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(54) Title: POLYMER ENCAPSULATION OF ADENOVIRUSES

(57) Abstract: The present invention provides a copolymer that noncovalently encapsulates an adenovirus while improving its delivery and resulting expression from the viral genome. It has now been discovered that a copolymer of a cationic polymer, such as PEI, polylysine, DEAE-Dextran, and derivatives thereof, and a nonionic polymer, such as PEG and derivatives thereof, can improve both delivery and transgene expression of the adenovirus in cells. The complex of the invention provides an easy-to-produce material that is therapeutically more effective than an unencapsulated adenovirus.



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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/19296

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: A61K 48/00( 2006.01)

USPC: 514/44

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 514/44

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                     | Relevant to claim No.                       |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Y          | SUNG et al. Effect of Polyethylene Glycol on Gene Delivery of Polyethyleneimine.<br>Biol. Pharm. Bull. April 2003, Vol. 26, No. 4,<br>pages 492-500, especially pages 492, 494, and 500.                                                               | 1-11, 21-25, 32-36, 52-58, 84-86, and 95-97 |
| Y          | FASBENDER et al. Complexes of Adenovirus with Polycationic Polymers and Cationic Lipids Increase the Efficiency of Gene Transfer in Vitro and in Vivo.<br>J. Biol. Chem. March 1997, Vol. 10 No. 7,<br>pages 6479-6489, especially pages 6480 and 6483 | 1-11, 21-25, 32-36, 52-58, 84-86, and 95-97 |

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

|                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| * Special categories of cited documents:                                                                                                                                |                                                                                                                                                                                                                                                  |
| "A" document defining the general state of the art which is not considered to be of particular relevance                                                                | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention                                              |
| "E" earlier application or patent published on or after the international filing date                                                                                   | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone                                                                     |
| "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "O" document referring to an oral disclosure, use, exhibition or other means                                                                                            |                                                                                                                                                                                                                                                  |
| "P" document published prior to the international filing date but later than the priority date claimed                                                                  | "&" document member of the same patent family                                                                                                                                                                                                    |

Date of the actual completion of the international search

17 February 2006 (17.02.2006)

Date of mailing of the international search report

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/19296

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

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1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-11, 21-25, 32-36, 52-58, 84-86, and 95-97

- Remark on Protest**
- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US04/19296

Continuation of B. FIELDS SEARCHED Item 3:

Medline

search terms: PEI, polythethyleneimine polyplexes, peg-conjugated PEI