

Development of First-In-Class Antibody Therapeutics and New Partnership Bring Hope to Patients with Fibrotic and Inflammatory Diseases

- *Clinicians and scientists from National Heart Centre Singapore, Duke-NUS Medical School's Cardiovascular & Metabolic Disorders Programme (CVMD) and SingHealth Duke-NUS Academic Medical Centre (AMC)s' discovery of a key driver of fibrosis and inflammation in human diseases is now moving rapidly toward the clinic.*
- *Discovery and development of therapeutic candidates led by Singapore-based biotech spin out company Enleofen Bio is a first for the SingHealth Duke-NUS AMC, as is its partnership with a major pharmaceutical company, Boehringer Ingelheim.*
- *Enleofen Bio could receive more than US\$ 1 billion per product from Boehringer Ingelheim, which will further develop the therapies for multiple fibrotic human disorders, including non-alcoholic steatohepatitis (NASH) and progressive fibrosing interstitial lung diseases (PF-ILDs).*

Singapore, 9 January 2020 – The breakthrough discovery of investigational therapies for multiple human diseases by a team of Singapore clinicians, clinician scientists and scientists from National Heart Centre Singapore (NHCS), Duke-NUS Medical School's Cardiovascular & Metabolic Disorders Programme (CVMD), SingHealth Duke-NUS AMC and the Singapore-based biotech company Enleofen Bio, along with a newly forged partnership with Boehringer Ingelheim, brings hope to patients with fibro-inflammatory conditions worldwide.

Due to an incomplete knowledge of the fibrotic process, there are currently very limited effective therapies to treat many fibro-inflammatory diseases. The discovery of the role of a specific protein – interleukin 11 (IL-11) – in fibrotic diseases of the liver, lung, kidney, eye, skin and heart stimulated the development of bio-therapeutics called neutralising antibodies, to target and block IL-11 to reverse inflammation and improve fibrosis in diseased body organs. The findings of the various pre-clinical studies were published in high impact scientific journals¹.

“More than 225 million people worldwide suffer from heart and kidney failure, which resulted from the hardening of the organ tissues with no treatment. The development of anti-IL-11 therapies will offer hope to patients with end-stage heart, kidney, lung or liver failure, addressing the unmet medical needs of patients worldwide,” shared Professor Terrance Chua, Medical Director, NHCS and Group Chairman Medical Board, SingHealth.

A new strategic partnership between Enleofen Bio and the global pharmaceutical company, Boehringer Ingelheim, has been announced today. This partnership adds large value to the IL-11 programme and greatly accelerates the therapies towards the clinic. Boehringer Ingelheim is a global leader in the treatment of fibrotic lung diseases and in therapeutic antibodies. On top of its continued focus on fibrotic lung diseases, Boehringer Ingelheim is committed to targeting fibrosis and inflammation in multiple new areas, starting with liver disease.

Boehringer Ingelheim also brings deep expertise in drug manufacturing and clinical development giving the IL-11 programme the best chance of success.

“We are very excited to engage Boehringer Ingelheim, a leading and innovative pharmaceutical company on this important phase of drug and clinical development. This marks a major biotechnology success in Singapore and we are extremely proud of the clinicians and scientists at NHCS and Duke-NUS,” said Professor Stuart Cook, Tanoto Foundation Professor of Cardiovascular Medicine, Director of Duke-NUS’ Cardiovascular and Metabolic Disorders Programme, and Senior Consultant at the Department of Cardiology, NHCS.

“This collaboration brings together Boehringer Ingelheim’s expertise in drug development and NHCS’ and SingHealth Duke-NUS AMC’s strengths in clinical care and translational research. This is a crucial step in the translational medicine process, and puts us in good stead to bring new anti-IL11 therapies and improve healthcare outcomes for patients in Singapore and beyond,” said Professor Ivy Ng, Group CEO, SingHealth.

“This is yet another example of the impactful research emerging from the Academic Medicine partnership between Duke-NUS and SingHealth, which integrates cutting-edge science with patient care. This new partnership between Enleofen Bio and Boehringer Ingelheim provides great promise for practical and clinical solutions to improve healthcare and patients’ lives,” said Professor Thomas M. Coffman, Dean of Duke-NUS Medical School.

The discovery science and drug target validation was made possible by the research done in the laboratories of National Heart Research Institute of Singapore (NHRIS) of NHCS, Duke-NUS Medical School’s Cardiovascular & Metabolic Disorders Programme and SingHealth Duke-NUS AMC. Funding from the National Medical Research Council (NMRC) underpinned the research on IL-11, which was patented over several years of scientific study at SingHealth Duke-NUS AMC.

####

¹Reference:

- Schafer, S., Viswanathan, S., Widjaja, A. et al. IL-11 is a crucial determinant of cardiovascular fibrosis. *Nature* 552, 110–115 (2017) doi: [10.1038/nature24676](https://doi.org/10.1038/nature24676)
- Widjaja, A. A., Singh, B. K., Adami, E., et al. (2019). Inhibiting Interleukin 11 Signaling Reduces Hepatocyte Death and Liver Fibrosis, Inflammation, and Steatosis in Mouse Models of Nonalcoholic Steatohepatitis. *Gastroenterology*, 157(3), 777–792.e14. doi: [10.1053/j.gastro.2019.05.002](https://doi.org/10.1053/j.gastro.2019.05.002)
- Ng, B., Dong, J., D’Agostino, G., et al. (2019). Interleukin-11 is a therapeutic target in idiopathic pulmonary fibrosis. *Science Translational Medicine*, 11(511). doi: [10.1126/scitranslmed.aaw1237](https://doi.org/10.1126/scitranslmed.aaw1237)

About SingHealth Duke-NUS Academic Medical Centre

The SingHealth Duke-NUS Academic Medical Centre draws on the collective strengths of SingHealth and Duke-NUS Medical School to drive the transformation of healthcare and provide affordable, accessible, quality healthcare. With over 40 clinical specialties, a network of acute hospitals, national specialty centres, polyclinics and community hospitals, it delivers comprehensive, multi-disciplinary and integrated care. Beyond hospital walls, SingHealth works closely with community care providers to ensure patients remain well-supported after their discharge and to empower the population to stay healthy and age in place.

For more information, please visit: www.singhealth.com.sg.

About National Heart Centre Singapore

The National Heart Centre Singapore (NHCS) is a national and regional referral centre for cardiovascular diseases. NHCS provides a one-stop comprehensive cardiac care ranging from preventive, diagnostic, therapeutic to rehabilitative services. It is also the only heart and lung transplantation centre in Singapore.

Each year, NHCS handles over 120,000 outpatient consultations, 9,000 interventional and surgical procedures and 10,000 inpatients. Its clinical outcomes for heart attack treatment, balloon angioplasty with stenting and coronary bypass surgery have been shown to be equivalent to international benchmarks.

Established in 1998, NHCS is the pioneer in cardiovascular care in Singapore.

For more information, please visit www.nhcs.com.sg.

About Duke-NUS Medical School

Duke-NUS is Singapore's flagship graduate entry medical school, established in 2005 with a strategic, government-led partnership between two world-class institutions: Duke University School of Medicine and the National University of Singapore (NUS). Through an innovative curriculum, students at Duke-NUS are nurtured to become multi-faceted 'Clinicians Plus' poised to steer the healthcare and biomedical ecosystem in Singapore and beyond. A leader in ground-breaking research and translational innovation, Duke-NUS has gained international renown through its five signature research programmes and nine centres. The enduring impact of its discoveries is amplified by its successful Academic Medicine partnership with Singapore Health Services (SingHealth), Singapore's largest healthcare group. This strategic alliance has spawned 15 Academic Clinical Programmes, which harness multi-disciplinary research and education to transform medicine and improve lives.

For more information, please visit www.duke-nus.edu.sg.

About Enleofen Bio

Enleofen Bio Pte. Ltd. was founded in 2017 as a spin-out from National Heart Centre Singapore (NHCS), SingHealth and Duke-NUS Medical School, under the SingHealth Duke-NUS Academic Medical Centre (AMC), Singapore. Enleofen is a Singapore-based biotech company developing first-in-class antibody therapeutics for the treatment of fibro-inflammatory human diseases. The initial discovery science and drug target validation was carried out by Scientific Founders Stuart Cook and Sebastian Schäfer at SingHealth Duke-NUS AMC and was subsequently licensed to Enleofen, where Cook is a Director. Since 2017, the company has invested extensively in target validation, drug development, and preclinical studies, with the support of experienced international life sciences executives and investors, including founding Directors Jeffrey Lu and Andrew Khoo.

For more information, please visit www.enleofen.com.

Glossary for the Medical Terms

- Fibrosis is the formation of excessive connective tissue, causing scarring and failure of bodily organs and the skin. It is a common cause of cardiovascular and renal disease, where excessive connective tissue destroys the structure and function of the organ with scar tissue.
- Interleukin 11 (IL-11) – a critical protein that causes fibrosis and organ damage, which was initially thought to be anti-fibrotic until the SingHealth Duke-NUS AMC team of researchers overturned this misconception in a series of publications.
- Non-alcoholic steatohepatitis (NASH) – Liver inflammation and damage caused by a build-up of fat in the liver. It is a part of a group condition called non-alcoholic fatty liver disease. When NASH gets worse, it causes scarring of the liver, which leads to cirrhosis.

For media enquiries and interviews, please contact:

Ms Elaine Loh

Corporate Development, National Heart Centre Singapore

DID: 6704 2387

Email: elaine.loh.l.p@nhcs.com.sg

Ms Lekshmy Sreekumar

Communications, Duke-NUS Medical School

DID : 6516 1138

Email: lekshmy_sreekumar@duke-nus.edu.sg