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(54) Title: INFLUENZA ANTIGENS, VACCINE COMPOSITIONS, AND RELATED METHODS

(57) Abstract: The present invention relates to the intersection of the fields of immunology and protein engineering, and particularly to antigens and vaccines useful in prevention of infection by influenza virus. Provided are recombinant protein antigens, compositions, and methods for the production and use of such antigens and vaccine compositions.



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## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/US2007/003969****A. CLASSIFICATION OF SUBJECT MATTER****C07K 16/46(2006.01)i**

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)

IPC8: C07K 16/46

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)

Delphion, Pubmed, Esp@snet

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	BRETT, I. C. and JOHANSSON, B. E.: 'Immunization against influenza A virus: comparison of conventional inactivated, live-attenuated and recombinant baculovirus produced purified hemagglutinin and neuraminidase vaccines in a murine model system' VIROLOGY, Vol. 339(2), pp. 273-280 (1 September 2005) See the whole document.	1-94
Y	CORBEL, M. J.: 'Reasons for instability of bacterial vaccines' DEVELOPMENTS IN BIOLOGICAL STANDARDIZATION, Vol. 87, pp. 113-124 (1996) See the whole document.	1-94
Y	BUSCAGLIA, C. A., et al.: 'Tandem amino acid repeats from Trypanosoma cruzi shed antigens increase the half-life of proteins in blood' BLOOD, Vol. 93(6), pp. 2025-2032 (15 March 1999) See the Abstract.	1-94
Y	COSTA, M. H., et al.: 'Conformational stability and antibody response to the 18kDa heat-shock protein formulated into different vehicles' APPLIED BIOCHEMISTRY AND BIOTECHNOLOGY, Vol. 73(1), pp. 19-28 (April 1998) See the Abstract.	1-94

 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 but 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 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

03 SEPTEMBER 2007 (03.09.2007)

Date of mailing of the international search report

**04 SEPTEMBER 2007 (04.09.2007)**

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**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/US2007/003969**

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	MUSIYCHUK, K. A., et al.: 'Preparation and properties of Clostridium thermocellum lichenase deletion variants and their use for construction of bifunctional hybrid proteins' BIOCHEMISTRY(MOSC), Vol. 65(12), pp. 1397-1402 (December 2000) See the Abstract.	1-94

**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/US2007/003969****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.: 51-55  
because they relate to subject matter not required to be searched by this Authority, namely:  
Claims 51-55 pertain to methods for treatment of the human or animal body, thus relate to a subject-matter which International Searching Authority is not required to search under PCT Art. 17(2)(a)(i) and Rule 39.1(iv).  
REMARK: Although claims 51-55 are directed to a method or treatment of the human or animal body, the search has been carried out based on the alleged effects of the composition used.
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:

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.:

**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.