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C07K 14/00 (2006.01) A61L 27/38 (2006.01)
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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,

[Continued on next page]

(54) Title: COMPOSITIONS AND METHODS FOR RE-PROGRAMMING CELLS WITHOUT GENETIC MODIFICATION FOR REPAIRING CARTILAGE DAMAGE

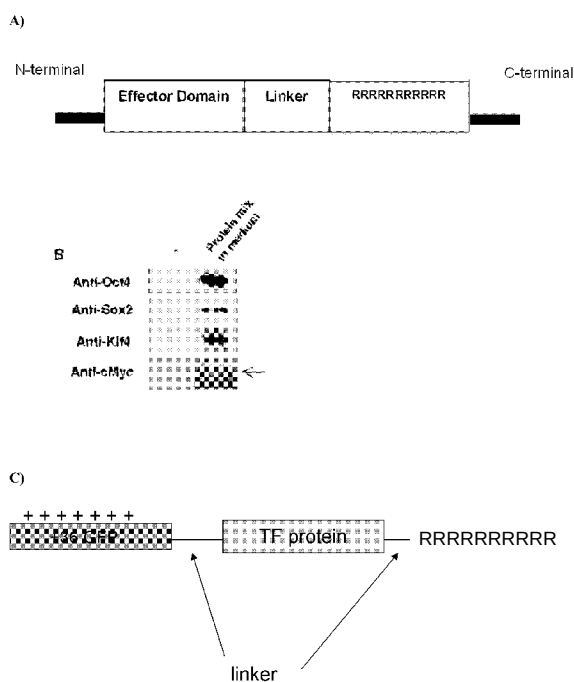


Figure 1

(57) Abstract: The present inventions are directed to compositions and methods regarding the reprogramming of other cells (such as embryonic stem cells (ESCs), induced pluripotent stem cells (iPSCs), MSCs, fibroblasts, hematopoietic stem cells, endothelial stem cells, adipocytes, chondrocytes, osteoblasts, osteoclasts and endothelial cells) into chondrogenic cells without introducing exogenous genes to the samples. In particular, the present inventions are directed to transducible materials that are capable of transducing into the biological samples but are not genes or causing genetic modifications. The present inventions also are directed to methods of reprogramming the path of biological samples or treating diseases using the transducible compositions thereof.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/047495**A. CLASSIFICATION OF SUBJECT MATTER****C12N 15/11(2006.01)i, C07K 14/00(2006.01)1, C12N 5/077(2010.01)1, A61K 38/16(2006.01)1, A61L 27/38(2006.01)1, C07K 19/00(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 15/1 1; C12N 5/10; C07K 1/00; A61K 35/12; C07K 14/00; C12N 15/62

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: transducible materials, effector domain, transduction domain, reprogramming cell, repairing cartilage damage

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	W0 2010-075575 A1 (BIOTIPS, INC. et al.) 01 July 2010 See the whole document, especially, abstract, claims 1-15	1-18
X	W0 2010-059806 A2 (CEDARS-SINAI MEDICAL CENTER et al.) 27 May 2010 See the whole document	1-5, 8-10, 13
X	W0 2011-050476 A1 (NEW WORLD LABORATORIES INC. et al.) 05 May 2011 See the whole document	1-4, 8, 13
A	VICTORIA SEBBAGE. Bioscience Horizons. 2009, Vol. 2, No. 1, pp. 64-72. Cell-penetrating peptides and their therapeutic applications See the whole document	1-18



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

02 May 2013 (02.05.2013)

Date of mailing of the international search report

03 May 2013 (03.05.2013)

Name and mailing address of the ISA/KR

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City, 302-70 1, Republic of Korea

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/047495

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item I.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/US2012/047495

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.: 33-35
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 33-35 pertain to methods for treatment of the human body by surgery or therapy, as well as diagnostic methods, 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:

See extra sheet

1. HI As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. HI As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. HI 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.:
1-18

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.

(Continuation of Box No. III)

This ISA found multiple inventions in this application as follows:

- Group 1: Claims 1-32, 36
 - Group 1-1: Claims 1-18 are directed to a transducible material.
 - Group 1-2: Claims 19-26 are directed to a method of reprogramming a biological sample.
 - Group 1-3: Claims 27-29 are directed to a pharmaceutical composition.
 - Group 1-4: Claim 30 is directed to a composition.
 - Group 1-5: Claims 31, 32 are directed to use of a transducible material.
 - Group 1-6: Claim 36 is directed to a method of developing drug screening or toxicity models.
- Group 2: Claim 37 is directed to a method of identifying an effector domain

The single general inventive concept linking Groups 1 ~ 2 together is a effector domain. And the single general inventive concept linking Groups 1-1 ~ 1-6 together is a transducible material comprising an effector domain, wherein the effector domain is a polypeptide, a small molecule, or a polynucleotide, and wherein the polypeptide is selected from the group consisting of Sox9, Sox6, Sox5, c-Myc, Klf4, Met2C, Trpsl, Gli3, Runx2, Dlx5, Dlx6, GATA-6, and Baf60c, and a homologous sequence thereof, and any combination thereof.

However, these common concepts are described in the following documents, therefore, do not represent any contribution over the prior art.

- WO 2010-075575 A1 (BIOPIPS, INC. et al.) 01 July 2010
- WO 2010-059806 A2 (CEDARS-SINAI MEDICAL CENTER et al.) 27 May 2010

Hence the inventions listed as Groups 1 ~ 2 and Groups 1-1 —1-6 do not relate to a single general inventive concept under PCT Rule 13.1 because the above mentioned common concept fails to make a contribution over the prior art within the meaning of PCT Rule 13.2.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/047495

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010-075575 A1	01.07.2010	AU 2009-329893 A1	30.06.2011
		AU 2009-329893 A1	01.07.2010
		CA 2748009 A1	01.07.2010
		CN 102272142 A	07.12.2011
		EP 2379577 A1	26.10.2011
		JP 2012-513218 A	14.06.2012
		US 2011-258713 A1	20.10.2011
WO 2010-059806 A2	27.05.2010	US 2011-300111 A1	08.12.2011
		WO 2010-059806 A3	27.05.2010
		WO 2010-059806 A3	15.07.2010
WO 2011-050476 A1	05.05.2011	CA 2779310 A1	05.05.2011
		EP 2494039 A1	05.09.2012
		KR 10-2012-0094488 A	24.08.2012