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- (88) Date of publication of the international search report:
9 June 2005
- 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.

(54) Title: INFLUENZA VIRUS VACCINE

(57) Abstract: The present invention provides vaccines against disease caused by infection with influenza virus, and methods of vaccination. The vaccines comprise peptides derived from the M2 and/or HA proteins of influenza virus conjugated to a carrier protein.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/06978

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A61K 39/12, 39/29; C12P 21/06, 19/34
 US CL : 424/184.1, 192.1, 204.1, 206.1, 225.1, 227.1; 435/69.1, 91.1, 91.33

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. : 424/184.1, 192.1, 204.1, 206.1, 225.1, 227.1; 435/69.1, 91.1, 91.33

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	TOLMAN, R.L. et al. Cyclic V3-loop-related HIV-1 Conjugate Vaccines. Int. J. Peptide Protein Res. 1993, Vol. 41, pages 455-466, especially page 457.	1-10
Y	NEIRYNCK, S. et al A Universal Influenza A Vaccine Based on the Extracellular Domain of the M2 Protein, Nature Medicine, October 1999, Vol 5. No. 10, pages 1157-1163, especially fig. 1 and page 1158.	1-2, 4, 6-7
Y, P	US Patent Application Publication No. US 2003/0175863 A1 (BIRKETT et al) 18 September 2003 (18.09.2003), sequence 13.	1- 10
A	DONNELLY, J.J. et al. Immunogenicity of a Haemophilus influenzae Polysaccharide-Neisseria meningitidis Outer Membrane Protein Complex Conjugate Vaccine. Journal of Immunology. Vol. 145. No. 9, pages 3071-3079.	1-10
A	FOMSGAARD, A. et al. Improved Humoral and Cellular Immune Responses Against the gp120 V3 Loop of HIV-1 Following Genetic Immunization with a Chimeric DNA Vaccine Encoding the V3 Inserted into the Hepatitis B Surface Antigen. Scand. J. Immunol. 1998, Vol. 47. pages 289-295.	1



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

"E" earlier application or patent published on or after the international filing date

"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)

"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

"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

"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

"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

"&"

document member of the same patent family

Date of the actual completion of the international search

17 February 2005 (17.02.2005)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/06978

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DELPEYROUX, F. et al. Presentation and Immunogenicity of the Hepatitis B Surface Antigen and a Poliovirus Neutralization Antigen on Mixed Empty Envelope Particles. Journal of Virology. May 1988, Vol. 62. No. 5, pages 1836-1839.	1

INTERNATIONAL SEARCH REPORT

International application No.

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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.: 37-39
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 an additional fee, this Authority did not invite payment of any additional fee.
 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
- Remark on Protest The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

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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.

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) 1-12, drawn to the influenza M2 peptide covalently linked to a carrier protein.

Group II, claim(s) 13-24, drawn to the influenza HA() peptide of influenza type A virus covalently linked to a carrier protein.

Group III, claim(s) 25-36, drawn to the influenza HA() peptide of influenza type B virus covalently linked to a carrier protein.

Claims 37-39 are unsearchable (i.e. no meaningful search can be performed). These claims are improper multiple dependent claims. "Any dependent claim which refers to more than one other claim ("multiple dependent claim ") shall refer to such claims in the alternative only." See PCT Rule 6.4.

Additionally, Group III contains the following subgroups based upon the 44 sequences of SEQ ID NOs: 60 and 126-168. In order for all inventions within Group III to be examined, the appropriate additional examination fees must be paid.

Subgroup 1 corresponds to SEQ ID NO. 60.

Subgroups 2 through 44 correspond to SEQ ID Nos. 126 through 168.

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 technical feature linking the inventions of Group I to the inventions of Groups II and III, and each to the other, appears to be that all relate to the use of a conserved influenza virus sequence covalently linked to a carrier protein. However this technical feature is known in the art and is taught by Neiryneck, S. et. al., (1999) Nature Medicine, 5(10) 1157-1163, teaching the combination of the conserved sequence of influenza M2 protein in combination with hepatitis B core protein as the carrier protein. A "special technical feature" is a technical feature that makes a contribution over the prior art. Thus, the inventions of Group I do not share a "special technical feature" with the inventions of Groups II and III, nor do the inventions of Group II and the inventions of Group III share a "special technical feature."

The peptides of SEQ ID Nos. 60 and 126 through 168, as presented on pages 17-18, were visually inspected. The various sequences all relate to influenza type B HA() cleavage site peptide. However, these peptides individually do not share a common structure or significant structural element with all other member of these SEQ ID Nos. Consequently, unity of invention is lacking between these sequences.

INTERNATIONAL SEARCH REPORT

International application No.
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Continuation of B. FIELDS SEARCHED Item 3:
STN- Medline, Embase, Biosis; EAST - USPAT, PGPUBS
Sequunce search - SEQ ID NO:39
search terms - carrier, epitope, neisseria, hbsag, m2, OMPC