The Chinese University of Hong Kong

Department of Biomedical Engineering

Genetic Switches for Precision Medicine

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Abstract

Synthetic biology-inspired gene- and cell-based therapies are recognized as central pillars of next-generation medicine. However, the controllability remains a critical issue for clinical applications. The design of sophisticated genetic switches enables spatial and temporal control of gene- and cell-based therapies. Such platform will open new possibilities for employing synthetic biology to advance personalized precision medicine. In this talk, I will present the most recent advances about design and creation of synthetic genetic switches for controlling cell behavior and drug delivery. We have engineered several gene switches controlled by small molecules for controlling blood glucose homebodies and chimeric antigen receptor T (Car-T) cell immunotherapy. Furthermore, we also have developed several innovative optogenetics-based technologies to achieve traceless, remotely controlled genome engineering and precision dosing of an enormous range of therapeutic outputs. These engineered genetic switches expand the synthetic biology toolkit for the development of therapeutic interventions and precise genome engineering in many areas of basic and translational research, which may in turn boost the clinical progress of precision medicines.

Biography

Dr. Haifeng Ye received his Ph.D degree and completed his Postdoctoral Research from Swiss Federal Institute of Technology Zurich (ETH Zürich). He has been awarded the “ETH Silver Medal” at ETH Zürich in 2013. He started his own group in the School of Life Sciences at East China Normal University (ECNU) in 2014 and established the Biomedical Synthetic Biology Research Center in 2019 at ECNU. In 2020, he was named the Wan Ren Scholar Distinguished Professor. His research interest has been focused on synthetic biology and biomedical engineering with the goal to achieve precise diagnosis and treatment of diseases. His research topics include optogenetics-based precision medicine, synthetic gene circuits for gene- and cell-based precision therapy, synthetic biology-based cancer therapy and precise controlled gene editing. His research work was published in the top scientific journals: Science, Science Translational Medicine, Science Advances, Nature Biotechnology, Nature Biomedical Engineering, Nature Chemical Biology, Nature Communications, Proc Natl Acad Sci USA, etc.

***** ALL ARE WELCOME *****

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