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(54) Title: COMPOSITIONS AND METHODS FOR INFERRING ANCESTRY

(57) Abstract: Ancestry informative marker (AIMs) polynucleotides that contain a single nucleotide polymorphism or that contain an insertion or deletion, are provided, as are methods of using panels of the AIMs to draw an inference as to a trait of an individual. The trait can be, for example, biogeographical ancestry, a pigmentation trait, responsiveness to a drug, or susceptibility to a disease. Also provided are methods of determining the proportional ancestry of an individual. Reagents and kits also are provided.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/26229

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01N 33/48; C12Q 1/68

US CL : 702/19; 435/6

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)

U.S. : 702/19; 435/6

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)

Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	WO 02/097047 A2 (Frudakis) 5 December 2002 (5.12.2002).	1-11, 24-58
Y,P	US 2003/012065 (Sorenson et al) 11 Sept. 2003 (11.9.2003).	1-11, 24-58
Y	Parra, E. J., Am. J. Hum. Genet., 1998, Vol. 63, pages 1839-1851.	1-11, 24-58
Y	McKeigue, P. M., Ann. Hum. Genet., 2000, Vol. 64, pages 171-186.	3, 8-11, 32-34, 39, 47-48,
Y,P	Fernandez, J. R., Obesity Res., 7 July 2003, Vol. 11, No. 7, pages 904-911.	1-11, 24-58
Y	Durham-Pierre, D., Hum. Mutation, 1996, Vol. 7, pages 370-373.	3, 8-11, 32-34, 39, 47-48,
Y	Collins-Scheramm, H. E., Am. J. Hum. genet., 11 Feb. 2002, Vol. 70, pages 737-750.	1-11, 24-58
Y	Chakraborty, R., Ethnicity & Disease, 1991, Vol. 1, pages 245-256.	1-11, 24-58
Y	Chakraborty, R., PNAS, 1988, Vol. 85, pages 9119-9123.	1-11, 24-58



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 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

"&"

document member of the same patent family

Date of the actual completion of the international search

30 September 2005 (30.09.2005)

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INTERNATIONAL SEARCH REPORT

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Continuation of B. FIELDS SEARCHED Item 3:

East, STN, Biosis, Compuscience, Biotedhds, Biotechno, Medline, Embase, WPI covering terms: SNP, polymorphism, ancestry, marker, primer, array, geographical, biogeographical, marker panel, African ancestry, Indian, Hispanics.

INTERNATIONAL SEARCH REPORT

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C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	NCBI record of a sequence ID U73638, Human Chromosome 11 Cosmid cSRL16b6 complete sequence, publicly available 25 July 1997.	4-6, 36-37
Y	NCBI record of a sequence ID AP000685, Human Chromosome 11 clone CMB9-8M6 map 11q23, publicly available 20 May 2000.	4-6, 36-37

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/26229

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim 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. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

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 an additional fee, this Authority did not invite payment of any additional fee.
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.: 1-11 and 24-58

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.:

Remark on Protest

☐
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

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BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

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, claim(s) 1-30, drawn to a method of inferring a trait of an individual.

Group II, claim(s) 31-58, drawn to a method of estimating proportional ancestry.

Group III, claim(s) 59-71, drawn to an article of manufacture.

Group IV, claim(s) 72-82, drawn to a kit.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

Species A: ancestry information markers of SEQ ID NOS: 1-331, recited in claims 4-6, 35-37, 72-73, and 75.

Species B: a set of traits, as recited in claims 3 and 12-23.

The inventions listed as Groups I-IV 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: an article of manufacture comprising a photograph of an individual of known proportional ancestry is known in the art. See a cover of "Time" magazine, enclosed with the action.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons:

Species of group A, SEQ ID NOS. are unrelated, each has a different structure and function, and therefore are independent inventions.

Species of group B, different traits, are structurally unrelated, each has different function, data generated for each trait is expected to be different from data generated for any other trait.