

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
21 December 2006 (21.12.2006)

PCT

(10) International Publication Number
WO 2006/135413 A3

(51) International Patent Classification:

A01N 63/00 (2006.01) C12N 7/00 (2006.01)
A61K 31/70 (2006.01) C12N 15/00 (2006.01)
C07H 21/04 (2006.01)

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(21) International Application Number:

PCT/US2005/031520

(22) International Filing Date:

1 September 2005 (01.09.2005)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

60/607,240 2 September 2004 (02.09.2004) US

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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Published:

— with international search report

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(88) Date of publication of the international search report:

14 June 2007

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 2006/135413 A3

(54) Title: ENCAPSIDATION SYSTEM FOR PRODUCTION OF RECOMBINANT VIRUS-LIKE PARTICLES

(57) Abstract: The present invention relates to methods and compositions for manufacturing virus-like particles (VLPs), suitable for use as immunogens and as research tools. The VLPs of the present invention provide a safe alternative to the use of pathogenic viruses for clinical and laboratory applications.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US05/31520

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8): **A01N 48/01;A61K 31/70(2006.01);C07H 21/04(2006.01);C12N 7/00(2006.01),15/00(2006.01)**

 USPC: 424/93.21;435/69.1,93.21;514/44;536/23.72
 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. : 424/93.21;435/69.1,93.21;514/44;536/23.72

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Naldini, et al. In Vivo Gene Delivery and Stable Transduction of Nondividing Cells by a Lentiviral Vector. Science. 12 April 1996; Vol 272:263-267.	1-10, 29
A	Pear, W. Transient Transfection Methods for Preparation of High-Titer Retroviral Supernatants. In: Current Protocols in Molecular Biology (1996) Unit 9.11.1-18 JohnWiley & Sons, Inc.	1-10, 29
A	Doan, et al. Virus-like particles as HIV-1 vaccines. Rev. Med Virol. 2005;15:75-88.	1-10, 29

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 08 February 2007 (08.02.2007)	Date of mailing of the international search report 06 MAR 2007
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Stuart Snyder <i>Julia Jackson</i> Telephone No. (571) 272-1600
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US05/31520

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:
Please See Continuation Sheet

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.: 1-10 and 29
- 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.

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-20 and 29, drawn to a method making a virus-like particle in general with species of an immunodeficiency virus-like particle (claims 9 and 10), a corona virus-like particle (claims 11-13), and a hepatitis type virus-like particle (claims 14-17).

Group II, claim(s) 21-28, drawn to a method of administering to a subject a virus-like particle to generate an immune response to the virus-like particle.

Group III, claim(s) 30, drawn to a virus-like particle.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The common technical feature of the claimed inventions is at least one packaging vector and two or more helper vectors, wherein said packaging vector comprises a nucleic acid having a packaging signal but lacking an integration signal and wherein said helper vectors each comprise one or more viral genes encoding one or more viral proteins and a cell line. Wagner, et al. (1990) teaches a *gag-pol* expression vector devoid of integration signal and at least two helper vectors encoding *tat-rev* and *vif-vpx-vpr-env-tat-rev*. Thus, the common technical feature of the instant invention is not "special" and unity is lacking.