Gene Editing and Applications

Session Organizers: Oscar Ortiz, Merck, and Stanley Qi, Stanford University

Whole genome sequencing of diverse organisms provides invaluable information about the landscape of the genome. Complete decoding of the genomic function related to biology, disease, and ecology requires precise and robust methods for genomic manipulation. Recent discoveries of zinc finger nucleases, TALENs, and the latest CRISPR/Cas9 technologies are beginning to universalize genome engineering as a routine lab technique. These new technologies and tools offer an effective means of "genetic surgery" and have great potential to enhance our understanding of genome function.

Beyond biological research, genome engineering is starting a revolution in therapeutics, environmental engineering, and agriculture. For example, genome engineering tools such as CRISPR/Cas9 may be used to treat genetic diseases such as muscular dystrophy. Moreover, this technology is starting to be used to repair patient hematopoietic cells for transplantation. In addition, CRISPR/Cas9 is a near-universal tool that has been successfully used in a broad catalog of organisms, including bacteria, animals, and crops.

Here we invite four speakers who contributed significantly to the field of gene editing and its applications. The first speaker, Montse Morell (Takara Bio), will introduce the state-of-the-art of customized nucleases and their applications for stem cell and regenerative medicine research. The second speaker, Jamal Alzub (University of Freiburg), will explain how CRISPR/Cas9 technology is used for gene therapy. The third speaker, Luisa Bortesi (RWTH Aachen), will focus on modifying crops using CRISPR/Cas9 and future perspectives of this work. The fourth speaker, Joseph Bondy-Denomy (University of California, San Francisco), will discuss moving "anti-CRISPR" proteins into human cells and how the proteins provide a robust "off-switch" for gene editing.