Duke File (IDF) Number

IDF #:T-007794

Meet the Inventors

Donald, Bruce
Frenkel, Marcel "Marcel"
Holt, Graham "Graham"
Lowegard, Anna "Anna"
Wang, Siyu "Siyu"

Contact For More Info

Krishnan, Shweta
919-681-7541
shweta.krishnan@duke.edu

Department

Computer Science

External Link(s)

- From the lab of Dr. Bruce Donald

HIV treatment and prevention using broadly neutralizing antibodies

Unmet Need

For over 40 years, the human immunodeficiency virus (HIV) pandemic has affected the quality of life and decreased the life expectancy for millions of people with approximately 1.5 million new cases each year. As of 2021, there are 38.4 million people living with HIV globally. Of them, only 28.7 million were using antiretroviral therapy to keep their HIV suppressed and stop disease progression. Additionally, antiretroviral therapy can be used in a preventative capacity to minimize the chance of acquiring HIV in individuals at high-risk. However, therapy and prevention require a strict regimen of multiple drugs daily. Failure to maintain this regimen can lead to antiretroviral resistance and the progression to acquired immunodeficiency syndrome. Yet, compliance is a challenge as it requires constant access to health care providers and pharmacies, which many communities lack. This places a burden on the patient to have a constant supply of medications and be monitored for treatment escape by the virus. Further, the use of current standard of care antiretrovirals causes many short- and long-term side effects, such as nausea, rash, dyslipidemia, and bone density loss among others which affect long-term health and quality of life. There is a need for an alternate treatment for HIV and HIV prevention that does not require a strict daily regimen and has minimal side effects.

Technology

Duke inventors have developed a collection of antibodies that neutralize HIV. This is intended to be used as a part of a treatment program for the treatment and prevention of HIV. Specifically, computational methods were utilized for the generation of new antibodies based on previously reported broadly neutralizing antibodies (bNAbs). Broadly neutralizing antibodies are antibodies that effectively neutralize multiple HIV variants. This ability to neutralize many variants limits the virus’s ability to mutate to escape treatment. bNAb based therapies differ from small molecule-based therapies by how they limit and control HIV. Small molecule-based therapies can interact with different portions of the viral life cycle inside and outside the cell at the cost of off target effects. Whereas bNAbs bind to and neutralize whole HIV and prevent the virus from infecting cells. This has been demonstrated with proof-of-concept cell-based assays to assess viral neutralization potency and breath. Cryo-electron microscopy high resolution imaging was also used to verify mechanism of action and target engagement. These antibodies were comparable to a current best in class antibody targeting the same region of the HIV envelope.

Advantages

- More potent compared to other broadly neutralizing antibodies.
- Provides another modality of treatment for HIV.
- Able to neutralize more variants of HIV than other broadly neutralizing antibodies.