Coordinately-Regulated Retroviral Gene Delivery System

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TECHNOLOGY DESCRIPTION

While viral vectors have the potential to deliver gene therapies to cancers, almost all of these vectors lack the ability to replicate, severely limiting their ability to distribute genetic information in a constantly proliferating tumor. On the other hand, oncolytic viruses with the ability to replicate lyse tumor cells as part of their lifecycle and are quickly cleared by the immune system as a result. Replicating retroviruses (RRVs) are unique among viruses being considered as anticancer agents because they persist intratumorally through nonlytic replication, stably integrate into the cancer cell genome, and have low immunogenicity. In addition, RRVs only replicate in dividing cells, adding to their cancer-specificity.

Current RRV technology, however, struggles to deliver larger genetic payloads. RRV have a limited transgene payload capacity of approximately 1.3 kB due to inherent viral packaging limitations and the presence of the genes necessary for replication. In addition, efforts to combine multiple RRVs to deliver more genetic information in a replication-competent fashion have failed due to a retroviral phenomenon called superinfection resistance.

A restricted gene payload capacity and superinfection resistance limit the utility of traditional RRV gene therapy. Expanding the number of genes to be delivered in a manner that can replicate through target cells has the potential to improve the efficacy of cancer gene therapy; it can also be used for a number of other applications, including diagnostic imaging and the perturbation of biological systems. Our novel system provides a replication-competent manner of delivering large genetic payloads (10+ kB) to cancer cells, overcoming the limitations of previous viral gene therapies.

This invention is a method of building coordinately- regulated retroviral multi-vector systems to efficiently deliver large genetic payloads to cancer cells for use by companies developing therapeutics, diagnostics, and theranostics for cancer patients, as well as diagnostic imaging and biomolecular reagent companies. The system is currently in the pre-clinical stage of development. This novel invention empowers the controlled and synchronized replication of multiple vectors throughout tumor cells, enabling significant improvement over the limited genetic payload capacity and intra-tumoral distribution of current viral vector technologies.

ADVANTAGES

This novel invention offers the following advantages:

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OTHER INFORMATION

KEYWORDS

replicating retrovirus vector, oncolytic retrovirus, gene delivery

CATEGORIZED AS

- **Medical**
  - Delivery Systems
  - Disease: Cancer
  - Disease: Central Nervous System
  - Gene Therapy
  - Therapeutics

RELATED CASES

- Efficient and wide intratumoral spread of desired transgenes
- Significantly larger transgene payload capacity relative to current replicating gene delivery technologies
- Stable transgene integration into target cells
- Tight control over synchronous replication of viral vectors with the potential for modulation and customization of the delivery platform

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DATA AVAILABILITY

Available under NDA

PATENT STATUS

Patent Pending

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