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**Declarations under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

**Published:**

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

(88) Date of publication of the international search report:  
15 April 2010



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(54) Title: USE MELANOCORTINS TO TREAT INSULIN SENSITIVITY

(57) Abstract: The present invention relates to peptide ligands of the melanocortin receptors, in particular the melancortin-4 receptor, and as such, are useful in the treatment of disorders responsive to the activation of this receptor, such as insulin resistance.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/12490

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - A61K 38/00 (2009.01) USPC - 514/2 According to International Patent Classification (IPC) or to both national classification and IPC													
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8): A61K 38/00 (2009.01) USPC: 514/2  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) PubWest, Google Scholar, Google Patent: melanocortin, melanocortin receptor 4 agonist, insulin resistance, obesity, overweight, lean, normal body weight, insulin resistance.													
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>													
<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</td> <td>US 2007/0244054 A1 (SENSFUSS et al.) 18 Oct 2007 (18.10.2007); para [0118]; [0147]; [0117]; [0011]; [0107]; [0146]; [0148]; [0150]; [0109]; [0048]</td> <td>1, 5-21, 28-35</td> </tr> <tr> <td>Y</td> <td></td> <td>2-4, 22, 23</td> </tr> <tr> <td>Y</td> <td>US 2007/0123453 A1 (HEIMAN et al.) 31 May 2007 (31.05.2007) claim 1, para [0019]</td> <td>2-4, 22, 23</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 2007/0244054 A1 (SENSFUSS et al.) 18 Oct 2007 (18.10.2007); para [0118]; [0147]; [0117]; [0011]; [0107]; [0146]; [0148]; [0150]; [0109]; [0048]	1, 5-21, 28-35	Y		2-4, 22, 23	Y	US 2007/0123453 A1 (HEIMAN et al.) 31 May 2007 (31.05.2007) claim 1, para [0019]	2-4, 22, 23	
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<input type="checkbox"/> Further documents are listed in the continuation of Box C.													
<table border="0"> <tr> <td>           * 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         </td> <td>           "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         </td> </tr> </table>		* 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 "&" document member of the same patent family										
* 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 "&" document member of the same patent family												
Date of the actual completion of the international search 14 May 2009 (14.05.2009)	Date of mailing of the international search report <b>26 MAY 2009</b>												
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.

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Continuation of Box III: Lack of Unity of Invention -

Group IV: claims 1,2, 4-12, 21-23 and 28-35, directed to a method of treating insulin resistance, comprising a melanocortin receptor 4 agonist, limited to a peptide having SEQ ID NO: 278.

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:

The special technical feature of the Group I claims is a method of treating insulin resistance, comprising a melanocortin receptor 4 agonist. The special technical feature of the claims of Groups II-IV is a method of treating insulin resistance, comprising a melanocortin receptor 4 agonist having a particular peptide sequence for each Group.

The common technical element shared by the above groups is that they are related to a method of treating insulin resistance, comprising a melanocortin receptor 4 agonist. This common technical element does not represent an improvement over the prior art of US 2006/0276485 A1 to Soebardt et al. (see abstract, para [0012]). Further, the prior art of US 2007/0244054 A1 to Sansfuss et al. (see para [0007], [0011] and [0015]-[0028]) discloses melanocortin receptor 4 antagonists that encompass the sequences of the Group II-IV claims. Therefore, the inventions of Groups I-IV lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.

It is noted that, should the applicant elect to pay for the search of the inventions of Groups II, III or IV, the applicant would be entitled to a search of SEQ ID NO: 1, 50 or 278, respectively. Should the applicant elect for further sequences to be searched, an additional fee must be paid for each specified sequence.

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Box No. 1 Nucleotide and/or amino acid sequence(s) (Continuation of item 1.b 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. type of material

- a sequence listing
- table(s) related to the sequence listing

b. format of material

- on paper
- in electronic form

c. time of filing/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 and/or table relating thereto 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:

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**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.: 24-27  
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 and 5-20 directed to a method of treating insulin resistance comprising administration of a melanocortin receptor 4 agonist.

Group II: claims 1, 2, 5-12, 21-23 and 28-35, directed to a method of treating insulin resistance, comprising a melanocortin receptor 4 agonist, limited to a peptide having SEQ ID NO: 1.

Group III: claims 1-3, 5-12, 21-23 and 28-35, directed to a method of treating insulin resistance, comprising a melanocortin receptor 4 agonist, limited to a peptide having SEQ ID NO: 50.

- 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.: 1-23, 28-35, limited to SEQ ID NO: 50 and 278
  
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 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.