



Jay Keasling, a professor at the University of California, Berkeley, leads the new lab, which is a collaboration between A*STAR's Singapore Institute of Food and Biotechnology Innovation and the National University of Singapore.
ST PHOTO: JASEL POH

Singapore opens synthetic biology lab to grab share of potential \$80b global market

It will use bioengineered yeast, fungi as 'cell factories' to make vaccines, biofuels

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A new laboratory has been launched in Singapore to transform recent breakthroughs in synthetic biology into commercial products, from eco-friendly cosmetics to affordable vaccines.

At the heart of the new lab's mission is the use of bioengineered yeast and fungi as "cell factories" to convert simple nutrients into complex molecules for the production of everything from vaccines to bio-fuels.

This scientific field, known as synthetic biology, where engineering principles are applied to living organisms, is projected to grow to more than US\$62 billion (S\$80 billion) in 2030 amid rising demand for sustainable chemicals and fuels, according to a January report by market research firm The Business Research Company.

Launched on June 11, the new lab is a collaboration between A*STAR's Singapore Institute of Food and Biotechnology Innovation (SIFBI) and the National University of Singapore (NUS).

Dubbed the Platform for Research and Innovation in Metabolic Engineering, the lab will combine NUS' foundational scientific research with SIFBI's expertise in cultivating and modifying biological materials.

The cell factories in the lab will allow for access to a new class of ingredients and chemicals that were previously too complex or costly to produce commercially.

The lab will be led by Jay Keasling, a professor at the University of California, Berkeley, who is widely credited with innovating the use of bioengineered yeast to produce a molecule called QS-21.

QS-21 is a plant extract that is typically added to vaccines for diseases such as shingles to enhance the body's immune response. It could cost more than US\$200 million to extract 1kg of QS-21.

The use of yeast has made it cheaper – a mere US\$200 – and more efficient to produce that same amount of QS-21. Yeast has also made the production more eco-friendly, without the need for chemicals to extract the molecule from plants.

The technology has been employed to create items ranging from cosmetics to biofuels, he noted, reducing the need to extract molecules from plants and animals.

The lab will support companies in developing and testing sustainable, synthetic alternatives to conventional chemical manufacturing.

Scientists at the new lab will use artificial intelligence to help them design molecules, as well as in other processes, Keasling said, describing the lab as "self-driving".

"That's our long-term goal: to have AI and automation work together to drive the engineering of biology," he said.

Using machine learning and biological data, the lab can help scientists to shorten development timelines, reducing the time and cost to bring new products to market.

The lab will also train future scientists and engineers in areas such as synthetic biology and metabolic engineering. Metabolic engineering involves the optimisation of a cell's genetic and regulatory processes to increase production of certain substances. The lab will offer joint supervision arrangements, internships and fellowships.

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What the new lab does is part of the so-called bio-economy, where renewable biological resources are tapped to produce food, energy and goods.

SIFBI executive director Sze Tan described bio-economy as the "next industrial revolution", and said its focus on sustainability is a chance to reverse the effects of previous industrial revolutions.

"We now have the tools to re-imagine biology, a chance to be bold and lead," she said, adding that the lab will help bridge the gap between academia and industry.

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