



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

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SUMMARY

UCLA researchers in the Department of Microbiology, Immunology, and Molecular Genetics have developed a matrix based virus-like particle entry and budding assay that can be used to study highly pathogenic viruses at lower containment conditions. The optimized biologically relevant assay is sensitive, specific and allows for easy quantitative detection of viral particles

BACKGROUND

Many viral entry studies on highly pathogenic agents rely on cell-cell fusion and envelope pseudotyped reporter assays. These assays allow for detailed analyses of virus entry characteristics without high-level biosafety containment. Unfortunately, these surrogate assays may not fully emulate the biological properties of native envelope structures that are unique to the virus being studied.

INNOVATION

Researchers at UCLA have developed a matrix based virus-like particle entry and budding assay that overcomes the limitations of surrogate assays and offers significant advantages, namely: extreme sensitivity, adaptability to other viruses with matrix determinants, and immediate entry detection without the requirement for reporter gene transcription/translations. The optimized entry and budding assay is based on a β -lactamase-Nipah matrix fusion protein which is able to bud and form virus-like particles that morphologically resemble paramyxoviruses. To increase detectability, the researchers have also created mammalian codon-optimized and catalytically improved versions of the β -lactamase matrix fusion genes. The matrix based virus-like particle assay can be used to study highly pathogenic (BSL-4) viruses under BSL-2 conditions. In addition, the codon-optimized β -lactamase matrix fusion genes can be used for efficient production of virus-like particles for vaccines.

APPLICATIONS

- Provides a more biologically relevant assay for studying Hendra, Nipah, and other high-containment (BSL-4) virus entry and budding requirements under BSL-2 conditions
- Strategy may be generalized to other viruses where the matrix is the primary determinant of budding and virion morphology (e.g. Ebola-VP40 matrix, HIV-gag matrix, influenza matrix, etc.)
- Facilitates the development of high-throughput screens for genetic or chemical factors that affect the virus entry and budding processes
- Codon-optimization allows for efficient production of virus-like particles which can serve as a platform for a safe and effective vaccine
- Rapid and simple detection of virus-like particle budding in the unconcentrated supernatant of transfected cells

ADVANTAGES

- Sensitive and specific viral entry and budding assay
- Matrix based virus-like particles will better reflect the biological properties of their live-virus counterparts in both entry and budding assays
- A single construct to study both entry and budding in the same virus
- Quantitative detection of viral particles without an ultracentrifugation step allows for rapid analyses of budding determinants
- Codon-optimized for efficient expression of virus-like particles
- Improved catalytic efficiency of the β -lactamase matrix allows each virion to be detected with greater sensitivity
- Detection does not require laborious techniques including radioactive labeling

STATE OF DEVELOPMENT

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OTHER INFORMATION

KEYWORDS

research tool, virus, vaccine
production, virus-like particle, VLP,
henipavirus, paramyxovirus, Nipah,
Hendra, virus entry and budding
assay, cell-cell fusion, envelope
pseudotyped reporter assays, beta-
lactamase

CATEGORIZED AS

- **Biotechnology**
 - Health
 - Other
- **Medical**
 - Disease: Autoimmune and Inflammation
 - Research Tools
 - Screening
- **Research Tools**
 - Screening Assays

RELATED CASES

2008-663-0

The virus-like particle entry and budding assays have been established for Nipah and Hendra viruses. The assay has been optimized with a β -lactamase mutation, as well as mammalian codon-optimization of both genes in the fusion construct.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

► [A Novel Rapid and Highly Sensitive Cell Based System for the Detection and Characterization of HIV](#)

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