PRESS RELEASE

Harvesting baker's yeast for ageing-related therapeutics

Researchers from Singapore and the UK successfully engineer common baker's yeast to produce D-lysergic acid (DLA), an ingredient used in medicine for dementia and Parkinson's Disease.

Singapore, 7 February 2022 — Around the world, more people are growing older. According to the World Health Organisation, 1 in 6 people in the world will be aged 60 years or over by 2030. By 2050, the world's population of people aged 60 years and older will double to 2.1 billion. The number of persons aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million.

In line with the growing number of seniors, the number of people living with age-related diseases such as dementia, including Alzheimer's Disease and Parkinson's Disease is also expected to increase exponentially. These age-related diseases are an emerging impediment to healthy and functional ageing.

A class of medicine used in the treatment of neuro-cognitive diseases and other neurological ailments (migraines, headaches, etc) are currently obtained from extracts of the ergot fungus. However, continued cultivation of the ergot fungus for medicine is not sustainable as industrial agriculture is one of the largest contributors to carbon emissions worldwide.

To meet the global demand for such medication, between 10-15 tons of D-lysergic acid (DLA), an ingredient used in producing the medicine, are produced each year. The ergot fungi are parasites to cereal crops such as rye, and their cultivation entails growing them on top of fields of such crops that could otherwise be used for food production. In order to reduce the use of arable land to produce such medicine, a group of researchers from the Yong Loo Lin School of Medicine at the National University of Singapore (NUS Medicine) and Imperial College London have trialled an alternative way of producing DLA.

Using yeast commonly known to make bread, and synthetic biology techniques, the team introduced the enzymes from the ergot fungus into baker's yeast, which also happens to be another fungus. Through a process known as fermentation, the modified yeast was then grown using sugar to produce DLA. Natural fermentation has been used throughout human history for food production, most notably in the production of bread and beer. Just like how baker's yeast has been used to produce the alcohol and flavours in beer, fermentation using the modified yeast can now produce DLA.

The study was published in Nature Communications on 7 Feb 2022.

“It is possible to produce up to five tons of DLA annually using the current yeast strain; and with further optimisation, commercial production levels could be attainable,” explained Associate Professor Yew Wen Shan from the Department of Biochemistry at NUS Medicine and the co-lead Principal Investigator of the study. “This research builds upon the growing body of work that use microbes such as yeast for the sustainable production of medicine and functional food ingredients.”

Professor Paul Freemont, from the Department of Infectious Disease at Imperial College London, said: “Yeast has been a key part of human civilization for thousands of years, helping us to make bread and brew beer. But our relationship with this familiar microbe is evolving. Through this exciting collaboration we have been able to harness fungal cells to act as miniature factories to produce raw compounds for medicines. This is an example of how something seemingly small and inconsequential has the potential to change human lives, providing the drugs which will enable us to age better and reduce the environmental impact of industrial drug production.”

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About the National University of Singapore (NUS)

The National University of Singapore (NUS) is Singapore’s flagship university, which offers a global approach to education, research and entrepreneurship, with a focus on Asian perspectives and expertise. We have 17 faculties across three campuses in Singapore, with more than 40,000 students from 100 countries enriching our vibrant and diverse campus community. We have also established our NUS Overseas Colleges programme in more than 15 cities around the world.

Our multidisciplinary and real-world approach to education, research and entrepreneurship enables us to work closely with industry, governments and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, 30 university-level research institutes, research centres of excellence and corporate labs focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research and cybersecurity.

For more information on NUS, please visit www.nus.edu.sg

About the NUS Yong Loo Lin School of Medicine (NUS Medicine)

The NUS Yong Loo Lin School of Medicine is Singapore's first and largest medical school. Our enduring mission centres on nurturing highly competent, values-driven and inspired healthcare professionals to transform the practice of medicine and improve health around the world.

Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus on innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University of Singapore and a founding institutional member of the National University Health System. It is Asia's leading medical school and ranks among the best in the world (Times Higher Education World University Rankings 2022 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2021).

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Imperial is University of the Year 2022 in the Times and Sunday Times Good University Guide. It is the world's fifth most international university, according to Times Higher Education, with academic ties to more than 150 countries. Reuters named the College as the UK's most innovative university because of its exceptional entrepreneurial culture and ties to industry.

Imperial staff, students and alumni are working round-the-clock to combat COVID-19. Imperial is at the forefront of coronavirus epidemiology, virology, vaccine development and diagnostics.

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