PRESS RELEASE

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NUS Medicine researchers identify key protein that could reverse ageing

The researchers have found that the increased expression of transcription factor DMTF1 can improve neural stem cell function, providing insights to how neural stem cells change with age and degeneration.

Singapore, 19 January 2026 — Researchers at the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine), have found that a key protein can help to regenerate neural stem cells, which may improve ageing-associated decline in neuronal production of an ageing brain. Published in Science Advances, the study identified a transcription factor in the brain, cyclin D-binding myb-like transcription factor 1 (DMTF1), as a critical driver of neural stem cell function during the ageing process. Transcription factors are proteins that regulate genes to ensure that they are expressed correctly in the intended cells.

The study, led by Assistant Professor Ong Sek Tong Derrick and first author Dr Liang Yajing, both from the Department of Physiology and the Healthy Longevity Translational Research Programme at NUS Medicine, sought to identify biological factors that influence the degeneration of neural stem cell function often associated with ageing, and guide the development of therapeutic approaches to mitigate the adverse effects of neurological ageing.

The research team assessed the role of DMTF1 in affecting neural stem cell function during brain ageing, using neural stem cells derived from human and laboratory models that simulate premature ageing. Genome binding and transcriptome analyses were employed to elucidate the mechanism of how DMTF1 promotes neural stem cell function. Specifically, the researchers analysed how DMTF1 interacted with telomere dysfunctional neural stem cells and potential regeneration approaches. Telomeres are the ends of chromosomes and gradually erode as cells divide. The gradual erosion of telomeres is an indicator of ageing.

The study found that DMTF1 levels are repressed in the “aged” neural stem cells, and that restoring DMTF1 expression is sufficient to restore the regeneration capabilities of such neural stem cells. The study results suggest that DMTF1 may serve as a potential

therapeutic target to restore neural stem cell function during brain ageing. The researchers also uncovered a novel mechanism that implicates DMTF1 in controlling the expression of helper genes (Arid2 and Ss18) that open up DNA and activate other growth-related genes. Without these helpers, neural stem cells lose their ability to renew.

“Impaired neural stem cell regeneration has long been associated with neurological ageing. Inadequate neural stem cell regeneration inhibits the formation of new cells needed to support learning and memory functions. While studies have found that defective neural stem cell regeneration can be partially restored, its underlying mechanisms remain poorly understood,” said Asst Prof Ong. “Understanding the mechanisms for neural stem cell regeneration provides a stronger foundation for studying age-related cognitive decline.”

The study findings also suggest approaches that enhance expression or activity of DMTF1 may have therapeutic potential in reversing or delaying ageing-associated decline of neural stem cell function.

While the preliminary findings stemmed mainly from in vitro experiments, the researchers hope to explore if elevating DMTF1 expression can regenerate neural stem cell numbers as well as improve learning and memory under the conditions of telomere shortening and natural ageing, without increasing the risk of brain tumours. The long-term objective is to discover small molecules that can enhance DMTF1 expression and activity to improve the function of aged neural stem cells.

“Our findings suggest that DMTF1 can contribute to neural stem cell multiplication in neurological ageing,” Dr Liang said. “While our study is in its infancy, the findings provide a framework for understanding how ageing-associated molecular changes affect neural stem cell behaviour, and may ultimately guide the development of successful therapeutics.”

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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, research centres of excellence, corporate labs and more than 30 university-level research institutes 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.

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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 one of the leading medical schools in Asia and ranks among the best in the world (Times Higher Education World University Rankings 2025 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2025).

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