product or service, he adds.

"As researchers ourselves, we must look at and plan the process of taking technology into a real-world situation."

Granted, the shift may not always be easy, given the differing demands of research and business.

In a research setting, one has more time and resources to consider a problem, which is more conducive to the nurturing of technology, says Dr Tan.

In a commercial or industrial setting, in contrast, there is a constant need to consider quality control issues – particularly when dealing with clinical samples, as Lucence does – as well as turnaround time.

Commercialisation of technology that originates in a research lab can be challenging because of the complexities of technology transfer, such as questions relating to IP and how to manage it, adds Dr Tan.

Happily, A*Star itself was "very supportive". Lucence also benefited as a member of A*STARTCentral, a co-innovation space which helps to incubate, de-



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velop, train and support technopreneurs from A*Star.

Another factor that has aided Lucence's commercialisation efforts is simply the value of its services.

"At this phase of the company, demonstrating the ability to solve major problems, major technological problems, is of great commercial value. And we have demonstrated that already."

The fact that it can offer its tests as a clinical service, as opposed to merely for research purposes, is "already a major differentiator," he adds.

And the demand for their technology is undeniable: "The needs are huge." Both patients and physicians understand the significance of a less painful test process and earlier cancer detection – as does Dr Tan, as a medical doctor himself.

"As you see patients being spared painful procedures, as you see the results coming back in one day instead of 10 days, the differences become obvious ... We have a responsibility to our patients to do the right thing."

A BRIGHT FUTURE

Though it may not be obvious to the layman, Lucence's approach to cancer diagnostics is far from conventional. Says Dr Tan: "We have a long track record of maverick science. We disrupt."

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It is still early days yet for Lucence, which is in the seed stage and has raised eight figures' worth of funding. In line with its expanding business, the firm is moving from its current 1,200 square foot laboratory in Henderson Industrial Park to a nearby facility spanning 9,500 square feet.

As it grows, Lucence is not going it alone. Its central service lab in Singapore works with local partners in the Asean region, such as distributors of its tests or hospitals themselves.

In a mark of its global ambitions, Lucence is in the process of filing patents not just in Singapore, but also in China, the United States, and the European Union, with other jurisdictions such as Japan and South Korea "to be considered".

Outside Singapore, the firm also has offices in San Francisco and Hong Kong. The Hong Kong office can serve as a gateway for access to the Greater Bay Area, particularly Guangdong, adds Dr Tan. The Sino-Singapore Guangzhou Knowledge City has potential, for instance, and Lucence is exploring its options.

From the original nucleus of Dr Tan and a couple of colleagues, the team has grown to comprise 30 people across three offices, with 10 different nationalities and ethnicities represented.

About two-thirds work in research and development – an area that Lucence has no intention of neglecting, even as its commercial efforts intensify.

As Lucence continues its research efforts, it is also maintaining the spirit of collaboration that has fuelled some of its earlier work.

Its blood test for the early detection of nose cancer, for instance, arose from a research tie-up with the National Cancer Centre Singapore (NCCS). Lucence is now working with the NCCS on a three-year study to improve genetic testing of Asian women for breast and gynaecological cancers.

The Hong Kong office in particular is working on collaborations with academic institutions.

And there are "quite a few" other research collaborations in the pipeline, including some with private sector organisations, says Dr Tan.

"We are open and actively looking for partners in Singapore, Hong Kong, China, and the US," he adds.

For Lucence, taking technology out of the lab was just the first step. Their current mission: taking it further, out into the world.



From lab work to impacting patients' lives

A MOLECULAR biologist by training, Yukti Choudhury spent five years of her PhD investigating the function of just 21 DNA base pairs – the building blocks of DNA – in relation to a specific type of cancer. Though ground-breaking in its own way, the research had "no immediate impact", in contrast to the work that the 35-year-old does as chief technology officer of Lucence Diagnostics.

"In a research career, you're investigating a minute problem in the grand scheme of things," says Dr Yukti. Such extremely specific research is still important in solving medical issues, but how it can be taken out of the lab and translated into the medical field is "not readily apparent" when research is ongoing, she adds.

The most obvious difference between a research career and her current role, she says, is that the technology she works on now is scalable, applicable, and "actually makes a difference to patients' lives".

Dr Yukti previously worked at A*Star's Institute of Bioengineering and Nanotechnology. At Lucence, she develops the firm's proprietary technology, the core of which is the detection of changes in DNA.

Lucence's work is possible thanks to next-generation DNA sequencing technology, which has brought down the cost of sequencing a whole human genome – a person's entire genetic map – from US\$100 million in 2001 to close to US\$1,000 today.

Lucence aims to enhance what can be done by sequencing machines, and improve the data quality. This work rests on both data analysis and biological foundations, says Dr Yukti: "It's a marriage of the two. One wouldn't work without the other."

The team she manages includes staff who are qualified in software engineering and bioinformatics, which is the use of software tools for understanding biological data.

Besides digital skills, scientific know-how is required to develop the cancer-related tests that Lucence provides, for instance in determining what parts of the genome need to be studied "in a cost-effective manner".

As Dr Yukti puts it: "Do we really need to look at the whole genome to make certain decisions? Or can just as much information be gathered from, say, 10 targets?" She determines what should go into each test and what samples are needed so the test is "answering the right questions".

Even as Lucence takes research results from the lab into the real world, it is not neglecting the need for further investigation. As the firm processes more and more samples, it is also using them to build up a data bank which it hopes to mine for future discoveries. Says Dr Yukti: "We aim to harness the data that has been gathered on a large scale ... to find further patterns which might be useful for clinical purposes."

The most obvious difference between a research career and her current role as chief technology officer of Lucence Diagnostics, says Dr Yukti, is that the technology she works on now is scalable, applicable, and "actually makes a difference to patients' lives".

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