



(51) International Patent Classification:  
C12N 15/64 (2006.01)

(21) International Application Number:  
PCT/KR2009/001184

(22) International Filing Date:  
10 March 2009 (10.03.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
10-2008-0021970 10 March 2008 (10.03.2008) KR

(71) Applicant (for all designated States except US): **INDUS-  
TRY FOUNDATION OF CHONNAM NATIONAL  
UNIVERSITY** [KR/KR]; 300, Yongbong-dong, Buk-gu,  
Gwangju 500-757 (KR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KIM, Doman** [KR/  
KR]; 103-902 Woosung Apt., 787-6 Munheung-dong,

Buk-gu, Gwangju 500-748 (KR). **KIM, Young-Min** [KR/  
KR]; 686, Yonggok-dong, Gwangsan-gu, Gwangju  
506-504 (KR). **KIM, Do-Won** [KR/KR]; 120, Kangnung  
Daehakro, Gangneung-si, Gangwon-do 210-702 (KR).  
**Lee, Hurng-Chun**; Academia Sinica, 128 Academia  
Road, Section 2, Nankang, Taipei, Taiwan 115 (TW).  
**Wu, Ying-Ta**; Academia Sinica, 128 Academia Road,  
Section 2, Nankang, Taipei, Taiwan 115 (TW). **Breton,  
Vincent** [FR/FR]; Universite Blaise PASCAL, 34, avenue  
Carnot, BP 185, F-63006 Clermont-Ferrand Cedex 1  
(FR).

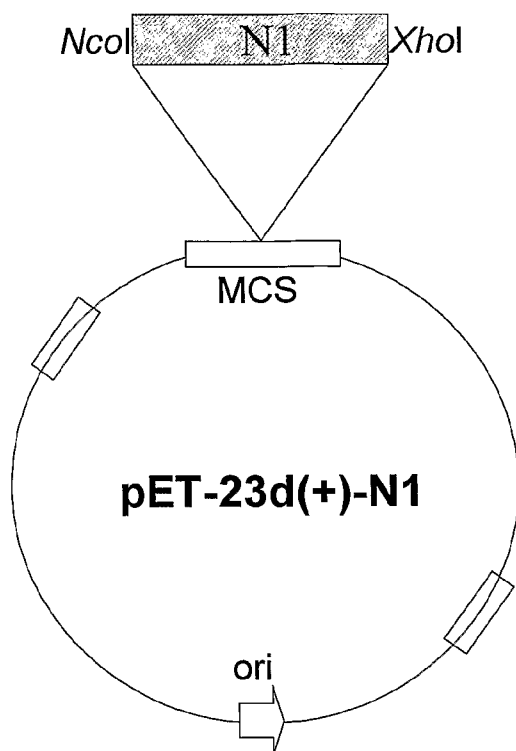
(74) Agents: **KWON, Oh-Sig** et al.; 4F, Joeeunleaderstel,  
921, Dunsan-dong, Seo-gu, Daejeon 302-120 (KR).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,  
CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ,  
EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,  
HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ,

[Continued on next page]

(54) Title: VECTOR AND METHOD FOR EXPRESSING AVIAN INFLUENZA VIRUS NEURAMINIDASE N1 IN E. COLI,  
METHOD OF USING THE VECTOR, AND NEURAMINIDASE INHIBITORS

[Fig. 2]



(57) Abstract: Disclosed are a vector and method for expressing  
neuraminidase N1 of avian influenza (AI) virus in E. coli, a  
method of using the vector to screen an inhibitor of neuraminidase  
N1, and a novel neuraminidase N1 inhibitor screened out by the  
method.



LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
- with sequence listing part of description (Rule 5.2(a))

**(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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR),

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

25 February 2010

## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/KR2009/001184****A. CLASSIFICATION OF SUBJECT MATTER***C12N 15/64(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)

IPC C12N 15/64

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

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

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

eKOMPASS(KIPO Internal)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Sontana Siritantikorn et al., Specific antibody response of mice after immunization with COS-7 cell derived avian influenza virus(H5N1) recombinant proteins, Journal of immune based therapies and vaccines, 3 October 2007, Vol. 5, No. 1, pp. 1-5 see pages 1-4	1-3
A	US 4537769 A(COSTANTINO P. CERINI) 27 August 1985 see columns 2-4	1-3
A	QI-SHI DU et al., Analogue inhibitors by modifying oseltamivir based on the crystal neuraminidase structure for treating drug-resistant H5N1 virus, Biochemical and biophysical research communications, 13 August 2007, V.362, No.2, pp.525-531 see pp.525, 527	1-3



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

30 DECEMBER 2009 (30.12.2009)

Date of mailing of the international search report

**31 DECEMBER 2009 (31.12.2009)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office  
Government Complex-Daejeon, 139 Seonsa-ro, Seo-  
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, Jae Hyun

Telephone No. 82-42-481-5626



## INTERNATIONAL SEARCH REPORT

International application No.

**PCT/KR2009/001184**

### Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.b of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of :

a. type of material



a sequence listing



table(s) related to the sequence listing

b. format of material



on paper



in electronic form

c. time of filing/furnishing



contained in the international application as filed



filed together with the international application in electronic form



furnished subsequently to this Authority for the purposes of search

2. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/KR2009/001184**

## 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:

- group 1 : claims 1-3 feature a vector for expressing avian influenza virus neuraminidase N1 in E.coli, E. coli transformed with the expression vector of claim 1, and a method for producing avian influenza virus neuraminidase N1 by culturing the transformed E. coli of claim 2.
- group 2 : claims 4-5 feature a method for screening inhibitor of an avian influenza virus neuraminidase N1, and a composition for inhibiting avian influenza virus neuraminidase.

<" a posteriori" lack of unity>

The single general concept linking groups 1-2 together is merely "avian influenza virus neuraminidase N1"

This common concept is, however, described in "Horthongkham et al., Specific antibody response of mice after immunization with COS-7 cell derived avian influenza virus recombinant proteins, Journal of immune based therapies and vaccines, 3 October 2007, Vol.5, No.1, pages 1-5" and, therefore, does not represent any contribution over the prior art.

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.: 1-3

### 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**

Information on patent family members

International application No.

**PCT/KR2009/001184**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 04537769 A	27.08.1985	EP 0090886 A3	26.09.1984
		EP 0090886 B1	20.04.1988
		EP 0090886 A2	12.10.1983
		JP 58-183628 A	26.10.1983