



(51) International Patent Classification:

C12N 15/63 (2006.01) C12N 5/10 (2006.01)
C12N 15/86 (2006.01) A61K 35/12 (2006.01)

(21) International Application Number:

PCT/US2012/024902

(22) International Filing Date:

13 February 2012 (13.02.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/442,554 14 February 2011 (14.02.2011) US

(71) Applicant (for all designated States except US):

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA [US/US]; 1111 Franklin Street, Twelfth Floor, Oakland, California 94607-5200 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **WILLIAMS, Ambrose** [US/US]; c/o UC Davis InnovationAccess, 1850 Research Park Drive, Suite 100, Davis, California 95618 (US). **DENG, Wenbin** [US/US]; c/o UC Davis InnovationAccess, 1850 Research Park Drive, Suite 100, Davis, California 95618 (US).

(74) Agents: **KONSKI, Antoinette F.** et al.; Foley & Lardner LLP, 975 Page Mill Road, Palo Alto, CA 94304 (US).

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

Declarations under Rule 4.17:

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

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))

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

15 November 2012

(54) Title: COMPOSITIONS AND METHODS FOR INCREASING REPROGRAMMING EFFICIENCY

(57) Abstract: The present invention relates to methods for enhancing the efficiency of reprogramming a non-pluripotent cell to a pluripotent cell, comprising expressing in the cell an effective amount of pluripotency factors and an effective amount of PARP-1 or an equivalent thereof, thereby enhancing the efficiency of reprogramming the non-pluripotent cell to the pluripotent cell.



WO 2012/112458 A3

A. CLASSIFICATION OF SUBJECT MATTER*C12N 15/63(2006.01)i, C12N 15/86(2006.01)i, C12N 5/10(2006.01)i, A61K 35/12(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)

C12N 15/63; C12N 5/10; A61K 35/12; C12N 15/09; C12N 5/08

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)

eKOMPASS(KIPO internal) & Keywords: pluripotent factor, parp-1, reprogramming, stem cell

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FURONG GAO et al., `PARP1 poly(ADP-ribosyl)ates Sox2 to Control Sox2 Protein Levels and FGF4 Expression during Embryonic Stem Cell Differentiation`, J Biol Chem., Vol. 284(33), pp. 22263-22273 (16 June 2009). See Abstract, Page 22272.	1-7, 10-13, 15, 17
A	Vimal Selvaraj et al., `PARP-1 Deficiency Increases the Severity of Disease in a Mouse Model of Multiple Sclerosis`, J Biol Chem., Vol. 284(38), pp. 26070-26084 (18 September 2009). See Whole-document.	1-7, 10-13, 15, 17
A	US 2009-0068742 A1 (SHINYA YAMANAKA) 12 March 2009. See Abstract, Claims 1-4.	1-7, 10-13, 15, 17
A	US 2009-0304646 A1 (KAZUHIRO SAKURADA et al.) 10 December 2009. See Abstract, Claim 149.	1-7, 10-13, 15, 17

 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

21 SEPTEMBER 2012 (21.09.2012)

Date of mailing of the international search report

24 SEPTEMBER 2012 (24.09.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

PARK, Yeong-Gwan

Telephone No. 82-42-481-8407



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.: 9, 19, 21-23, 25, 27, 29, 32-35 and 40
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:

Since claims 9, 19, 21-23, 25, 27, 29, 32-35 and 40 directly or indirectly refer to 8, 18, 20, 28, 31 or 39 which are not drafted in accordance with the second and/or third sentence of Rule 6.4(a), this international search report of the claims has not been established.

3. Claims Nos.: 8, 14, 16, 18, 20, 24, 26, 28, 30, 31 and 36-39
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

Information on patent family members

International application No.

PCT/US2012/024902

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0068742 A1	12.03.2009	AU 2006-325975 A1	21.06.2007
		AU 2006-325975 B2	08.12.2011
		CA 2632142 A1	21.06.2007
		CA 2660123 A1	30.04.2009
		CN 101356270 A	28.01.2009
		CN 101617043 A	30.12.2009
		CN 101864392 A	20.10.2010
		EP 1970446 A1	17.09.2008
		EP 1970446 A4	08.04.2009
		EP 1970446 B1	03.08.2011
		EP 2096169 A1	02.09.2009
		EP 2206724 A1	14.07.2010
		EP 2206778 A1	14.07.2010
		EP 2208786 A1	21.07.2010
		JP 04-183742 B1	19.11.2008
		JP 04-411362 B2	20.11.2009
		JP 04-411363 B2	20.11.2009
		JP 2008-283972 A	27.11.2008
		JP 2009-165478 A	30.07.2009
		JP 2009-165479 A	30.07.2009
		JP 2009-165480 A	30.07.2009
		JP 2009-165481 A	30.07.2009
		JP 2011-188860 A	29.09.2011
		KR 10-2008-0095852 A	29.10.2008
		KR 10-2010-0075771 A	05.07.2010
		MX 2008007654 A	26.09.2008
		US 2009-0047263 A1	19.02.2009
		US 2009-0227032 A1	10.09.2009
		US 2010-0062533 A1	11.03.2010
		US 2010-0210014 A1	19.08.2010
		US 2010-0216236 A1	26.08.2010
		US 8048999 B2	01.11.2011
		US 8058065 B2	15.11.2011
		US 8129187 B2	06.03.2012
WO 2007-069666 A1	21.06.2007		
WO 2009-057831 A1	07.05.2009		
US 2009-0304646 A1	10.12.2009	AU 2008-273817 A1	15.01.2009
		CA 2690629 A1	15.01.2009
		CN 102317448 A	11.01.2012
		EP 2164952 A1	24.03.2010
		EP 2171045 A2	07.04.2010
		EP 2213727 A1	04.08.2010
		EP 2297332 A2	23.03.2011
		EP 2476749 A1	18.07.2012
		GB 0810897 D0	23.07.2008
		GB 0922013 D0	03.02.2010
		GB 2450603 A	31.12.2008
GB 2450603 B	10.02.2010		

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/024902

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		GB 2465291 A	19.05.2010
		GB 2465291 B	18.01.2012
		JP 2008-307007 A	25.12.2008
		JP 2010-529851 A	02.09.2010
		KR 10-2010-0059781 A	04.06.2010
		MX 2009013706 A	02.07.2010
		US 2009-0191159 A1	30.07.2009
		US 2009-0299763 A1	03.12.2009
		US 2009-0324559 A1	31.12.2009
		US 2010-0105100 A1	29.04.2010
		US 2010-0120069 A1	13.05.2010
		US 2010-0240090 A1	23.09.2010
		US 2010-0267135 A1	21.10.2010
		US 2011-0039332 A1	17.02.2011
		US 8211697 B2	03.07.2012
		US 8257941 B2	04.09.2012
		WO 2009-006930 A1	15.01.2009
		WO 2009-006997 A1	15.01.2009
		WO 2009-007852 A2	15.01.2009
		WO 2009-007852 A3	20.08.2009
		WO 2009-152484 A2	17.12.2009
		WO 2009-152485 A2	17.12.2009