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

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[Continued on next page]

(54) **Title:** GENES DYSREGULATED IN AUTISM AS BIOMARKERS AND TARGETS FOR THERAPEUTIC PATHWAYS

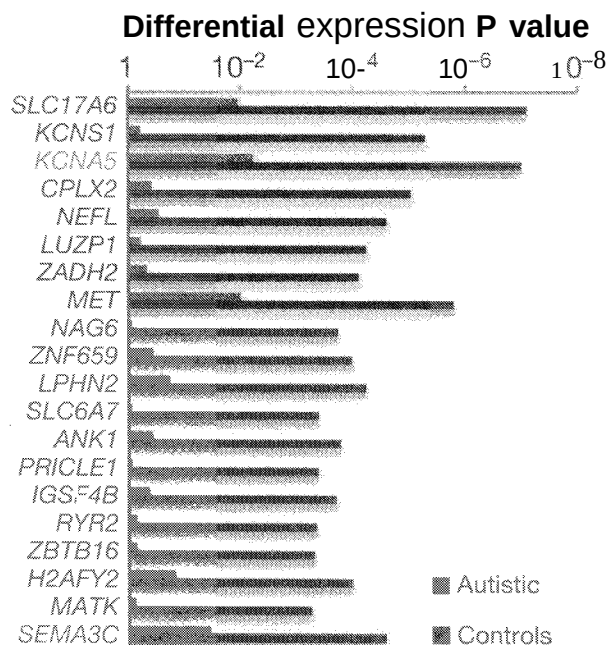
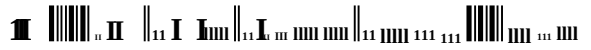


FIG. 1

(57) **Abstract:** The disclosed invention comprises methods and materials for screening cells for genetic profiles associated with autism spectrum disorders. The methods typically involve isolating a cell from an individual and then observing the expression profile of one or more genes in the cell, wherein certain expression patterns of the genes observed are associated with autism spectrum disorders.



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- with international search report (Art. 21(3))
- with sequence listing part of description (Rule 5.2(a))

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/039269**A. CLASSIFICATION OF SUBJECT MATTER****C12Q 1/68(2006.01)i, C12N 15/11(2006.01)1**

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)

C12Q 1/68

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)

PubMed:"ACOT7, autism"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	RATAJCZAK, H. V. Theoretical aspects of autism: biomarkers – a review. Journal of Immunotoxicology. Jan-Mar 2011, Vol. 8, No. 1, pages 80-94. See tables 1-5.	1-19
A	BAILEY, A. R. et al. Peripheral biomarkers in Autism: secreted amyloid precursor protein-alpha as a probable key player in early diagnosis. International Journal of Clinical and Experimental Medicine. 2008, Vol. 1, No. 4, pages 338-44. See abstract; figure 1.	1-19
A	BOSL, W. et al. Response: Infant EEG activity as a biomarker for autism: a promising approach or a false promise? BMC Medicine. 20 May 2011, Vol. 9, pages 60-61. See page 60, column 2.	1-19
A	MUHLE, R. et al. The genetics of autism. Pediatrics. May 2004, Vol. 113, No. 5, pages e472-86. See page e480.	1-19



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

15 April 2013 (15.04.2013)

Date of mailing of the international search report

16 April 2013 (16.04.2013)

Name and mailing address of the ISA/KR

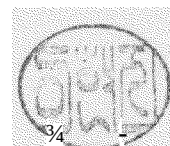
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/039269

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SHUBINA, D. M. et al. CENTB5 gene expression in human and mouse. Molecular Biology. May-Jun 2009, Vol. 43, No. 3, pages 407-13. See page 378.	1-19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/039269

Patent document
cited in search report

Publication
date

Patent family
member(s)

Publication
date

None

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/039269

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/US2012/039269

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:

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.: 1-19

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.
- HI No protest accompanied the payment of additional search fees.

Continuation of Box No. III

This ISA found 88 inventions in this application as follows:

Invention 1: a method of identifying a cell having a gene expression observed in individuals diagnosed with autism, wherein the gene comprises a sequence of SEQ ID No: 1(claims 1- 19 partially)

Invention 2: a method of identifying a cell having a gene expression observed in individuals diagnosed with autism, wherein the gene comprises a sequence of SEQ ID No: 2(claims 1- 19 partially)

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Invention 44: a method of identifying a cell having a gene expression observed in individuals diagnosed with autism, wherein the gene comprises a sequence of SEQ ID No: 44(claims 1- 19 partially)

Invention 45: a method of observing an effect of a compound on an expression of a gene comprising a sequence of SEQ ID No: 1(claim 20 partially)

Invention 46: a method of observing an effect of a compound on an expression of a gene comprising a sequence of SEQ ID No: 2(claim 20 partially)

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Invention 88: a method of observing an effect of a compound on an expression of a gene comprising a sequence of SEQ ID No: 44(claim 20 partially)

The common technical feature linking inventions 1-88 is a gene comprising one of the SEQ ID No:1-SEQ ID No:44. However, this concept common to all claims of the present invention is described in said NCBI Reference Sequence: NM_007274.3, so the feature does not define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art under PCT Rule 13.2.

Thus the inventions 1-88 do not relate to a single general inventive concept under PCT Rule 13.1.