CLASSIC CRISPR/Cas systems (e.g., type V CRISPR/Cas systems such as Cas12 family systems) are characterized by effector modules that include a single effector protein. For example, in a type V CRISPR/Cas system, the effector protein - a CRISPR/Cas endonuclease (e.g., a Cas12a protein) - interacts with (binds to) a corresponding guide RNA (e.g., a Cas12a guide RNA) to form a ribonucleoprotein (RNP) complex that is targeted to a particular site in a target nucleic acid via base pairing between the guide RNA and a target sequence within the target nucleic acid molecule. Thus, like CRISPR-Cas9, Cas12 has been harnessed for genome editing based on its ability to generate targeted, double-stranded DNA (dsDNA) breaks.

UC Berkeley researchers have discovered that RNA-guided DNA binding unleashes indiscriminate single-stranded DNA (ssDNA) cleavage activity by Cas12a that completely degrades ssDNA molecules. The researchers found that target-activated, non-specific ssDNase cleavage is also a property of other type V CRISPR-Cas12 enzymes. By combining Cas12a ssDNase activation with isothermal amplification, the researchers were able to achieve attomolar sensitivity for DNA detection. For example, rapid and specific detection of human papillomavirus in patient samples was achieved using these methods and compositions.

SUGGESTED USES

Platform for molecular diagnostics for detecting target DNAs (double or single stranded)

ADVANTAGES

- Highly specific method of detection
- Attomolar sensitivity for DNA detection
Target DNAs can be detecting using any convenient detection method (e.g., using labeled single stranded detector DNA)

RELATED MATERIALS

- CRISPR-Cas12a target binding unleashes indiscriminate single-stranded DNase activity

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- COMPOSITIONS AND METHODS FOR IDENTIFYING HOST CELL TARGET PROTEINS FOR TREATING RNA VIRUS INFECTIONS
- Lentivirus-like Particle Delivery of CRISPR-Cas9 & Guide RNA for Gene Editing
- Genome Editing via LNP-Based Delivery of Efficient and Stable CRISPR-Cas Editors
- Type III CRISPR-Cas System for Robust RNA Knockdown and Imaging in Eukaryotes
- Cas12-mediated DNA Detection Reporter Molecules
- Improved guide RNA and Protein Design for CasX-based Gene Editing Platform
- Cas13a/C2c2 - A Dual Function Programmable RNA Endoribonuclease
- RNA-directed Cleavage and Modification of DNA using CasY (CRISPR-CasY)
- CasX Nickase Designs, Tans Cleavage Designs & Structure
- In Vivo Gene Editing Of Tau Locus Via Liponanoparticle Delivery
- A Dual-RNA Guided Cas2 Gene Editing Technology
- CRISPR-CAS EFFECTOR POLYPEPTIDES AND METHODS OF USE THEREOF (“Cas-VarPhi”) Modifications To Cas9 For Passive-Delivery Into Cells
- A Protein Inhibitor Of Cas9
- RNA-directed Cleavage and Modification of DNA using CasX (CRISPR-CasX)
- Compositions and Methods for Genome Editing
- Split-Cas9 For Regulatable Genome Engineering
- NANOPORE MEMBRANE DEVICE AND METHODS OF USE THEREOF
- Methods to Interfere with Prokaryotic and Phage Translation and Noncoding RNA
- CRISPR CASY COMPOSITIONS AND METHODS OF USE
- Single Conjugative Vector for Genome Editing by RNA-guided Transposition
- Improved Cas12a Proteins for Accurate and Efficient Genome Editing
- CRISPR-CAS EFFECTOR POLYPEPTIDES AND METHODS OF USE THEREOF
- Engineered/Variant Hyperactive CRISPR CasPhi Enzymes And Methods Of Use Thereof
- Engineering Cas12a Genome Editors with Minimized Trans-Activity
- Methods Of Use Of Cas12L/CasLambda In Plants
- THERMOSTABLE RNA-GUIDED ENDONUCLEASES AND METHODS OF USE THEREOF (GeoCas9)
- Structure-Guided Methods Of Cas9-Mediated Genome Engineering
- Endoribonucleases For Rna Detection And Analysis
- Efficient Site-Specific Integration Of New Genetic Information Into Human Cells
- CRISPR-Cas Effector Polypeptides and Methods of Use Thereof
- Class 2 CRISPR/Cas COMPOSITIONS AND METHODS OF USE
- Compositions and Methods of Use for Variant Cas4 Endoribonucleases
- Identification Of Sites For Internal Insertions Into Cas9
- Small Molecule Assisted Cell Penetrating Cas9 RNP Delivery
- Methods and Compositions for Controlling Gene Expression by RNA Processing