

**MEDIA RELEASE
FOR IMMEDIATE RELEASE**

21 AUG 2017

REPAIRING DAMAGED HEARTS WITH SELF-HEALING HEART CELLS

Researchers discover a new molecule, ‘Singheart’, that may hold the key to triggering the regeneration and repair of damaged heart cells

Singapore – New research has discovered a potential means to trigger damaged heart cells to self-heal. The discovery could lead to groundbreaking forms of treatment for heart diseases. For the first time, researchers have identified a long non-coding ribonucleic acid (ncRNA) that regulates genes controlling the ability of heart cells to undergo repair or regeneration. This novel RNA, which researchers have named “Singheart”, may be targeted for treating heart failure in the future. The discovery was made jointly by A*STAR’s Genome Institute of Singapore (GIS) and the National University Health System (NUHS), and is now published in *Nature Communications*.

Unlike most other cells in the human body, heart cells do not have the ability to self-repair or regenerate effectively, making heart attack and heart failure severe and debilitating. Cardiovascular disease (CVD) is the leading cause of death worldwide, with an estimated 17.7 million people dying from CVD in 2015¹. CVD also accounted for close to 30% of all deaths in Singapore in 2015².

In this project, the researchers used single cell technology to explore gene expression patterns in healthy and diseased hearts. The team discovered that a unique subpopulation of heart cells in diseased hearts activate gene programmes related to heart cell division, uncovering the gene expression heterogeneity of diseased heart cells for the first time. In addition, they also found the “brakes” that prevent heart cells from dividing and thus self-healing. Targeting these “brakes” could help trigger the repair and regeneration of heart cells.

“There has always been a suspicion that the heart holds the key to its own healing, regenerative and repair capability. But that ability seems to become blocked as soon as the heart is past its developmental stage. Our findings point to this potential block that when lifted, may allow the heart to heal itself,” explained A/Prof Roger Foo, the study’s lead author, who is Principal Investigator at both GIS and NUHS’ Cardiovascular Research Institute (CVRI) and Senior Consultant at the National University Heart Centre, Singapore (NUHCS).

¹ World Health Organization <http://www.who.int/mediacentre/factsheets/fs317/en/>

² Singapore Heart Foundation <http://www.myheart.org.sg/article/about-the-heart-and-heart-disease/statistics/singapore/75>

“In contrast to a skin wound where the scab falls off and new skin grows over, the heart lacks such a capability to self-heal, and suffers a permanent scar instead. If the heart can be motivated to heal like the skin, consequences of a heart attack would be banished forever,” added A/Prof Foo.

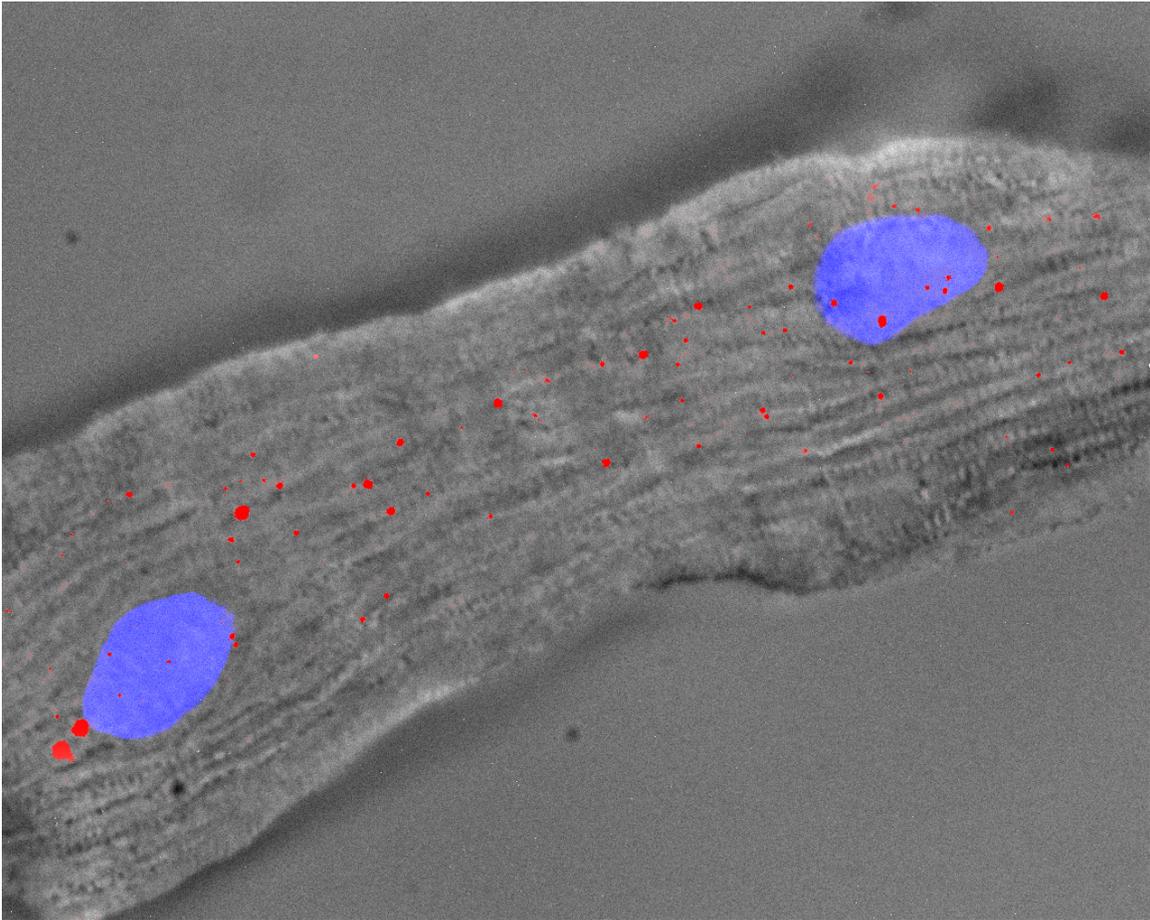
The study was driven by first author and former Senior Research Fellow at the GIS, Dr Kelvin See, who is currently a Postdoctoral Researcher and Mack Technology Fellow at University of Pennsylvania.

“This new research is a significant step towards unlocking the heart’s full regenerative potential, and may eventually translate to more effective treatment for heart diseases. Heart disease is the top disease burden in Singapore and strong funding remains urgently needed to enable similar groundbreaking discoveries,” said Prof Mark Richards, Director of CVRI.

Executive Director of GIS, Prof Ng Huck Hui added, “This cross-institutional research effort serves as a strong foundation for future heart studies. More importantly, uncovering barriers that stand in the way of heart cells’ self-healing process brings us another step closer to finding a cure for one of the world’s biggest killers.”

This research project is funded by the Asian neTwork for Translational Research and Cardiovascular Trials (ATTRaCT) programme – an A*STAR-led initiative to deepen understanding of CVD progression in heart failure – and supported by the National Medical Research Council of Singapore, and Biomedical Research Council (BMRC) Young Investigator Grant award 2016 to Dr See.

Image



(Image source: A*STAR's Genome Institute of Singapore)

A mouse heart cell with 2 nuclei (blue) and Singheart RNA labelled by red fluorescent dyes.

Notes to Editor:

The research findings described in this media release can be found in the scientific journal *Nature Communications*, under the title, “*Single cardiomyocyte nuclear transcriptomes reveal a lincRNA-regulated de-differentiation and cell cycle stress-response in vivo*” by Kelvin See¹, Wilson L.W. Tan^{1,2}, Eng How Lim^{1,2}, Zenia Tiang^{1,2}, Li Ting Lee¹, Peter Y.Q. Li², Tuan D.A. Luu², Matthew Ackers-Johnson² & Roger S. Foo^{1,2}

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About A*STAR's Genome Institute of Singapore (GIS)

The Genome Institute of Singapore (GIS) is an institute of the Agency for Science, Technology and Research (A*STAR). It has a global vision that seeks to use genomic sciences to achieve extraordinary improvements in human health and public prosperity. Established in 2000 as a centre for genomic discovery, the GIS will pursue the integration of technology, genetics and biology towards academic, economic and societal impact.

The key research areas at the GIS include Human Genetics, Infectious Diseases, Cancer Therapeutics and Stratified Oncology, Stem Cell and Regenerative Biology, Cancer Stem Cell Biology, Computational and Systems Biology, and Translational Research.

The genomics infrastructure at the GIS is utilised to train new scientific talent, to function as a bridge for academic and industrial research, and to explore scientific questions of high impact.

For more information about GIS, please visit www.gis.a-star.edu.sg

About the Agency for Science, Technology and Research (A*STAR)

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector agency that spearheads economic oriented research to advance scientific discovery and develop innovative technology. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit society.

As a Science and Technology Organisation, A*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by contributing to societal benefits such as improving outcomes in healthcare, urban living, and sustainability.

We play a key role in nurturing and developing a diversity of talent and leaders in our Agency and Research Institutes, the wider research community and industry. A*STAR oversees 18 biomedical sciences and physical sciences and engineering research entities primarily located in Biopolis and Fusionopolis.

For more information on A*STAR, please visit www.a-star.edu.sg

About National University Health System (NUHS)

The National University Health System (NUHS) is an integrated Academic Health System and Regional Health System in Singapore that delivers value-driven, innovative and sustainable healthcare.

Institutions in the NUHS group include four hospitals - National University Hospital, Ng Teng Fong General Hospital, Jurong Community Hospital and Alexandra Hospital (in 2018); three National Specialty Centres - National University Cancer Institute, Singapore (NCIS), National University Heart Centre, Singapore (NUHCS) and National University Centre for Oral Health, Singapore (NUCOHS); a polyclinic group - the National University Polyclinics (NUP); one medical centre – Jurong Medical Centre; and three academic health sciences institutions – NUS Yong Loo Lin School of Medicine (including the Alice Lee Centre for Nursing Studies), NUS Faculty of Dentistry and NUS Saw Swee Hock School of Public Health.

With member institutions under a common governance structure, NUHS creates synergies for the advancement of health by integrating patient care, health science education and biomedical research.

As a Regional Health System, NUHS works closely with health and social care partners in the public, private and people sectors to develop and implement programmes that contribute to a healthy and engaged population in the Western part of Singapore.