

\$130m RNA research programme launched to fight disease

It will formally study applications of RNA in vaccine development, among other things

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A new programme has been launched in Singapore to formally study the applications of ribonucleic acid (RNA) in vaccine development, as well as in disease therapy and prevention, to deepen Singapore's competitive edge in the emerging space.

The seven-year \$130 million programme – dubbed the National Initiative for RNA Biology and Its Applications (Nirba) – is backed by the National Research Foundation (NRF).

Announcing its launch on March 24 at the National University of Singapore (NUS), Deputy Prime Minister Heng Swee Keat said: "RNA biology and its applications are an important domain in foundational research."

DPM Heng, who is also chairman of the NRF, said Singapore's experience with Covid-19 demonstrated that the rapid development and deployment of mRNA vaccines saved countless lives.

"Since then, the number of potential therapies and applications tapping RNA technology has grown significantly," he said, adding that RNA-based therapies are being tested to tackle a wider range of ailments, including cancers and metabolic diseases.

As at end-2023, at least 25 RNA-based therapies had been approved by the US Food and Drug Administration to target infectious diseases, rare genetic diseases and high cholesterol, DPM Heng said.

More than 125 such therapies are also undergoing clinical trials to target cardio-metabolic and neurological diseases as well as cancer, he added.

RNA molecules – present in all living organisms and in many viruses – serve as vital messengers that translate genetic information into proteins, driving the biological processes essential to life.

"It is still early days for RNA technology, but its potential is very promising. As populations in Singapore – and many parts of Asia and the world – age, demand for these new therapies to increase health spans will rise," DPM Heng said.

Through Nirba, Singapore aims to strengthen its RNA capabilities by providing a platform for the key research institutions here to collaborate and share the management of intellectual property.

To this end, NUS, Nanyang Technological University and A*Star have signed a master research collaboration agreement.

A new 2,000 sq m space at NUS – equipped to meet the biological, structural, chemical and computa-

tional needs of research projects – will serve as a hub for researchers to convene and exchange ideas.

Nirba will focus its research on four competitive peaks of excellence:

- How Asian genetic diversity impacts the RNA biology of diseases including cancer, heart disease, diabetes and other conditions relevant to Singapore. Scientists will examine whether Asian genomic variants affect RNA expression, modification and function in different cell types linked to these diseases.
- How chemical modifications on RNA alter host immunity. RNA modifications, or small chemical changes made to RNA molecules, play a crucial role in helping our body balance immune responses, enabling the body to fight off infections while protecting our own healthy cells.
- How RNA molecules enter cells and are transported within them to lay scientific

foundations for effective RNA-based therapeutics that selectively target diseased tissues.

- How RNA-based drugs exert their effects and are cleared from the body after administration – a critical enabler for the development of RNA-based therapies and vaccines in Singapore.

Professor Ashok Venkitaraman, who leads Nirba, explained that Asian genes, which differ from those of people in Europe or the US, make Asians especially vulnerable to, for instance, diabetes.

"Singapore has two enemies of healthy ageing: cancer and cardio-metabolic syndromes (which are diseases of the heart, brain and metabolism)," he said, noting that research outcomes include preventing and effectively treating these diseases.

Prof Venkitaraman is also professor of medicine at the NUS Yong Loo Lin School of Medicine, director of the Cancer Science Institute of Singapore at NUS, and research

director at the Institute of Molecular and Cell Biology at A*Star.

Over the next seven years, funding by NRF will also be allocated to training researchers, recruiting overseas talent, sharing resources, and exposing local research staff to collaborative projects.

DPM Heng said Singapore's capabilities in genomics and precision medicine, anchored by programmes like PRECISE-SG100K, provide a good base for advancing RNA-based therapeutics.

For instance, the work of PRECISE-SG100K has started to establish links between Asian genetic ancestry and different diseases such as cardio-metabolic syndromes and cancer.

Over the last 25 years, Singapore has steadily built up its biomedical ecosystem and capabilities. Today, nine out of 17 A*Star research institutes are focused on biomedical research, said DPM Heng.

Singapore also has strong partnership with global biomedical leaders including Pfizer, Novartis, Thermo Fisher Scientific, MSD and Sanofi. Today, Singapore hosts

more than 30 regional headquarters of the world's leading biomedical companies, including nine of the top 10 global pharmaceutical companies.

In 2023, the biomedical sector accounted for 2.55 per cent of Singapore's gross domestic product, with manufacturing output growing steadily at 4.4 per cent annually since 2015.

"Importantly, deepening our biomedical research capabilities has had tangible impact on our people, including saving lives in moments of crisis," said DPM Heng.

During the Covid-19 pandemic, for example, the Diagnostics Development Hub that was launched back in 2014 was instrumental in developing the Fortitude diagnostic test kit. This was used to detect cases quickly and stem the spread of infections. The test kit, which was rolled out in February 2020, was especially useful in the early days of the pandemic when therapeutics were not yet widely available, he added.

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Deputy Prime Minister Heng Swee Keat speaking at the launch of the National Initiative for RNA Biology and Its Applications on March 24. He said RNA-based therapies are being tested to tackle a wider range of ailments, including cancers and metabolic diseases. ST PHOTO: BRIAN TEO