

SINERGY SEMINAR SERIES

NUS Synthetic Biology for Clinical and Technological Innovation (NUS SynCTI)
Member of Singapore Consortium for Synthetic Biology (Sinergy)



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Metabolic engineering and regulation of the biosynthesis of artemisinin, the most potent anti-malaria compound, in *Artemisia annua* L.

Artemisinin, an endoperoxide-containing sesquiterpene lactone isolated from *Artemisia annua* L., is extensively used in treating malaria. The artemisinin-based combination therapy (ACT) is recommended by World Health Organization (WHO) to combat the drug-resistant malaria. China's pharmacologist Youyou Tu received 2015 Nobel Prize in Physiology or Medicine due to the finding of artemisinin. However, the artemisinin content in *A. annua* is low (0.01-1% dry weight), and the demand for artemisinin is huge (180-200 tons/year). In addition, although the artemisinin biosynthesis in *A. annua* is almost elucidated, how artemisinin biosynthesis is regulated is poorly known. I will present recent achievements in my research group in the development of multiple metabolic engineering strategies to increase artemisinin content in *A. annua*. Specifically, we have developed *A. annua* lines with extremely high content of artemisinin (up to 2% DW), which are under the field trial in Africa. Our achievements, combined with efforts of the newly established Artemisinin Industrial Alliance comprised of all major Artemisia growers, artemisinin and ACT producers in China, will fundamentally solve the unstable artemisinin supply problem and guarantee the world the constant supply of artemisinin at low price to combat malaria.

Dr. Kexuan TANG is a Distinguished Professor, Director of Plant Biotechnology Research Center, Director of Fudan-SJTU-Nottingham Plant Biotechnology R&D Center at Shanghai Jiao Tong University. He serves as Chairman for the Artemisinin Industrial Alliance in China. He received his Ph.D from Nottingham University in 1996, and an honorary doctorate from Linnaeus University, Sweden in 2012. His research interests lie in plant metabolic regulation and engineering, plant bioreactors and plant molecular biology. In recently years, Prof. Tang presides over 20 research projects including the Bill & Melinda Gates Foundation, the Rockefeller Foundation, China National "863" High-Tech Project, China Transgenic Plant Research and Commercialization Project, China National "973" Basic Research Program Project, Sino-UK Collaborative Project, etc. He has engineered Artemisia annua plants with enhanced artemisinin contents, and engineered Catharanthus roseus with increased vinblastine contents. They were the first GM medicinal plants in field trials in the world. He has identified a number of transcription factors from A. annua which influence artemisinin accumulation and trichome development. He has published over 300 papers in international scientific journals such as SCIENCE ADVANCES, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA, CELL RESEARCH, etc. He has chief-edited two books, Plant Biotechnology, and Biotechnology of Traditional Chinese Medicine. He has over 200 patents filed or granted.

Tuesday, 12 March 2019 at 2pm
CeLS #01-06, CeLS Seminar Room 1

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hosted by: Dr Ling Hua

