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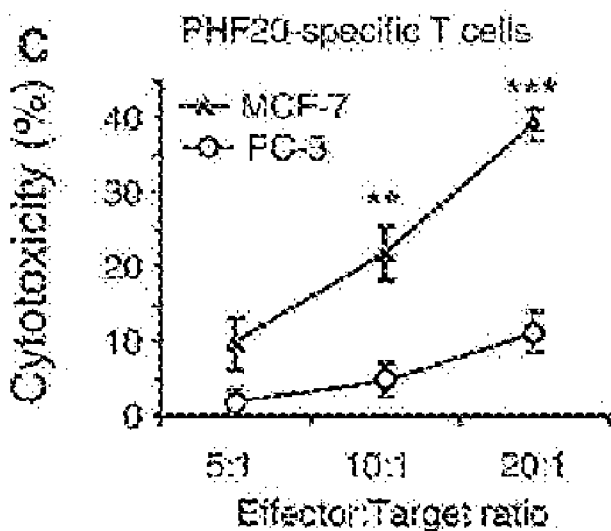
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**Published:**

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- (88) Date of publication of the international search report:  
24 December 2014

(54) Title: PHF20 AND JMJD3 COMPOSITIONS AND METHODS OF USE IN CANCER IMMUNOTHERAPY



**FIG 9C**

(57) Abstract: Pharmaceutical compositions and methods for regulating somatic cell reprogramming in mammals, and in particular, for positively and negatively regulating cell reprogramming in human cells in vivo and in vitro. The invention also provides PHF20-derived compositions and methods useful for cancer immunotherapies, including breast cancer therapies in particular.



**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US14/18464

<p><b>A. CLASSIFICATION OF SUBJECT MATTER</b>                  IPC(8) - A61K 38/00, 38/03 (2014.01)                  USPC - A61K 38/00, 39/00                  According to International Patent Classification (IPC) or to both national classification and IPC</p>																	
<p><b>B. FIELDS SEARCHED</b></p> <p>Minimum documentation searched (classification system followed by classification symbols)                  IPC(8): C12N 5/00, 5/02, 5/0783; A61K 38/00, 38/03 (2014.01)                  CPC: C12N 2506/02, 2501/115; A61K 31/7088, 38/00, 39/00; USPC: 435/377, 375, 325</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)                  MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); Google Scholar; Pubmed; ScienceDirect; peptide, 'PHF20,' 'GLEA2,' 'HCA58,' 'PD-1,' 'PD1,' 'CD279,' 'siRNA,' antibody, dendritic</p>																	
<p><b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b></p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>Y</td> <td>WO 2010/038027 A9 (GUINN, BA et al.) April 8, 2010; page 3, lines 23-36; page 11, lines 23-31; page 53, lines 36-37; page 54, lines 1-34; page 60, lines 28-34; page 62, lines 1-5</td> <td>1-23</td> </tr> <tr> <td>Y</td> <td>WO 2006/072304 A2 (COMTESSE, N et al.) July 13, 2006; SEQ ID NO: 1; page 2, paragraphs 14-15</td> <td>1-23</td> </tr> <tr> <td>Y</td> <td>US 2012/0114648 A1 (LANGERMANN, S et al.) May 10, 2012; paragraph [0014]</td> <td>8, 10-12, 23</td> </tr> <tr> <td>Y</td> <td>SONG, X et al. A20 Is An Antigen Presentation Attenuator; And Its Inhibition Overcomes Regulatory T Cell-Mediated Suppression. Nature Medicine. March 2008; Vol. 14, No. 3; pages. 258-265; page 259, right column, third paragraph to page 260, left column, first paragraph. DOI: 10.1038/nm172.</td> <td>9</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	Y	WO 2010/038027 A9 (GUINN, BA et al.) April 8, 2010; page 3, lines 23-36; page 11, lines 23-31; page 53, lines 36-37; page 54, lines 1-34; page 60, lines 28-34; page 62, lines 1-5	1-23	Y	WO 2006/072304 A2 (COMTESSE, N et al.) July 13, 2006; SEQ ID NO: 1; page 2, paragraphs 14-15	1-23	Y	US 2012/0114648 A1 (LANGERMANN, S et al.) May 10, 2012; paragraph [0014]	8, 10-12, 23	Y	SONG, X et al. A20 Is An Antigen Presentation Attenuator; And Its Inhibition Overcomes Regulatory T Cell-Mediated Suppression. Nature Medicine. March 2008; Vol. 14, No. 3; pages. 258-265; page 259, right column, third paragraph to page 260, left column, first paragraph. DOI: 10.1038/nm172.	9
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<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/></p>																	
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"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</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"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</td> </tr> <tr> <td>"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)</td> <td>"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</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance	"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	"E" earlier application or patent but published on or after the international filing date	"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	"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)	"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	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed						
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<p>Date of the actual completion of the international search 12 September 2014 (12.09.2014)</p>		<p>Date of mailing of the international search report <b>07 OCT 2014</b></p>															
<p>Name and mailing address of the ISA/US                  Mail Stop PCT, Attn: ISA/US, Commissioner for Patents                  P.O. Box 1450, Alexandria, Virginia 22313-1450                  Facsimile No. 571-273-3201</p>		<p>Authorized officer: Shane Thomas</p> <p>PCT Helpdesk: 571-272-4300                  PCT OSP: 571-272-7774</p>															

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/18464

**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:

\*\*\*-Please See Supplemental Page-\*\*\*

- 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 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.:

Group I: Claims 1-23

- 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/US14/18464

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 sequence listing filed or furnished:

a. (means)



on paper



in electronic form

b. (time)



in the international application as filed



together with the international application in electronic form



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/US14/18464

\*\*\*\*-Continued from Box No. 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.

Group I: Claims 1-23 are directed toward a PHF20 peptide, pharmaceutical compositions and vaccines comprising said peptide, nucleic acids encoding said peptide, and methods of treating breast cancer comprising screening a cell population for Th cells with specificity for said peptide.

Group II: Claim 24 is directed toward a method for inducing pluripotent stem cell formation, comprising inhibiting or preventing the expression of expression of Jmjd3 gene in a cell, or inhibiting the activity of the JMJD3 protein in a cell.

The inventions listed as Groups I-II 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 special technical features of Group I include a PHF20 peptide, which is not present in Group II; the special technical features of Group II including a Jmjd3 protein.

Groups I-II share the technical features including a gene encoding a peptide or protein.

However, these shared technical features are previously disclosed by the publication entitled 'Identification Of Akt Interaction Protein PHF20/TZP That Transcriptionally Regulates p53' by Park, et al. (hereinafter 'Park'). Park discloses a gene encoding a peptide or protein (cDNA of PHF20 (a gene encoding a peptide or protein); page 11152, column 1, paragraph 4).

Since none of the special technical features of the Groups I-II inventions is found in more than one of the inventions, and since all of the shared technical features are previously disclosed by the Park reference, unity of invention is lacking.