



(51) International Patent Classification:

C12Q 1/04 (2006.01) *C12Q 1/48* (2006.01)
C12N 1/20 (2006.01)

(21) International Application Number:

PCT/US2012/040089

(22) International Filing Date:

31 May 2012 (31.05.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/491,726 31 May 2011 (31.05.2011) US

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

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, 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, RS, SE, SI, SK, SM,

[Continued on next page]

(54) Title: METHODS AND COMPOSITIONS FOR THE DETECTION OF FUNCTIONAL CLOSTRIDIUM DIFFICILE TOX-INS

(57) Abstract: Methods and compositions for the identification of functional *C. difficile* toxin, as among other things identifying individuals infected with toxigenic *C. difficile* and therefore in need of therapy. In specific embodiments, the methods and compositions provide colorimetric assays for cleavage activity of *C. difficile* toxin.

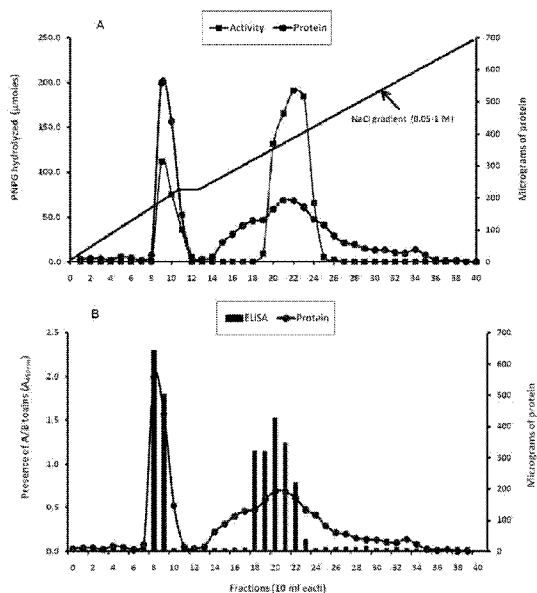


FIGURE 1



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

— *with sequence listing part of description (Rule 5.2(a))*

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

28 March 2013

- *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))*

A. CLASSIFICATION OF SUBJECT MATTER*C12Q 1/04(2006.01)i, C12N 1/20(2006.01)i, C12Q 1/48(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)

C12Q 1/04; C12Q 1/34; C12Q 1/00; A61K 39/40; C07K 16/12; C12N 9/24; C12N 1/20

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

Japanese utility models and applications for utility models

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

NCBI PubMed, eKOMPASS (KIPO internal), 'Clostridium difficile, d-cycloserine, cefoxitin, glucosyltransferase, culture medium, etc.'

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0279330 A1 (ASIR, K. et al.) 2010-11-04 - see the whole document, especially Abstract; Claims 1-3	1,4,6-8,10-15,18 ,20
A		2,5,9,16,19,21 ,25-28
A	US 6,287,798 B1 (JAMES, A. et al.) 2001-09-11 - see the whole document, especially Abstract; Claims 1, 4	1,2,4-16,18-21 ,25-28
A	US 2007/0004021 A1 (RESTAINO, L.) 2007-01-04 - see the whole document, especially Abstract; Claims 1, 8, 13-14	1,2,4-16,18-21 ,25-28
A	US 2007/0098731 A1 (BURNIE, J. P. et al.) 2007-05-03 - see the whole document, especially Abstract; Claims 18-19	1,2,4-16,18-21 ,25-28
PX	DARKOH, C. et al., 'Novel one-step method for detection and isolation of active-toxin-producing Clostridium difficile strains directly from stool samples' J. Clin. Microbiol., 2011 Dec., Vol. 49, No. 12, pp. 4219-4224 - see the whole document, especially Abstract; Materials and methods in pp. 4220-4221.	1,2,4-16,18-21 ,25-28



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

"&" document member of the same patent family

Date of the actual completion of the international search

30 JANUARY 2013 (30.01.2013)

Date of mailing of the international search report

30 JANUARY 2013 (30.01.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/040089

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c 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. a sequence listing filed or furnished

☐

on paper

☒

in electronic form

b. time of filing or 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 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/US2012/040089**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.: 23,24
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 23 and 24 are a method of screening a population of individuals for infection by toxin-producing *C. difficile*. The method comprises 'administering a therapeutic treatment for oxin-producing *C. difficile* to patients. The method is thus considered a therapeutic method or a diagnosing method falling into the category of methods for treatment of the human body by surgery or therapy as well as diagnostic methods [Article 17(2)(a)(i), Rule 39.1(iv) PCT]
2. ☒ Claims Nos.: 3,17,22
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:
Claims 3, 17 and 22 are worded in reference to 'the method of claim 1 (claim 3)', 'the method of claim 9 (claim 17)' and 'the method of claim 1 (claim 22)', respectively. However, said 'the method' has not been worded in 'claims 1 and 9'.
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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/040089

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	DARKOH, C. et al., 'Harnessing the glucosyltransferase activities of Clostridium difficile for functional studies of toxins A and B' J. Clin. Microbiol., 2011 Aug., Vol. 49, No. 8, pp. 2933-2941 - see the whole document, especially Abstract; Materials and methods in pp. 2933-2935.	1,2,4-16,18-21 ,25-28

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/040089

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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