Taiwanese American Association of Pharmaceutical Sciences

台美藥劑學會

2019 TAAP Symposium

Speaker Introduction

Bio

Hsing has more than 10 years of experience in genetics, microbiology, and molecular biology. He is currently an associate research scientist in Harris Wang lab at Columbia University, where he focused on engineering CRISPR systems to regulate microbial gene expression and new technology development under the light of synthetic biology. He is passionate about stablishing high-throughput platforms to characterize or digitize biological systems. His recent publication in Science was elected as one of the top research achievements of 2019 in synthetic biology by SynBioBeta. Hsing receive his bachelor degree in Life Science from National Yang Ming University in Taiwan, and PhD degree in Molecular and Human Genetics from Baylor College of Medicine. His doctoral research used slime molds to study the genetic basis and evolutionary origin of social behaviors. During his PhD training, he was one of the 50 recipients of the International Student Research Fellowship from Howard Hughes Medical Institute in 2012. Hsing will be starting his new position in the protein engineering group at Merck in New Jersey.

Abstract

The core concept of synthetic biology is to engineer biological systems for designed functions. The field is growing rapidly and benefits from the cross pollination of different areas. With the advancement in sequencing, DNA synthesis, and automation, synthetic biology is expected to revolutionize multiple fields including medicine, agriculture, and food industry. Here, we present an example of applying engineering principles in re- designing biological systems. We described a generalizable strategy to preserve and constrain genetic information through computational design of overlapping genes. Overlapping a sequence with an essential gene prevents it from mutations even for synonymous ones. Embedding a toxin gene in a gene of interest restricts its horizontal gene transfer. We further demonstrated a multiplex and scalable platform to build and test thousands of overlapping gene designs. This work enables deeper exploration of natural and engineered overlapping genes and facilitates enhanced genetic stability and biocontainment in emerging applications.