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THE BIOLOGY OF AGEING: TACKLING THE SILVER TSUNAMI THROUGH A FUNDAMENTAL APPROACH

*A*STAR and NUHS launch SG90, a new study looking at biological signatures of ageing to improve the health span of Singaporeans*

Singapore – The Agency for Science, Technology and Research (A*STAR), and the National University Health System (NUHS) have launched a new study to help Singapore's rapidly ageing population to live longer and healthier lives. The SG90 Longevity Cohort Study will examine those aged 90 and above to look at biological signatures of healthy ageing. Through studying the underlying biology of ageing, novel ways to extend one's health span, or the length of time in which one is free of the harmful conditions of old age, can be developed.

As a whole, the world is seeing a trend of longer life expectancy. Combined with a marked decline in fertility rates, the increase in life expectancy is resulting in a rapidly ageing population. Between 2000 and 2050, the proportion of the world's population over 60 years will double from around 11% to 22%[1].

Singapore is one of the fastest ageing countries in the world. By 2030, one in five Singaporeans will be aged 65 and older and there will be nearly a million elderly, of whom the vast majority will have at least one medical condition, resulting in reduced autonomy and lower quality of life. The estimated number of elderly who may require assistance with daily living is expected to nearly triple between 2010 and 2030.[2]

Measures have been put in place in Singapore to support a growing senior population and to help them age-in-place and live fulfilling lives. However, enhancing the health span of the elderly, such that they are free from age-related conditions for a longer time, would significantly mitigate this issue in the long run.

[1] 'Global Strategy and Action Plan on Ageing and Health: Draft 0', Aug-Oct 2015, World Health Organization
[2] 'Long-Term Care in Singapore: Challenges and Learning Points', Ministry of Health, Singapore

Recognising this need, A*STAR and NUHS have launched the SG90 Longevity Cohort Study. Based on the current population census, an estimated 13,000 are aged 90 and above in Singapore. By looking at a cohort of 1,000 such individuals, the study will identify biomarkers linked to successful ageing. Follow-ups will be spaced closely to track the health of these individuals and understand the processes that lead to the appearance and progression of diseases.

While such studies are already being conducted worldwide, they tend to be of limited genetic diversity and relevance to Asian populations. The SG90 Longevity Cohort Study will be the first longevity cohort study in the world to focus on three major Asian ethnicities, making it representative of half of the world population, and with immediate applications to Singapore's population. The in-depth clinical phenotyping and biological characterization of the SG90 study creates a unique opportunity to tackle age-related issues.

A*STAR, National University Hospital (NUH), and the National University of Singapore (NUS) have already embarked on a joint study in 2014 to better understand immunosenescence, or age-related loss of immunity[3]. Adopting the same collaborative approach, the SG90 study also synergises clinical and scientific expertise from NUHS with A*STAR's deep scientific capabilities and resources, to deliver a unique platform examining the biology of ageing in Singapore, for Singaporeans. A*STAR's Singapore Immunology Network (SIgN) and Singapore Institute for Clinical Sciences (SICS) will contribute their established domain knowledge in immunosenescence and cellular ageing, and epigenetics and nutrition, respectively. This will complement ongoing NUHS ageing cohort studies in Singapore, such as the Singapore Longitudinal Ageing Studies (SLAS) and the Singapore Chinese Health Study[4].

The SG90 study is part of an overarching ageing programme by A*STAR and NUHS, with other cohort studies in the pipeline as well. Through understanding the root causes of ageing, and identifying biomarkers of healthy and unhealthy ageing, pre-emptive solutions to address unhealthy ageing can be developed. The end goal is to empower Singaporeans to live longer, healthier and more fulfilling lives.

"A more fundamental approach to understand scientifically how Singaporeans can adapt our diet and lifestyle, in a way that improves health span, is a challenge that we must take on. There is also a pressing need to discover biomarkers that can stratify the middle-aged and elderly population for pre-symptomatic interventions that will improve health span – a form of stratified medicine or precision prevention," said Associate Professor Chong Yap Seng, ,

[3] http://www.a-star.edu.sg/Media/News/Press-Releases/ID/2554/ASTAR-NUS-and-NUH-Join-Forces-to-Understand-Immune-Erosion-in-Elderly.aspx

[4] The Singapore Longitudinal Ageing Studies (SLAS) and the Singapore Chinese Health Study are existing ageing cohorts under NUHS, looking at individuals above 55 and 60 respectively.

Executive Director of A*STAR's Singapore Institute for Clinical Sciences (SICS) and Senior Consultant, National University Hospital, NUHS.

Mr Lim Chuan Poh, Chairman of A*STAR, said, "Addressing the issue of ageing is a key priority for Singapore and A*STAR. A*STAR has made a strategic push towards R&D to support Singapore's growing senior population, from assistive medical technologies and therapeutics, to the new cohort study. The study will be invaluable in our efforts to develop impactful healthcare solutions and ensure healthy, meaningful lives for the elderly."

Associate Professor Yeoh Khay Guan, Deputy Chief Executive (Academic Enterprise), NUHS and Dean of the NUS Yong Loo Lin School of Medicine, said, "Building a deeper base of knowledge around the science of healthy longevity can only come about through deep, sustained, collaborative research. The NUHS and NUS bring a combined expertise in a multitude of biomedical disciplines, and together with A*STAR and the Singaporean scientific community, we are working to improve health span, adding life to years, for people in Singapore, and beyond."

The SG90 Longevity Cohort Study was announced at the Opening Ceremony of the inaugural A*STAR-NUHS Biology of Ageing Conference, which is being held at the Grand Copthorne Waterfront Hotel Singapore from 22 to 24 October 2015.

Enclosed:

ANNEX A – Factsheet on SG90

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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 A*STAR's Singapore Immunology Network (SIgN)
The Singapore Immunology Network (SIgN), officially inaugurated on 15 January 2008, is a research consortium under the Agency for Science, Technology and Research (A*STAR)'s Biomedical Research Council. The mandate of SIgN is to advance human immunology research and participate in international efforts to combat major health problems. Since its launch, SIgN has grown rapidly and currently includes 250 scientists from 26 different countries around the world working under 28 renowned principal investigators. At SIgN, researchers investigate immunity during infection and various inflammatory conditions including cancer and are supported by cutting edge technological research platforms and core services.

Through this, SIgN aims to build a strong platform in basic human immunology research for better translation of research findings into clinical applications. SIgN also sets out to establish productive links with local and international institutions, and encourage the exchange of ideas and expertise between academic, industrial and clinical partners and thus contribute to a vibrant research environment in Singapore.

For more information about SIgN, please visit www.sign.a-star.edu.sg.

About A*STAR's Singapore Institute for Clinical Sciences (SICS)

Established in 2007, the Singapore Institute for Clinical Sciences (SICS) is a research institute within the Agency for Science, Technology and Research (A*STAR), and its mission is to do needs driven, impact-focused research to promote the health and human capacity of Singapore.

SICS is distinguished by its focus on clinical sciences and the use of innovative approaches and technologies that enable the efficient and effective study of human health and diseases. The clinician scientists in SICS conduct the full spectrum of "*bench to bedside*" research activities in:

- Metabolic diseases (including diabetes, obesity and insulin resistance)
- Pathways to normal growth and development (including neurocognitive and behavioural development) via birth cohort studies e.g. GUSTO & S-PRESTO
- Nutritional sciences (including functional foods, body composition, carbohydrate / fat / protein metabolism and aspects of food intake, energy regulation, human growth and development, satiety regulation, sensory and taste perception, and nutritional psychology)
- Biology of human ageing.

The institute aims to attract, train and nurture clinician-scientists and to develop joint programmes with universities, academic medical centres, government hospitals and research institutes.

For more information on SICS, please visit www.sics.a-star.edu.sg.

About the National University Health System (NUHS)

The National University Health System (NUHS) is an integrated academic health system that delivers value-driven, innovative and sustainable healthcare.

Grouping the National University Hospital (NUH), the National University Cancer Institute, Singapore (NCIS), the National University Heart Centre, Singapore (NUHCS), the NUS Yong Loo Lin School of Medicine, the NUS Faculty of Dentistry and the NUS Saw Swee Hock School of Public Health under a common governance structure, NUHS creates synergies for the advancement of health by integrating patient care, health science education and biomedical research.

NUHS also 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 its Regional Health System.

For more information on the NUHS, visit www.nuhs.edu.sg

ANNEX A

ANNEX – FACTSHEET ON SG90

SG90 Longevity Cohort: A longitudinal study to better understand pathways leading to health-span

The SG90 Longevity Cohort will be a cohort of 1,000 Singaporeans with a history of longevity: comprising the oldest old individuals (in this case, 90 years and above) who are ageing successfully and in sustained good health. This Cohort leverages on an ongoing ageing cohort study - the Singapore Longitudinal Ageing Study (SLAS). We will be recruiting these oldest old individuals from community settings within Singapore's heartlands. The SG90 Longevity Cohort spearheads our attempts to identify biological signatures of healthy ageing in Singaporeans. Such studies are now being conducted worldwide and Singapore researchers are actively networking and collaborating with some of the world leaders in this field, several of whom are attending the A*STAR-NUHS Biology of Ageing Conference taking place in Singapore from 22-24 Oct 2015.

We have the unique opportunity in Singapore of being home to 3 major Asian ethnicities (Chinese, Malay, and Indian) that represent about half the global population. Individuals aged 90 years old and older will be invited to participate and, based on the baseline clinical examination, stratified into healthy and less healthy sub-groups. This will allow an initial case-control study to examine the biological differences between healthy and less healthy participants. All participants will be clinically characterised, with bio-samples collected and stored, and have appropriate clinical imaging performed. They will be closely followed up to track their health trajectories. With this study design, we anticipate not only the discovery of potential biomarkers associated with medical conditions but also processes that lead to the appearance and/or progression of diseases.

In the second phase of SG90, we will further recruit the offspring and offspring's spouses of these oldest old, in an attempt to study the genetic advantage they may have – and tease apart the role of genetics versus that of lifestyle (e.g. nutrition and exercise) and environment – on their health span.