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CRISPR-Cas Based Treatment for Latent Viral Infections

Researchers in Prof. Stephen Quake's laboratory have developed a CRISPER-Cas-based targeted endonuclease system designed to treat latent viral infections by attacking the viral genome. Latent viral infections present a continuous risk to an infected patient, but are difficult to treat with traditional therapeutics because extremely low amounts of protein are expressed by the dormant genome. This new endonuclease system uses viral-specific guide RNAs to treat an infection by destroying one of the remaining viral targets - the viral genome itself. This technology can be adapted with a range of specific guide RNAs and/or delivery methods which could lead to a generalized approach for curing latent viral infections (such as herpesviridae and human papillomavirus).

Stage of Research
The inventors have demonstrated this system in cells of patients with Burkitt's lymphoma that were infected with Epstein-Barr virus (EBV or human herpesvirus 4). The CRISPR/Cas9 system suppressed virally induced cell proliferation, restored the apoptosis pathway in the cells and completely cleared EBV from ~25% of the cells with no toxic side-effects to noninfected cells.

Applications

- **Anti-viral therapy** - eliminate virus from the host cells with CRISPR/Cas9 endonuclease and viral specific guide RNAs, particularly for latent viruses such as herpesviridae (including Epstein-Barr virus) and human papillomavirus (HPV)

Advantages

- **Unmet medical need** - current anti-viral therapies cannot eradicate latent viruses
- **First in class approach** - this technology directly attacks the viral genome (compared with standard antiviral therapies that target proteins) which is particularly useful for latent viral infections where protein production is extremely low
- **Fast and easy design** of viral specific guide RNA to develop therapeutic candidates with different disease targets

Publications

- Wang J, Quake SR, "RNA-guided endonuclease provides a therapeutic strategy to cure latent herpesviridae infection" *Proc Natl Acad Sci* U S A. 2014 Aug 25.

Patents

- Published Application: WO2015184262
- Published Application: WO2015184268
- Published Application: 20150368670
- Published Application: 20150376583
- Published Application: 2017-182190
- Published Application: 20190032090
- Published Application: 20190010518
- Published Application: 20190185882

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