



- (51) **International Patent Classification:**
C07K 16/28 (2006.01)
- (21) **International Application Number:**
PCT/US2014/040360
- (22) **International Filing Date:**
30 May 2014 (30.05.2014)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/829,082 30 May 2013 (30.05.2013) US
- (71) **Applicant:** BIOGEN IDEC MA INC. [US/US]; 14 Cambridge Center, Massachusetts, Cambridge, Massachusetts 02142 (US).
- (72) **Inventors:** ARNETT, Heather A.; 3029 25th Avenue W., Seattle, Washington 98199 (US). ESCOBAR, Sabine S.; 1707 E. Beaver Lake Drive, SE, Sammamish, Washington 98075 (US). KING, Chadwick T.; 1325 Moody Avenue, North Vancouver, British Columbia V7L 3T5 (CA). LIM, Ai Ching; 7105 82nd Avenue, SE, Mercer Island, Washington 98040 (US). NARAYANAN, Saravanakumar; 70 Centre Street, #1C, Brookline, Massachusetts 02446 (US). WEINREB, Paul H.; 133 Boston Post Road, Weston, Massachusetts 02493 (US). PEDERSON, Nels E.; 71 Patty's Road, Mansfield, Massachusetts 02048 (US).
- (74) **Agents:** BRENNAN, Jack et al.; Fish & Richardson P.C., P.O. Box 1022, Minneapolis, Minnesota 55440-1022 (US).
- (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, BN, 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, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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.

- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
- with sequence listing part of description (Rule 5.2(a))

- (88) **Date of publication of the international search report:**
12 March 2015

(54) **Title:** ONCOSTATIN M RECEPTOR ANTIGEN BINDING PROTEINS

(57) **Abstract:** The invention provides anti-oncostatin M receptor- β (OSMR) antigen binding proteins, e.g., antibodies and functional fragments, derivatives, muteins, and variants thereof. OSMR antigen binding proteins interfere with binding of OSM and/or IL-31 to OSMR. In some embodiments, anti-OSMR antigen binding proteins are useful tools in studying diseases and disorders associated with OSMR and are particularly useful in methods of treating diseases and disorders associated with OSMR and binding of OSM and/or IL-31 to OSMR.



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/040360

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07K16/28
ADD.

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 practicable, search terms used)

EPO-Internal, BIOSIS, EMBASE, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/171951 A1 (MATHER JENNIE P [US] ET AL) 3 August 2006 (2006-08-03) The whole document, in particular the Title, Antibody LUCA38; see Examples and Deposits ----- -/--	1-74



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 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

12 January 2015

Date of mailing of the international search report

21/01/2015

Name and mailing address of the ISA/

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

Authorized officer

Chapman, Rob

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/040360

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DIVEU C ET AL: "Predominant expression of the long isoform of GP130-like (GPL) receptor is required for interleukin-31 signaling", EUROPEAN CYTOKINE NETWORK, JOHN LIBBEY EUROTEXT LTD, FR, vol. 15, no. 4, 1 January 2004 (2004-01-01), pages 291-302, XP002397783, ISSN: 1148-5493 The whole document, in particular, anatagonist anti-OSMR antibody XR-M70 - see discussion 2 -----	1-74
X	JALAL A. JAZAYERI ET AL: "Targeting the Glycoprotein 130 Receptor Subunit to Control Pain and Inflammation", JOURNAL OF INTERFERON & CYTOKINE RESEARCH, vol. 30, no. 12, 1 December 2010 (2010-12-01), pages 865-873, XP055143486, ISSN: 1079-9907, DOI: 10.1089/jir.2010.0035 The whole document, in particular Fig.1 -----	1-74
X	REPOVIC PAVLE ET AL: "Oncostatin-M induction of vascular endothelial growth factor expression in astroglioma cells", ONCOGENE, NATURE PUBLISHING GROUP, GB, vol. 22, no. 50, 6 November 2003 (2003-11-06), pages 8117-8124, XP009125279, ISSN: 0950-9232, DOI: 10.1038/SJ.ONC.1206922 The whole document, in particular the section 'Reagents' and p.8120, col.2, 3 -----	1-74
T	Anomynous: "SA1290581 align light chain", , 29 September 2014 (2014-09-29), XP055143314, Retrieved from the Internet: URL:q/ibis [retrieved on 2014-09-29] the whole document -----	
T	Anomynous: "SA1290581 Heavy chain align", , 29 September 2014 (2014-09-29), XP055143316, Retrieved from the Internet: URL:q/ibis [retrieved on 2014-09-29] the whole document ----- -/--	

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/040360

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
T	Anomymous: "SA1290581 identity of SEQ ID NO:29", 29 September 2014 (2014-09-29), XP055143370, Retrieved from the Internet: URL:q/ibis [retrieved on 2014-09-29] -----	
A	RUDIHOFF S ET AL: "Single amino acid substitution altering antigen-binding specificity", PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, NATIONAL ACADEMY OF SCIENCES, vol. 79, 1 March 1982 (1982-03-01), pages 1979-1983, XP007901436, ISSN: 0027-8424, DOI: 10.1073/PNAS.79.6.1979 the whole document -----	1-74
A	PANKA D J ET AL: "VARIABLE REGION FRAMEWORK DIFFERENCES RESULT IN DECREASED OR INCREASED AFFINITY OF VARIANT ANTI-DIGOXIN ANTIBODIES", PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, NATIONAL ACADEMY OF SCIENCES, vol. 85, no. 9, 1 May 1988 (1988-05-01), pages 3080-3084, XP000611718, ISSN: 0027-8424, DOI: 10.1073/PNAS.85.9.3080 the whole document -----	1-74

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/040360

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 additional 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 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.:
1-32, 57-74(completely); 33-56(partially)
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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-74(partially)

An OSMR binding protein comprising a light chain variable domain having a sequence with at least 90% identity to SEQ ID NO:27 and a heavy chain variable domain having a sequence with at least 90% identity to SEQ ID NO:9, and related subject-matter

2. claims: 1-74(partially)

An OSMR binding protein comprising a light chain variable domain having a sequence with at least 90% identity to SEQ ID NO:28 and a heavy chain variable domain having a sequence with at least 90% identity to SEQ ID NO:10, and related subject-matter

3. claims: 1-74(partially)

An OSMR binding protein comprising a light chain variable domain having a sequence with at least 90% identity to SEQ ID NO:29 and a heavy chain variable domain having a sequence with at least 90% identity to SEQ ID NO:11, and related subject-matter

4. claims: 33-56, 73(all partially)

Isolated nucleic acids encoding a polypeptide and related subject-matter.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/040360

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006171951 A1	03-08-2006	AU 2006210606 A1	10-08-2006
		CA 2597171 A1	10-08-2006
		EP 1846455 A2	24-10-2007
		JP 5328156 B2	30-10-2013
		JP 2008532488 A	21-08-2008
		US 2006171951 A1	03-08-2006
		US 2009269340 A1	29-10-2009
		WO 2006084092 A2	10-08-2006
