

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
20 March 2008 (20.03.2008)

PCT

(10) International Publication Number  
WO 2008/033395 A3

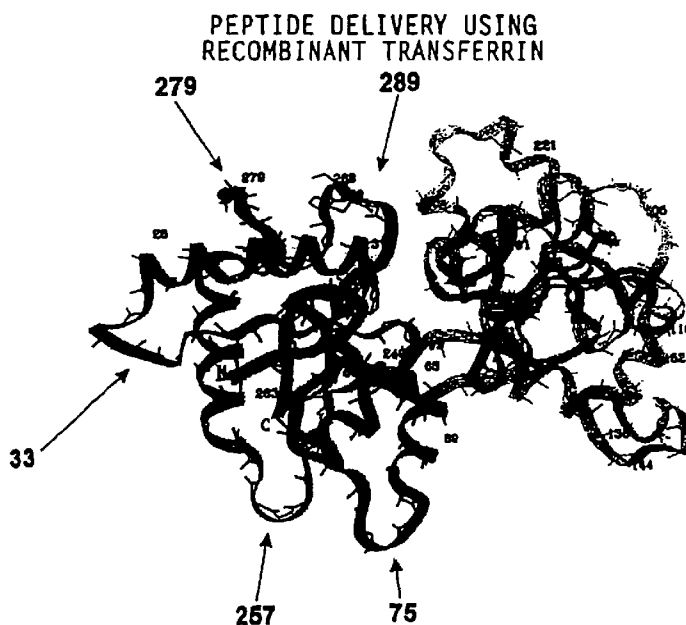
- (51) International Patent Classification:  
C07K 14/435 (2006.01)
- (21) International Application Number:  
PCT/US2007/019809
- (22) International Filing Date:  
11 September 2007 (11.09.2007)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/844,348 14 September 2006 (14.09.2006) US
- (71) Applicant (for all designated States except US):  
BIOREXIS PHARMACEUTICAL CORPORATION  
[US/US]; 3400 Horizon Drive, King Of Prussia, PA 19406  
(US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): SADEGHI, Homayoun [US/US]; 3400 Horizon Drive, King Of Prussia, PA 19406 (US). PRIOR, Christopher, Philip [US/US]; 3400 Horizon Drive, King Of Prussia, PA 19406 (US).
- (74) Agents: FULLER, Grover, F. et al.; c/o GEORGE, Nancy McGraw, Pfizer Inc. MS8260-1615, Eastern Point Road, Groton, CT 06340 (US).

- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:  
— with international search report

[Continued on next page]

(54) Title: MELANOCORTIN AND TRANSFERRIN FUSION PROTEINS



(57) Abstract: The present invention discloses fusion proteins comprising a transferrin moiety and a melanocortin or melanocortin receptor agonist moiety. In one embodiment of the invention, the transferrin moiety is modified to exhibit reduced or no glycosylation. In another embodiment, the transferrin moiety is modified to exhibit reduced or no binding to a transferrin receptor. The fusion protein of the invention can optionally comprise a linker peptide and/or a second therapeutic peptide such as GLP-1 or exendin-4. Also disclosed are methods of treating or preventing a disease or condition in a subject by administering a fusion protein of the invention.

WO 2008/033395 A3



- 
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*
  - *with sequence listing part of description published separately in electronic form and available upon request from the International Bureau*
- (88) **Date of publication of the international search report:**  
15 May 2008

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2007/019809

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. C07K14/435

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)  
C07K

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 practical, search terms used)

EPO-Internal, WPI Data, EMBASE, MEDLINE, Sequence Search, BIOSIS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/017688 A (BIOREXIS PHARMACEUTICAL CORP [US]; SADEGHI HOMAYOUN [US]; PRIOR CHRIST) 16 February 2006 (2006-02-16) page 14; table 2	1-39
X	WO 2004/020588 A (BIOREXIS PHARMACEUTICAL CORP [US]; PRIOR CHRISTOPHER P [US]; TURNER AN) 11 March 2004 (2004-03-11) page 51, line 14	1-39
X	WO 2004/019872 A (BIOREXIS PHARMACEUTICAL CORP [US]; PRIOR CHRISTOPHER P [US]; SADEGHI H) 11 March 2004 (2004-03-11) page 47, line 23	1-39
	----- -/--	

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 document 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

17 March 2008

Date of mailing of the international search report

28/03/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Young, Craig

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/019809

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE Geneseq [Online] 27 January 2005 (2005-01-27), "Human transferrin protein." XP002471765 retrieved from EBI accession no. GSP:ADU17611 Database accession no. ADU17611 abstract	1-39
A	----- RAFFIN-SANSON M L ET AL: "Proopiomelanocortin, a polypeptide precursor with multiple functions: From physiology to pathological conditions." EUROPEAN JOURNAL OF ENDOCRINOLOGY, vol. 149, no. 2, August 2003 (2003-08), pages 79-90, XP002471746 ISSN: 0804-4643 the whole document	1-39
P, X	----- MUNEAKI MATSUBARA, EARL ALBONE, JOSEPH H. GORMAN AND ROBERT C. GORMAN: "?-Melanocyte Stimulating Hormone Fused to Transferrin: A Novel Adjunct to Reperfusion Therapy for Acute MI" CARDIOVASCULAR PHYSIOLOGY, 1 August 2007 (2007-08-01), page S92, XP002471736 abstract	1-39
P, X	----- MATSUBARA MUNEAKI ET AL: "Glucagon-like-peptide-1 fused to transferrin: A novel approach to myocardial reperfusion injury" JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY, vol. 49, no. 9, Suppl. A, March 2007 (2007-03), page 236A, XP009096973 & 56TH ANNUAL SCIENTIFIC SESSION OF THE AMERICAN-COLLEGE-OF-CARDIOLOGY; NEW ORLEANS, LA, USA; MARCH 24 -27, 2007 ISSN: 0735-1097 the whole document	1-39

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2007/019809

## 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:  
  
Although claims 38 and 39 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
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 additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2.  As all searchable claims could be searched without effort justifying an 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.:

### 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.

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6-39

A fusion protein comprising a transferrin and a melanocortin  
---

2. claim: 2 (partially) and 3

A fusion protein comprising a transferrin and alpha  
-melanocortin  
---

3. claim: 2 (partially) and 4

A fusion protein comprising a transferrin and beta  
-melanocortin  
---

4. claim: 2 (partially) and 5

A fusion protein comprising a transferrin and gamma  
-melanocortin  
---

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/019809

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006017688    A	16-02-2006	AU 2005271403 A1	16-02-2006
		CA 2575756 A1	16-02-2006
		CN 101035568 A	12-09-2007
		EP 1814599 A2	08-08-2007
		GB 2431583 A	02-05-2007
		KR 20070085224 A	27-08-2007
WO 2004020588    A	11-03-2004	AU 2003270010 A1	19-03-2004
		EP 1539221 A2	15-06-2005
WO 2004019872    A	11-03-2004	AU 2003270009 A1	19-03-2004