Weill Cornell Medicine

A Novel Adenovirus-based Vaccine for the Treatment of Fentanyl Addiction

Lead Inventors:

Ronald G. Crystal, M.D.
Chairman of Genetic Medicine, Weill Cornell Medical College
Professor of Genetic Medicine, Weill Cornell Medical College
The Bruce Webster Professor of Internal Medicine, Weill Cornell Medical College

Stephen M. Kaminsky, Ph.D.
Professor of Research in Genetic Medicine,
Weill Cornell Medical College

Tristan H. Lambert, Ph.D.
Professor of Chemistry and Chemical Biology,
Cornell University

Dolan Sondhi, Ph.D.
Professor of Research in Genetic Medicine,
Weill Cornell Medical College

Bishnu De, Ph.D.
Senior Research Associate in Genetic Medicine,
Weill Cornell Medical College

Business Development Contact:

Brian Kelly
Director, Technology Licensing

(646) 962-7041
bjk44@cornell.edu

A Novel Adenovirus-based Vaccine for the Treatment of Fentanyl Addiction

Background & Unmet Need

- Fentanyl is a highly addictive synthetic mu-opioid receptor agonist with a significant risk for lethal overdose
- Fentanyl is relatively simple to manufacture and often added to other addictive drugs (unbeknownst to the user), with fatal consequences
- The rate of fentanyl-related lethal overdoses has continued to rise in the United States and has reached as high as over 6,000 a month
- Naloxone is effective at reversing opioid overdose if promptly administered, but is not an effective treatment for opioid use disorder
- Buprenorphine-containing therapies SUBOXONE® and SUBLOCADE® are helpful tools for treating opioid dependence, but require either daily or monthly dosing, respectively
- **Unmet Need:** Long-acting therapy for durable treatment of opioid dependence

Technology Overview

- **The Technology:** Cornell inventors have devised an adenovirus-based vaccine conjugated with fentanyl analogs which causes the immune system to recognize and respond to fentanyl
- Adenoviruses are highly immunogenic, and coupling a small molecule to adenovirus capsid proteins results in a vaccine that induces an immune response to the presence of that molecule
- The antibodies generated in response to fentanyl sequester it in the blood and stop it from reaching the brain, preventing a lethal overdose
- **PoC Data:** Administration of the adenovirus-based vaccine conjugated with a fentanyl analog (dAd5-CF) resulted in high-titer levels of anti-fentanyl antibodies in mice within two weeks
- The anti-fentanyl vaccine dAd5-CF sequestered injected fentanyl within peripheral plasma and prevented fentanyl from reaching the brain, blocking the addictive effects of fentanyl

Inventors:
Ronald G. Crystal
Stephen Kaminsky
Tristan H. Lambert
Dolan Sondhi
Bishnu De

Patents:
US Application Filed

Biz Dev Contact:
Brian Kelly
(646) 962-7041
bjk44@cornell.edu

Cornell Reference:
D-9885

Weill Cornell Medicine

A Novel Adenovirus-based Vaccine for the Treatment of Fentanyl Addiction

Technology Applications

- Prophylactic administration of an anti-fentanyl vaccine may prevent fatal overdoses resulting from inadvertent exposure to fentanyl and fentanyl analogs
- The anti-fentanyl vaccine can also be used to block the addictive and rewarding effects of fentanyl administration, for the treatment of opioid dependence

Technology Advantages

- The prophylactic vaccine provides long-lasting protection against the harmful effects of fentanyl within weeks
- Anti-fentanyl vaccine also prevents the addictive effects of fentanyl at doses insufficient to cause an overdose

Supporting Data / Figures

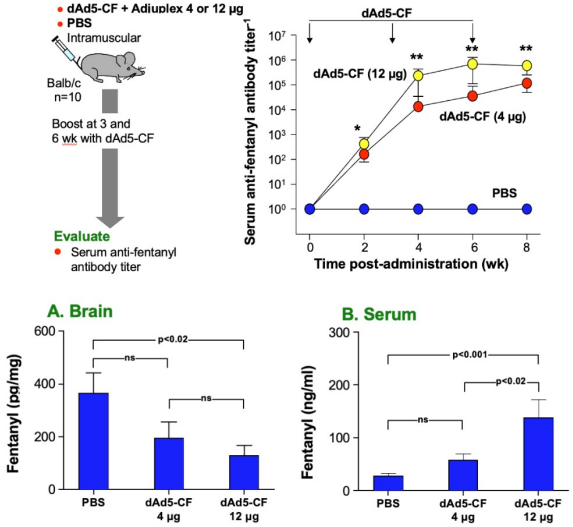

Figure 1. Top: Vaccine based on Carfentanil (dAd5-CF) mediates production of anti-fentanyl antibodies in mice**. Bottom:** Administration of fentanyl to mice immunized with dAd5-CF vaccine results in reduced fentanyl levels in brain due to sequestration in peripheral blood serum.

Inventors:
Ronald G. Crystal
Stephen Kaminsky
Tristan H. Lambert
Dolan Sondhi
Bishnu De

Patents:
US Application Filed

Biz Dev Contact:
Brian Kelly
(646) 962-7041
bjk44@cornell.edu

Cornell Reference:
D-9885

Weill Cornell Medicine

A Novel Adenovirus-based Vaccine for the Treatment of Fentanyl Addiction

Supporting Data / Figures

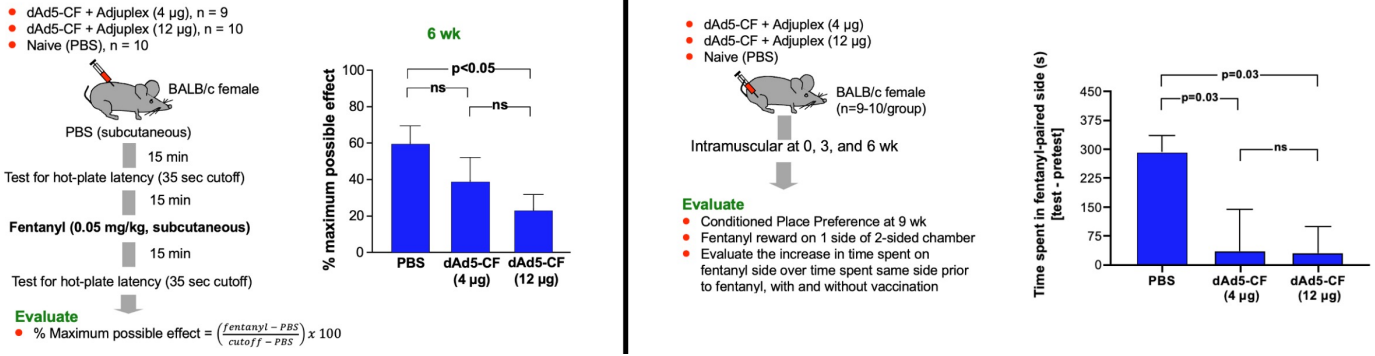

Figure 2. Left: Immunization with the anti-fentanyl vaccine (dAd5-CF) does not significantly reduce the analgesic effects of fentanyl in a pain sensitivity test (hot plate). **Right:** Immunization with the anti-fentanyl vaccine (dAd5-CF) significantly reduces the addictive effects of fentanyl in a behavioral test for drug reward (conditioned place preference).

Inventors:
Ronald G. Crystal
Stephen Kaminsky
Tristan H. Lambert
Dolan Sondhi
Bishnu De

Patents:
US Application Filed

Biz Dev Contact:
Brian Kelly
(646) 962-7041
bjk44@cornell.edu

Cornell Reference:
D-9885

Weill Cornell Medicine

Weill Cornell Medicine