Southern Illinois University System

Applications

- Possible markets of interest, direct applications, etc.
- Try to include useful keywords or buzz words

Inventor(s)

Keith Gagnon, PhD

Dr. Gagnon is an Assistant Professor in the Department of Chemistry and Biochemistry at SIU Carbondale, with a cross appointment in the Department of Biochemistry and Molecular Biology at SIU School of Medicine. His research focuses on the molecular mechanisms of human neurological repeat expansion disorders as well as the roles of noncoding RNA in human biology and disease.

Masad Damha, PhD

Dr. Damha is a Distinguished James McGill Professor in the Department of Chemistry at McGill University. His research focuses on the chemical synthesis, biochemical properties and molecular behavior of nucleosides, nucleic acids, and their analogues.

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Tuning CRISPR/Cas9 Activity with Chemically Modified Nucleotide Substitutions

The CRISPR/Cas9 system is an innate defense mechanism present in many prokaryotic organisms that has been discovered and developed in recent years as a gene editing tool with numerous applications. The system generally consists of the Cas9 enzyme and two pieces of RNA: a CRISPR RNA (crRNA) and a trans-activating CRISPR RNA (tracrRNA). When combined, the three pieces form the CRISPR ribonucleoprotein complex, which can perform various gene editing functions. Although CRISPR technology is revolutionizing genome editing and associated applications, predictable targeting in the laboratory and safety in the clinic will require careful engineering. Improving CRISPR cleavage activity, specificity, and stability represent promising areas for increasing the reliability and performance of the CRISPR system.

Invention

Researcher from SIU and McGill University have discovered novel CRISPR/Cas9 compositions that can improve the gene editing functions of the CRISPR ribonucleoprotein complex. Specifically, this technology incorporates various modifications to the nucleic acid sequences of the crRNA and tracrRNA. The most promising modifications include substitution of DNA nucleotide bases and chemically modified bases for the inherent RNA bases present in the unmodified constructs.

Key Advantages

- crRNA and tracrRNA constructs containing base substitutions show improved stability and efficacy *in vitro*
- Substitute bases include DNA, DNA analogs, and a variety of chemically modified nucleotide bases
- crRNA and tracrRNA constructs can be made with a ranged number of substitutions, including complete substitution/no RNA bases present
- Cost of synthesis using DNA and chemically modified bases is greatly reduced compared to RNA-only constructs

Status

US Patent Application #16/327,605 was filed for this technology on February 22, 2019, with a complementary filing also submitted in Canada. The technology is available for license.

Other opportunities related to this technology, included but not limited to sponsored and/or collaborative research, may be available. Please reach out to the designated contact identified at left for more information.