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(54) Title: METHOD FOR APCDD1 MEDIATED REGULATION OF HAIR GROWTH AND PIGMENTATION AND MUTANTS THEREOF

(57) Abstract: The invention provides for methods for controlling hair growth by administering an APCDD1 modulating compound to a subject. The invention further provides for a method for screening compounds that bind to and modulate APCDD1.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 09/62970

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61K 31/7088, 38/16 (2010.01) USPC - 514/44A, 2 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) IPC(8) - A61K 31/7088, 38/16 (2010.01) USPC - 514/44A, 2 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) WEST - DB=PGPB,USPT,USOC,EPAB,JPAB; PLUR=YES; OP=ADJ; Google Scholar search terms: APCDD1, adenomatosis, B7323, DRAPC1, beta-catenin, catenin, hair-loss, hair loss, Alopecia, telogen effluvium, hypotrichosis, adenomatosis polyposis coli down-regulated 1, Desmoglein, position, amino, guanine, Leucine, Arginine, leu, arg,																						
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X ----- Y ----- A</td> <td>US 2008/0207549 A1 (NAKAMURA et al.) 28 August 2008 (28.08.2008) para [0011]; [0012]; [0022]-[0033]; [0038]; [0063]; [0075]; [0076]; [0080]-[0084]; [0093]-[0102]; [0121]; [0140]; [0151]; [0160]; [0161]; [0228]-[0234]; [0298]-[0301]; [0305]-[0324]; SEQ ID NOs: 7, 8.</td> <td>27-45 ----- 1-12, 16-26, 46-48, 50-54, 56-63 ----- 49, 55</td> </tr> <tr> <td>Y</td> <td>US 2004/0142854 A1 (BLASCHUK et al.) 22 July 2004 (22.07.2004) para [0007]-[0012]; [0017]; [0050]-[0052]; [0056].</td> <td>1-12, 16-26, 46-48, 50-54, 56-63</td> </tr> <tr> <td>Y</td> <td>US 2004/0205910 A1 (LI et al.) 21 October 2004 (21.10.2004) abstract; para [0033]-[0035].</td> <td>3</td> </tr> <tr> <td>Y</td> <td>US 2006/0088505 A1 (HOFFMAN et al.) 27 April 2006 (27.04.2006) para [0007]; [0008]; [0035].</td> <td>7, 9, 10, 22, 24, 25, 63</td> </tr> <tr> <td>Y</td> <td>US 2008/0051342 A1 (CHRISTIANO) 28 February 2008 (28.02.2008) para [0050].</td> <td>26</td> </tr> <tr> <td>Y</td> <td>US 2007/00448738 A1 (DONKENA et al.) 01 March 2007 (01.03.2007) para [0018]; [0060]; [0208]; [0209]; 0245; Table 2.</td> <td>47, 48, 50-54</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X ----- Y ----- A	US 2008/0207549 A1 (NAKAMURA et al.) 28 August 2008 (28.08.2008) para [0011]; [0012]; [0022]-[0033]; [0038]; [0063]; [0075]; [0076]; [0080]-[0084]; [0093]-[0102]; [0121]; [0140]; [0151]; [0160]; [0161]; [0228]-[0234]; [0298]-[0301]; [0305]-[0324]; SEQ ID NOs: 7, 8.	27-45 ----- 1-12, 16-26, 46-48, 50-54, 56-63 ----- 49, 55	Y	US 2004/0142854 A1 (BLASCHUK et al.) 22 July 2004 (22.07.2004) para [0007]-[0012]; [0017]; [0050]-[0052]; [0056].	1-12, 16-26, 46-48, 50-54, 56-63	Y	US 2004/0205910 A1 (LI et al.) 21 October 2004 (21.10.2004) abstract; para [0033]-[0035].	3	Y	US 2006/0088505 A1 (HOFFMAN et al.) 27 April 2006 (27.04.2006) para [0007]; [0008]; [0035].	7, 9, 10, 22, 24, 25, 63	Y	US 2008/0051342 A1 (CHRISTIANO) 28 February 2008 (28.02.2008) para [0050].	26	Y	US 2007/00448738 A1 (DONKENA et al.) 01 March 2007 (01.03.2007) para [0018]; [0060]; [0208]; [0209]; 0245; Table 2.	47, 48, 50-54	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>
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<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>																					
Date of the actual completion of the international search 02 May 2010 (02.05.2010)	Date of mailing of the international search report 07 MAY 2010																					
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774																					

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 09/62970

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:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-12 and 16-63 directed to a method of controlling hair growth or loss of pigmentation in a subject, comprising administering an effective amount of an APCDD1 modulating compound, a method of identifying said compound, and a method for detecting whether a subject may benefit from administration of said compound with regard to hair loss.

- Please see extra sheet for continuation -

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 additional fees, this Authority did not invite payment of additional fees.
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.:
1-12 and 16-63

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

International application No.

PCT/US 09/62970

Continuation of Box III: Lack of Unity of Invention

Group II: claims 13-15 and 21-25, directed to a composition for modulating APCDD1 protein expression or activity in a subject, comprising an siRNA that targets and APCDD1 gene, wherein the sequence of the siRNA is selected from SEQ ID NOs: 112-3776; limited to SEQ ID NO: 112. (Applicants may elect for additional sequences to be searched by specifying the SEQ ID NO, and paying an additional invention search fee for each sequence.)

Group III: claims 64-66, directed to a diagnostic kit for determining whether a sample from a subject exhibits reduced APCDD1 expression or APCDD1 mutation, wherein the kit comprises nucleic acid primers that are capable of priming a polymerase reaction from APCDD1.

The inventions listed as Groups I - III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature of the Group I claims is a method of controlling hair growth or loss of pigmentation in a subject, comprising administering an effective amount of an APCDD1 modulating compound, a method of identifying said compound, and a method for detecting whether a subject may benefit from administration of said compound with regard to hair loss - not required by the claims of Groups II or III. The special technical feature of the Group II claims is a composition for modulating APCDD1 protein expression or activity in a subject, comprising an siRNA that targets and APCDD1 gene. The special technical feature of the Group III claims is a diagnostic kit for determining whether a sample from a subject exhibits reduced APCDD1 expression or APCDD1 mutation.

The only common technical element shared by the above groups is that they are related to APCDD1 expression in a subject. Groups I and II share a further common technical element of being related to compositions that modulate APCDD1 expression. These common technical elements do not represent an improvement over the prior art of US 2008/0207549 A1 to Nakamura et al. (see abstract, para [0011], [0024], [0030], [0063], and SEQ ID NO: 7 in comparison to Applicants' SEQ ID NO: 112). Therefore, the inventions of Groups I - III lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.