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C12N 5/10 (2006.01)
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- (74) **Agents:** HETZER-EGGER, Claudia, H. et al; Kilpatrick Townsend & Stockton LLP, Two Embarcadero Center, 8th Floor, San Francisco, California 941 11 (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,

[Continued on nextpage]

(54) **Title:** CORD BLOOD-DERIVED NEURONS BY EXPRESSION OF SOX2

(57) **Abstract:** Provided herein are induced neural progenitors cells generated from cord blood (CB-iNPCs). CB-iNPCs are generated by ectopic expression of SOX2, optionally in combination with c-MYC. CB-iNPCs differentiate into functional, mature neurons *in vitro* and *in vivo*. The mature CB-derived neurons form functional synapses, generate action potentials, and produce neurons when grafted *in vivo*. Thus, further provided herein are cell-base therapies for neurodegenerative diseases and traumatic injuries to the nervous system.

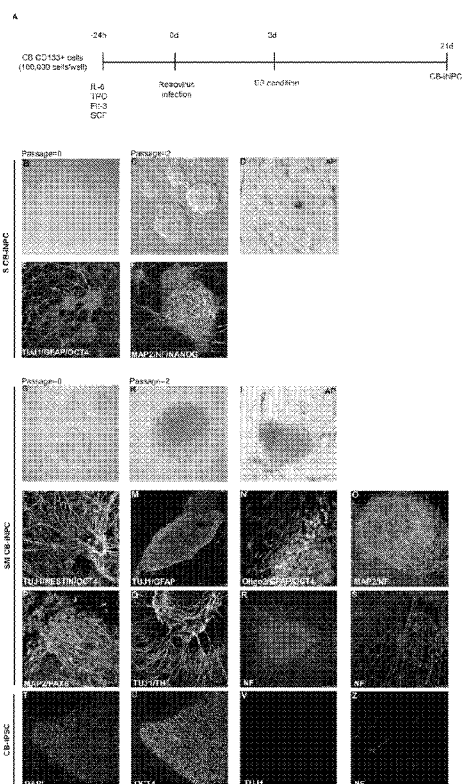
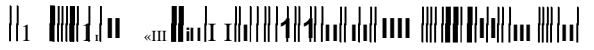


FIG. 3

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SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
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Published:

— *with international search report (Art. 21(3))*

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

11 July 2013

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.: **27-30**
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 27-30 pertain to methods for treatment of the human body by therapy, and thus relate to a subject matter which this International Searching Authority is not required, under Article 17(2)(a)(i) of the PCT and Rule 39.1(iv) of the Regulations under the PCT, to search.
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:

1. IAs all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. IAs all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. IAs 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. INo 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.
- I No protest accompanied the payment of additional search fees.

A. CLASSIFICATION OF SUBJECT MATTER*C12N 15/12(2006.01)i, C12N 5/10(2006.01)I, C12N 5/0735(2010.01)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 15/12; C12N 5/10; C07K 14/47; C12N 5/02; A61K 35/12; A61K 45/00; C12N 5/08; C12N 15/00; C12N 15/85

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: induced neuroprogenitor cell, iNPC, SOX2, cord blood, CB cell, neuron, differentiation.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GIORGETTI, A. et al., 'Generation of induced pluripotent stem cells from human cord blood cells with only two factors: Oct4 and Sox2', Nat. Protoc, April 2010, Vol.5, No.4, pp.811-820. See abstract; figure 6.	1-26,31-33
A	GIORGETTI, A. et al., 'Generation of induced pluripotent stem cells from human cord blood using OCT4 and SOX2', Cell Stem Cell, 2 October 2009, Vol.5, No.4, pp.353-357. See p.3, lines 37-39; figures 1, 2E, and 2F.	1-26,31-33
A	W0 2011-050470 A1 (MCMASTER UNIVERSITY) 05 May 2011 See abstract; claims 1-6, 15, and 16.	1-26,31-33
A	W0 2011-032166 A2 (THE JOHNS HOPKINS UNIVERSITY) 17 March 2011 See abstract; claims 1, 8, and 13-15.	1-26,31-33
A	W0 2010-108005 A2 (UNIVERSITY OF GEORGIA RESEARCH FOUNDATION et al.) 23 September 2010 See abstract; claims 1, 2, 13, and 20-22.	1-26,31-33

 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

25 FEBRUARY 2013 (25.02.2013)

Date of mailing of the international search report

26 FEBRUARY 2013 (26.02.2013)

Name and mailing address of the ISA/KR



Facsimile No. 82-42-472-7140

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/042803

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009-0191159 A1 (SAKURADA, KAZUHIRO et al.) 30 July 2009 See abstract; claims 133, 134, and 142-144.	1-26,31-33
PA	GIORGETTI, A. et al. 'Cord Blood-derived neurons by ectopic expression of SOX2 and c-MYC', 53rd ASH Annual Meeting and Exposition, 11 December 2011, poster [https://ash.confex.com/ash/2011/webprogram/Paper42938.html] See the whole document.	1-26,31-33

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/042803

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011-050470 A1	05.05.2011	CA 2779039 A1 EP 2494032 A1	05.05.2011 05.09.2012
WO 2011-032166 A2	17.03.2011	WO 2011-032166 A3	21.07.2011
WO 2010-108005 A2	23.09.2010	wo 2010-108005 A3	31.03.2011
US 2009-0191159 A1	30.07.2009	AP 201005102 DO AU 2008-273817 A1 CA 2690629 A1 CN 102203275 A CN 102317448 A EP 2164952 A1 EP 2171045 A2 EP 2213727 A1 EP 2297332 A2 EP 2476749 A1 GB 0810897 DO GB 0922013 DO GB 2450603 A GB 2450603 B GB 2465291 A GB 2465291 B IL 202678 DO JP 2008-307007 A JP 2010-529851 A KR 10-2010-0059781 A MX 2009013706 A US 2009-0299763 A1 US 2009-0304646 A1 US 2009-0324559 A1 US 2010-0105100 A1 US 2010-0120069 A1 US 2010-0240090 A1 US 2010-0267135 A1 US 2011-0039332 A1 US 8211697 B2 US 8257941 B2 WO 2009-006930 A1 wo 2009-006997 A1 wo 2009-007852 A2 wo 2009-152484 A2 wo 2009-152485 A2 ZA 200908904 A	28.02.2010 15.01.2009 15.01.2009 28.09.2011 11.01.2012 24.03.2010 07.04.2010 04.08.2010 23.03.2011 18.07.2012 23.07.2008 03.02.2010 31.12.2008 10.02.2010 19.05.2010 18.01.2012 01.08.2011 25.12.2008 02.09.2010 04.06.2010 02.07.2010 03.12.2009 10.12.2009 31.12.2009 29.04.2010 13.05.2010 23.09.2010 21.10.2010 17.02.2011 03.07.2012 04.09.2012 15.01.2009 15.01.2009 15.01.2009 17.12.2009 17.12.2009 29.09.2010