



PRESS RELEASE

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Engineered bacteria and broccoli extract kills colorectal cancer cells

Singapore, 25 January 2018 — Colorectal cancer is one of the most common cancers in the world, especially the developed world. Although the five-year survival rates for earlier stages of this cancer are relatively good, at later stages survival goes down and the risk of cancer recurrence goes up considerably.

To help address this problem, a team of researchers from the Department of Biochemistry, National University of Singapore Yong Loo Lin School of Medicine (NUS Medicine), have found a way to turn a humble cocktail of bacteria and vegetables into a targeted system that seeks out and kills colorectal cancer cells. The study, which was led by Dr Chun-Loong Ho, was published online and in the January 2018 issue of *Nature Biomedical Engineering*.

At the heart of this cancer-targeting system is an engineered form of *E.coli* Nissle, a harmless type of bacteria found in the gut. Using genetic techniques, the team engineered the bacteria into a probiotic that attached to the surface of colorectal cancer cells and secreted an enzyme to convert a substance found in cruciferous vegetables (like broccoli) into a potent anticancer agent. The idea was for the cancer cells in the vicinity to take up this anticancer agent and be killed. Normal cells cannot perform this conversion, nor are they affected by the toxin, which targets only colorectal cancer cells.

The mixture of engineered probiotics with a broccoli extract or water containing the dietary substance killed more than 95 per cent of colorectal cancer cells in a dish. Strikingly, the probiotics-vegetable combination reduced colorectal cancer tumours by 75 per cent. Also, the tumours that were detected were three times smaller than those in controls which were not given the mixture.

Dr Ho and Associate Professor Matthew Chang, along with colorectal cancer specialist Dr Yong Wei Peng, Associate Director (Research) and Senior Consultant from the National University Cancer Institute, Singapore (NCIS), envision that these probiotics could be used in two ways: 1) prophylactically, i.e. as prevention, and 2) to mop up cancer cells remaining after surgical removal of tumours.

“The day may come when a weekly dose of the engineered probiotic drink with a healthy diet of cruciferous vegetables would suffice to prevent colorectal cancer or reduce recurrence after surgery,” Dr Ho suggested. He added, “Mothers are right after all - eating vegetables is important.”

A/Prof Chang added, "One exciting aspect of our strategy is that it just capitalises on our lifestyle, potentially transforming our normal diet into a sustainable, low-cost therapeutic regimen. We hope that our strategy can be a useful complement to current cancer therapies."

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About the National University of Singapore (NUS)

A leading global university centred in Asia, the National University of Singapore (NUS) is Singapore's flagship university, which offers a global approach to education and research, with a focus on Asian perspectives and expertise.

NUS has 17 faculties and schools across three campuses. Its transformative education includes a broad-based curriculum underscored by multidisciplinary courses and cross-faculty enrichment. Over 38,000 students from 100 countries enrich the community with their diverse social and cultural perspectives. NUS also strives to create a supportive and innovative environment to promote creative enterprise within its community.

NUS takes an integrated and multidisciplinary approach to research, working with partners from industry, government and academia, to address crucial and complex issues relevant to Asia and the world. Researchers in NUS' Schools and Faculties, 30 university-level research institutes and centres, and Research Centres of Excellence cover a wide range of themes including: energy, environmental and urban sustainability; treatment and prevention of diseases common among Asians; active ageing; advanced materials; risk management and resilience of financial systems. The University's latest research focus is to use data science, operations research and cybersecurity to support Singapore's Smart Nation initiative.

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

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

Established in 1905, the NUS Yong Loo Lin School of Medicine is the first institution of higher learning in Singapore and the genesis of the National University of Singapore.

The School offers one of the finest undergraduate medical programmes in the Asia Pacific region and enjoys international recognition and respect. The Times Higher Education World University Rankings 2016 by subject and Quacquarelli Symonds (QS) World University Rankings by Subject 2017 list NUS Medicine as a leading medical school in Asia.

It admits 300 students to the MBBS degree programme annually and its principal missions are to educate and train the next generation of healthcare professionals, and foster research that will help to advance the practice of medicine.

The 18 NUS Medicine departments in the basic sciences and clinical specialties work closely with the Centre for Medical Education, the Centre for Biomedical Ethics, the Centre for Healthcare Simulation as well as the restructured public hospitals to ensure that teaching and research are aligned and relevant to Singapore's healthcare needs. The School is a founding institutional member of the National University Health System.

For more information about NUS Medicine, please visit <http://nusmedicine.nus.edu.sg>