Recombinant oriP Plasmid Vector for Efficient DNA Synthesis

INVENTORS • William Sugden, Scott Lindner

WARF: P08058US
View U.S. Patent No. 9,206,439 in PDF format.

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a modified oriP vector that could be used to more efficiently express desirable genes for gene therapy or cell culture.

OVERVIEW

The Epstein-Barr virus (EBV) is a member of the Herpes family of viruses. The genome of this virus usually is maintained as a nuclear plasmid in the cells it infects. A replication origin (oriP) is included within the EBV genome.

The oriP vector has been a popular cell culture tool for the expression of DNA sequences of interest. It consists of plasmids with two elements from EBV. The first is the cis acting element (oriP), which initiates synthesis of DNA and helps partition DNA to dividing cells. The second is the trans acting element, EBNA-1, which binds to the cis acting element.

Although this vector is widely used, it becomes cytotoxic when its wild-type EBNA-1 moiety is overexpressed. UW-Madison researchers previously developed a non-cytotoxic oriP vector by removing 25 amino acids from the trans acting EBNA-1 element. This improved vector supports extrachromosomal replication of oriP without activating expression of the host genes.

THE INVENTION

UW-Madison researchers have now improved the oriP vector by engineering the cis acting oriP element. The recombinant vector is significantly more efficient than the wildtype vector. It can be used to enhance stable, long term expression of a desirable gene or to express a desirable gene at higher levels.

The origin of synthesis within oriP is the Dyad Symmetry (DS) element, which includes two pairs of EBNA-1 binding sites flanked by half-binding sites for the human protein TRF2. The inventors discovered that the affinity of EBNA-1’s binding to an origin directly correlates with the efficiency at which DNA synthesis is initiated as well as the efficiency at which extrachromosomal establishment is supported at that origin. They used these findings to construct artificial origins of DNA synthesis that are several-fold more efficient than wildtype DS in their abilities to initiate DNA synthesis and promote
extrachromosomal establishment.

**APPLICATIONS**

- Gene expression systems
- Gene transfer in gene or cell therapy
- Large vectors that carry sizable regions of genomic DNA
- Preparation of embryonic stem cells from adult somatic cells

**KEY BENEFITS**

- Modified vector incorporates a significantly more efficient origin of DNA synthesis than the wildtype vector.
- Enhances transformation efficiency for cells that are difficult to transform, such as stem cells or nondividing cells like lung cells
- Provides a method of maintaining and expressing at least one heterologous DNA sequence in a cell
- Useful to deliver genes to cells *ex vivo or in vivo*
- The non-cytotoxic EBNA-1 derivative previously developed by the inventors may be used in the vector.
- *oriP*-based vectors are inexpensive, replicated once per cell cycle and efficiently partitioned to daughter cells; allow large fragments of DNA to be introduced to a cell and maintained extrachromosomally; and do not elicit an immune response.
- The invention also includes a less efficient recombinant vector that may be useful to transiently express a desirable gene or express a desirable gene at lower levels.

**ADDITIONAL INFORMATION**

**Related Technologies**

WARF reference number P04170US describes a non-cytotoxic *oriP* vector created by removing 25 amino acids from the trans acting EBNA-1 element.

**Publications**


**Tech Fields**

Research Tools - Gene expression

**CONTACT INFORMATION**

For current licensing status, please contact Joshua Carson at jcarson@warf.org or 608-960-9844.