A Novel Rapid and Highly Sensitive Cell Based System for the Detection and Characterization of HIV

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CONTACT

UCLA Technology Development Group
ncd@tdg.ucla.edu
tel: 310.794.0558.

INVENTORS

- Lee, Benhur

OTHER INFORMATION

KEYWORDS

HIV, virus, mammalian cell line

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Medical**
  - Diagnostics
  - Disease: Autoimmune and Inflammation
  - Disease: Infectious Diseases
  - Research Tools
- **Research Tools**
  - Cell Lines
  - Expression System
  - Screening Assays
  - Vectors

RELATED CASES

2012-524-0

SUMMARY

Dr. Benhur Lee and colleagues in the UCLA Department of Microbiology, Immunology and Molecular Genetics have developed a novel system to detect and characterize HIV with unprecedented sensitivity and rapidity.

BACKGROUND

AIDS, the disease caused by the virus HIV, represents a devastating global pandemic. According to a United Nations report in 2010, HIV has killed nearly 30 million people worldwide, with over 2.5 million additional infections each year. Detecting HIV particles is critical not only to patient diagnosis, but also for basic and clinical research, the source of future therapies. Unfortunately, current methods are severely lacking. Phenotypic testing can take over a month to complete and only reports a single time point. Another system widely used for research employs cell lines that express CD4 and co-receptors at abnormally high levels, rendering results of questionable physiological relevance. Patients, physicians, and researchers alike would benefit greatly from a new method of detecting and characterizing HIV; one that is rapid, sensitive, adaptable, and most importantly, physiologically accurate.

INNOVATION

Dr. Benhur Lee and colleagues in the UCLA Department of Microbiology, Immunology and Molecular Genetics have developed a novel system to detect and characterize HIV with unprecedented sensitivity and rapidity. By engineering a cell line with precise control over CD4 and CCR5 expression, the researchers enable comprehensive characterization of viral entry efficiency as a function of receptor density. Combining this with a secreted tat-rev dependent reporter protein 1,000-fold brighter than luciferase, the result is GGR, a novel cell line that can detect pseudotype and replication competent HIV in less time and with higher sensitivity compared to what is currently available.

APPLICATIONS

- Assay for HIV entry, infection and replication efficiency over time under various laboratory conditions
- Calculate IC50 values for antiretroviral drugs
- Test for acute viral infections (not just HIV)
- Characterize patient-derived viruses' tropisms to guide therapeutic options
  - This would represent the first alternative to the only product currently available
- Conduct basic research on antiretroviral drug mechanisms
- Monitor relative resistance or sensitivity to neutralizing antibodies

ADVANTAGES

- Unprecedented rapidity
  - Infection can be detected as early as 17 hours post-infection, compared to 72 hours for current methods
  - Viral tropism can be determined in 2-4 days, compared to 3-4 weeks for current methods
- Extremely sensitive, with as little as 0.0625 MOI required
- Infection can be traced over time since the reporter protein is secreted
- CD4 and co-receptor densities can be precisely tuned to physiological levels
- Readily adaptable to high throughput formats, such as 96- and 384-well plates
- Very low background signal, driven by the reporter protein's dependence on both tat and rev expression by the virus

STATE OF DEVELOPMENT

The GGR indicator cell line has been engineered in its entirety, and the researchers have demonstrated acute sensitivity of the cell line to infectious HIV detection with pseudotype and replication-competent viruses.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,719,127	08/01/2017	2012-524

RELATED MATERIALS

- Affinofile profiling: how efficiency of CD4/CCR5 usage impacts the biological and pathogenic phenotype of HIV. *Virology* (2013)

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Optimized Matrix Based Virus-like Particle Entry and Budding Assay for Highly Pathogenic Viruses

UCLA Technology Development Group

10889 Wilshire Blvd., Suite 920,Los Angeles,CA 90095

https://tdg.ucla.edu

Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu