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:M19-255LC
Published: 1/30/2020

Inventors

Alexander Green

Kirstie Swingle

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

Utilization of CRISPR-Cas Systems for Analyte Detection

Compared to nucleic acid tests, current immunoassays suffer from low specificity and poor sensitivity. Attempts have been made to combine protein detection with nucleic acid amplification schemes to increase sensitivity, however, these techniques require multiple processing steps and are limited to fluorescent readout or the use of thermal cycling, making them difficult to implement in low-cost point-of-care (POC) assay formats.

Researchers at the Biodesign Institute of Arizona State University have developed novel highly sensitive methods for analyte detection that can be integrated into low-cost lateral flow assay formats. By exploiting the collateral ssDNAse or ssRNAse activity of CRISPR-Cas enzymes on specific engineered nucleic acid substrates, these methods can sensitively report on the presence of an analyte of interest. Diverse molecular analytes, including antibodies, proteins, small molecules, carbohydrates, lipids, metal ions and even combinations can be detected with high sensitivity. Using additional barcoding approaches, multiplexed analyte detection can also be achieved. These methods enable the design of powerful diagnostics to detect a broader range of diseases and infections, both viral and bacterial, as well as enable profiling of the human immune system.

This generalizable analyte detection platform and tunable facets offer a wide range of applications from convenient low-cost diagnostic assays for point-of-care use to immune system profiling and even cellular and tissue imaging.

Potential Applications

- POC diagnostics
  - Pathogens - viral, bacterial, fungal, etc.
  - Other diseases including cancer
- Biomarker detection
- Profiling the human immune system
- Studying protein interactions
- Basic research

- Cellular and tissue imaging tools
- Water purity detection - e.g. lead, arsenic, mercury
- Testing beverages for drugs – e.g. date-rape drugs

Benefits and Advantages

- Able to detect diverse molecular analytes, including antibodies, proteins, small molecules, carbohydrates, lipids, metal ions and even combinations
- Multiplexed analyte detection capabilities
  - Could answer fundamental questions in cell biology - e.g. protein-protein interactions
  - Could be used to rapidly identify flu types
- High sensitivity
- Reaction can take place in vitro, in paper-based systems and potentially in living or fixed cells/tissues
- Can be interpreted through convenient low-cost lateral flow assay formats
- Does not require thermal cycling or additional processing steps
- Has its own unique amplification schemes that don't require additional processing steps
- Convenient visual readout system

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

Dr. Green's departmental webpage

Dr. Green's laboratory webpage