

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL SEARCH REPORT**  
(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 9869SG5138	<b>FOR FURTHER ACTION</b>	See Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/SG2018/050438	International filing date ( <i>day/month/year</i> ) 29/08/2018	(Earliest) Priority Date ( <i>day/month/year</i> ) 29/08/2017
Applicant AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH		

This international search report has been prepared by this International Search Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of   6   sheets.

It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

the international application in the language in which it was filed.

a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purpose of international search (Rules 12.3(a) and 23.1(b)).

b.  This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c.  With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2.  **Certain claims were found unsearchable** (see Box No. II).

3.  **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. \_\_\_\_\_

as suggested by the applicant.

as selected by this Authority, because the applicant failed to suggest a figure.

as selected by this Authority, because this figure better characterizes the invention.

b.  none of the figures is to be published with the abstract.

# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/SG2018/050438**

## 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:
  - a.  forming part of the international application as filed:
    - in the form of an Annex C/ST.25 text file.
    - on paper or in the form of an image file.
  - b.  furnished together with the international application under PCT Rule 13~~ter~~.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
  - c.  furnished subsequent to the international filing date for the purposes of international search only:
    - in the form of an Annex C/ST.25 text file (Rule 13~~ter~~.1(a)).
    - on paper or in the form of an image file (Rule 13~~ter~~.1(b) and Administrative Instructions, Section 713).
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:

Although a sequence listing has been filed or furnished, it was not used for the purposes of this search.

Since only one version or copy of sequence listing has been filed or furnished, the statements under item 2 are not required.

**Box No. IV      Text of the abstract (Continuation of item 5 of the first sheet)**

Methods of enriching non-senescent mesenchymal stem cells (MSCs) and methods of performing quality control for non-senescent MSCs are disclosed. The methods comprise contacting a sample comprising MSCs with a probe (specifically peanut agglutinin, PNA) that binds to a glycan (specifically glycan T-antigen) expressed on the surface of MSCs, with the separation or determination of non-senescent MSCs from senescent MSCs based on a difference in expression of the glycan at the cell surface, i.e. the non-senescent MSCs express more of the glycan than senescent MSCs. A high amount of non-senescent MSCs is indicative of a sample of acceptable quality.

## INTERNATIONAL SEARCH REPORT

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**A. CLASSIFICATION OF SUBJECT MATTER****C12N 5/0775 (2010.01)**

According to International Patent Classification (IPC)

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

C12N G01N

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)

EPODOC/WPI/CAPLUS/BIOSIS/EMBASE/MEDLINE: mesenchymal stem cells, MSCs, enrich, sort, isolate, senescence, glycan, T-antigen, sialyl-Tn, N acetylgalactosamine, fucose, lewis X, lectin, agglutinin, jacalin, amaranthin, frutalin, morniga G and related terms.

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ZARIFI F. ET AL, Research Paper: Lectin Histochemistry Showed a Heterogeneous Population of Cells Among Human Mesenchymal Stem Cells Isolated From Adipose Tissue. <i>JAMSAT</i> , 31 July 2017, Vol. 3, No. 2, pages 77-84 [Retrieved on 2018-10-02] <DOI: 10.18869/NRIP.JAMSAT.3.2.77> Discussion on pages 80-81; Conclusion	1-23
A	WO 2016/006712 A1 (NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY) 14 January 2016 Page 4, last para., page 5, para. 1, pages 6-7, page 10, last para.; Example 2 of the machine translation	1-23
A	HASEHIRA K. ET AL, Structural and quantitative evidence of $\alpha$ 2-6-sialylated N-glycans as markers of the differentiation potential of human mesenchymal stem cells. <i>Glycoconj J.</i> , 17 June 2016, Vol. 34, No. 6, pages 797-806 [Retrieved on 2018-10-02] <DOI: 10.1007/S10719-016-9699-6> Page 803, right col. para. 1, page 798, left col. para. 2-3	1-23

 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

15/10/2018

(day/month/year)

Date of mailing of the international search report

02/11/2018

(day/month/year)

Name and mailing address of the ISA/SG

**Intellectual Property Office of Singapore**51 Bras Basah Road  
#01-01 Manulife Centre  
Singapore 189554

Email: pct@ipos.gov.sg

Authorized officer

Chen Xiuli (Dr)

IPOS Customer Service Tel. No.: (+65) 6339 8616

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SG2018/050438

**C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2008/087260 A1 (SUOMEN PUNAINEN RISTI, VERIPALVELU & GLYKOS FINLAND LTD.) 24 July 2008 Whole document	-
A	SALNER A.L. ET AL, Differing stem cell self-renewal of lectin-separated murine bone marrow fractions. <i>J Natl Cancer Inst</i> , 30 April 1982, Vol. 68, No. 4, pages 639-641 [Retrieved on 2018-10-02] <DOI: NOT AVAILABLE> Abstract	-
A	ITAKURA Y. ET AL, N- and O-glycan surface modifications associated with cellular senescence and human aging. <i>Cell Biosci</i> , 18 February 2016, Vol. 6, No. 14, pages 1-11 [Retrieved on 2018-10-02] <DOI: 10.1186/S13578-016-0079-5> Whole document	-
A	TURINETTO V. ET AL, Senescence in Human Mesenchymal Stem Cells: Functional Changes and Implications in Stem Cell-Based Therapy. <i>International Journal of Molecular Sciences</i> , 19 July 2016, Vol. 17, No. 1164, pages 1-18 [Retrieved on 2018-10-02] <DOI: 10.3390/IJMS17071164> Abstract; Table 1	-

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

**PCT/SG2018/050438**

*Note: This Annex lists known patent family members relating to the patent documents cited in this International Search Report. This Authority is in no way liable for these particulars which are merely given for the purpose of information.*

<b>Patent document cited in search report</b>	<b>Publication date</b>	<b>Patent family member(s)</b>	<b>Publication date</b>
WO 2016/006712 A1	14/01/2016	NONE	
WO 2008/087260 A1	24/07/2008	JP 2010516241 A EP 2115461 A1 CA 2712562 A1 US 2010/0047827 A1 AU 2008206887 A1	20/05/2010 11/11/2009 24/07/2008 25/02/2010 24/07/2008