Docket #: S21-272

CIRCULAR RNA DERIVED FROM RNA VIRUSES AND RELATED COMPOSITIONS AND METHODS

Technology Reference
CZ Biohub ref. no. CZB-221S
Stanford ref. no. S21-272

Researchers at Stanford have developed a new therapeutic avenue for the treatment of RNA viral infections.

Myriad advances in the field of infectious diseases have been made in the last century, including the development of antibiotics and the widespread use of vaccines. While vaccines offer a powerful tool for prophylaxis against viral (and some bacterial) infections, there is a dearth of treatments available to those who are already infected with a specific virus. Anti-retroviral therapy is a notable exception to this rule, with anti-polymerase and anti-proteinase pharmaceuticals comprising an incredibly effective strategy in controlling viral replication of HIV. However, these treatments remain costly and unavailable to most people worldwide despite nearly 40 years on the market. Additional therapeutic strategies are needed to adequately address RNA viral infections worldwide.

Stage of Development
Research-

in vitro

Stage of Research
The inventors discovered that circular RNAs (cRNAs) that are encoded in RNA viral genomes can have pro-viral effects. In this vein, they have developed methods to inhibit cRNAs that have been identified as pro-viral and can therefore hamper viral replication in human cells. These methods include siRNA or shRNAs that target the

cRNAs, an RNA-targeting CRISPR-Cas system, or a small molecule. These methods can be used in both infected and bystander cells. Furthermore, the inventors also discovered specific cRNAs that act on host proteins to dampen the innate immune response in cells, therefore allowing excess viral replication. In turn, the inventors provide additional methods of viral replication impediment in the form of inhibiting these cRNAs that inhibit the innate immune response in cells, and therefore allows the host's own immune system to respond more effectively to a viral infection.

Applications

- Treatment of RNA virus infections by limiting replication of the virus and/or promoting greater effectiveness of the hosts immune system to eliminate the virus.

Advantages

- This method encompasses both nuclear RNA viruses, such as flaviviruses and coronaviruses, as well as nuclear RNA viruses, such as influenza or retroviruses.
- Provides additional therapeutic targets in the treatment of RNA viral infections which comprises an urgent unmet medical need

Publications

- Chen T-C, Tallo-Parra M, Cao QM, Kadener S, Böttcher R, Pérez-Vilaró G, et al. (2020) "Host-derived circular RNAs display proviral activities in Hepatitis C virus-infected cells." PLoS Pathog 16(8): e1008346.
- Qian M. Cao, Pakpoom Boonchuen, Tzu-Chun Chen, Shaohua Lei, Kunlaya Somboonwiwat, and Peter Sarnow (2024).Virus-derived circular RNAs populate hepatitis C virus–infected cells. *PNAS*, 121 (7) e2313002121.

Patents

- Published Application: WO2023133418
- Published Application: 20250034573

Innovators

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