Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M19-105LC^
Published: 2/26/2020

Inventors

Kylie Standage-Beier
Xiao Wang
David Brafman
Nicholas Brookhouser
Parithi Balachandran

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

Novel Cas9 Fusion (iCas9)

In recent years, the true power of predictable and high-fidelity genome engineering for applications in gene therapy and biotechnology is closer than ever to being realized, and the CRISPR and CRISPR-associated (Cas) systems have played an instrumental role in this development. While CRISPR offers great programmability, it isn't perfect and its reliance on the generation of double stranded DNA breaks (DSBs) has increased susceptibility for off-target mutations as well as translocations and complex rearrangements of large sections of DNA. Despite all the tremendous advances in CRISPR, the technology still needs to be further developed to minimize genomic off target effects and maximize in vivo gene editing efficiency.

Researchers at Arizona State University have developed a novel recombinant Cas9-fusion (iCas9) that complements Cas9's programmability with a recombinase's functionality. iCas9 fuses a hyperactive mutant resolvase to a catalytically inactive Cas9 and is capable of targeting both DNA-deletion and integration, without the formation of insertion or deletion (indel) mutations. The ability of iCas9 to target DNA deletion and integration has been demonstrated in a human HEK293S cell line using plasmid reporter systems.

This novel iCas9, with its own recombinase functionality, enables the development of new approaches to CRISPR-Cas9-based genome engineering, synthetic biology and other biotechnology applications.

Potential Applications

- Genome engineering
- Synthetic biology
  - Construction and implementation of recombinase-based gene networks
- Gene therapy
- Generation of new cell lines
- Disease modeling
- Regenerative medicine

Benefits and Advantages

- Does not directly rely on DSB repair pathways thus reducing the likelihood of off-target effects such as:
  - Unwanted indel mutations at target site
  - Translocations and complex rearrangements of large sections of DNA
- Higher predictability and specificity than canonical CRISPR-Cas9 editing techniques
- Can target both DNA deletion and integration on genomic and episomal substrates
- May be helpful in editing cell types recalcitrant to DNA manipulations

For more information about this opportunity, please see

Standage-Beier et al - CRISPR J - 2019

For more information about the inventor(s) and their research, please see

Dr. Wang's laboratory webpage

Dr. Brafman's laboratory webpage