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18 August 2016

(54) Title: CHIMERIC ANTIGEN RECEPTORS AND METHODS OF USE THEREOF

(57) Abstract: The present invention provides chimeric antigen receptors, cells expressing same and methods of using same for treatment various disorders such as cancer.



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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/067225

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07K14/705 C07K19/00 C07K14/735 C07K14/725
ADD.

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)
C07K

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)

EPO-Internal, WPI Data, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CARPENTER R O ET AL: "B-cell Maturation Antigen Is a Promising Target for Adoptive T-cell Therapy of Multiple Myeloma", CLINICAL CANCER RESEARCH, THE AMERICAN ASSOCIATION FOR CANCER RESEARCH, US, vol. 19, no. 8, 15 April 2013 (2013-04-15), pages 2048-2060, XP002727959, ISSN: 1078-0432, DOI: 10.1158/1078-0432.CCR-12-2422 [retrieved on 2013-01-23] Whole document especially page 2050, left column 2	1-19
X	WO 2013/154760 A1 (US HEALTH [US]) 17 October 2013 (2013-10-17) Whole document, especially the claims ----- -/--	1-19



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 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

11 April 2016

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2015/067225

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	XIAO-SONG ZHONG ET AL: "Chimeric Antigen Receptors Combining 4-1BB and CD28 Signaling Domains Augment PI3kinase/AKT/Bcl-XL Activation and CD8+ T Cell-mediated Tumor Eradication", MOLECULAR THERAPY, vol. 18, no. 2, 1 February 2010 (2010-02-01), pages 413-420, XP055023623, ISSN: 1525-0016, DOI: 10.1038/mt.2009.210 Whole document, especially figure 1a -----	1-8, 10-12, 14-20
X	WO 2014/011988 A2 (UNIV PENNSYLVANIA [US]) 16 January 2014 (2014-01-16) -----	1-8, 10-12, 14-19
A	Whole document, especially the claims 23-27, 29,31,33 -----	20,21
A	M. SADELAIN ET AL: "The Basic Principles of Chimeric Antigen Receptor Design", CANCER DISCOVERY, vol. 3, no. 4, 1 April 2013 (2013-04-01), pages 388-398, XP055133523, ISSN: 2159-8274, DOI: 10.1158/2159-8290.CD-12-0548 the whole document -----	1-19
A	WO 2005/044996 A2 (ST JUDE CHILDRENS RES HOSPITAL [US]; CAMPANA DARIO [US]; IMAI CHIHAYA) 19 May 2005 (2005-05-19) the whole document -----	1-19
A	JULIE R BRAHMER ET AL: "Safety and activity of anti-PD-L1 antibody in patients with advanced cancer", NEW ENGLAND JOURNAL OF MEDICINE, THE - NEJM, MASSACHUSETTS MEDICAL SOCIETY, US, vol. 366, no. 26, 28 June 2012 (2012-06-28), pages 2455-2465, XP002685330, ISSN: 1533-4406, DOI: 10.1056/NEJMOA1200694 abstract -----	21
X,P	Wayne A Marasco ET AL: "Carbonic Anhydrase IX: Opportunities for Immune-Based Approaches", 7 November 2015 (2015-11-07), XP055264162, Retrieved from the Internet: URL:http://www.euikcs.com/kca/miami/docs/h6-marasco.pdf [retrieved on 2016-04-11] the whole document -----	1-21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/067225

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:

see additional 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 fees, this Authority did not invite payment of 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.:

1-21(partially)

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-21(partially)

Chimeric antigen receptor having extracellular immunoglobulin part specific binding BCMA. Nucleic acid encoding said receptor. Vector comprising said nucleic acid. Host cell comprising the vector. Genetically engineered cell expressing said receptor on the membrane.

2-13. claims: 1-21(partially)

As for subject 1, now specificity for other molecules selected from CD138, CCR4, PD-1, PD-L1, PD-L2, CXCR4, GITR, SARS virus, flavivirus, MERS virus, influenza virus, or CAIX.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2015/067225

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2013154760 A1	17-10-2013	AU 2013246443 A1 CA 2869562 A1 CN 104379179 A EA 201491837 A1 EP 2836239 A1 HK 1203393 A1 IS 9056 A JP 2015513920 A KR 20150003306 A RU 2014144143 A SG 11201406414W A US 2015051266 A1 WO 2013154760 A1	23-10-2014 17-10-2013 25-02-2015 31-03-2015 18-02-2015 30-10-2015 06-10-2014 18-05-2015 08-01-2015 10-06-2016 27-11-2014 19-02-2015 17-10-2013
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