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Published:

— *with international search report (Art. 21(3))*

— *with (an) indication(s) in relation to deposited biological material furnished under Rule 13bis separately from the description (Rules 13bis.4(d)(i) and 48.2(a)(viii))*

— *with sequence listing part of description (Rule 5.2(a))*

(88) Date of publication of the international search report:
30 December 2009

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(54) Title: REACTIVATION OF AXON GROWTH AND RECOVERY IN CHRONIC SPINAL CORD INJURY

(57) Abstract: Disclosed are methods of treating chronic nervous system diseases or injuries, e.g., chronic spinal cord injury, using Nogo receptor antagonists, including Nogo receptor-1 (NgR1) polypeptides, Nogo receptor-1 antibodies and antigen-binding fragments thereof, soluble Nogo receptors and fusion proteins thereof, and polynucleotides. Also disclosed are methods of noninvasively monitoring axonal growth during and after treatment with an axonal growth promoting agent.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 09/01635

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61K 38/00 (2009.01)
USPC - 514/2
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)
USPC- 514/2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC- 514/2 (text search-see search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (USPT, PGPB, EPAB, JPAB), Google Patent/Scholar
Search Terms Used: Nogo receptor antagonist, solbule Nogo receptor, chronic spinal cord injury, C266, TAJ, contusion

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---------- Y	US 2006/0058223 A1 (Mi et al.) 16 March 2006 (16.03.2006) para [0009], [0012], [0013], [0015], [0108], [0137], [0139], [0335], [0338]	1-8, 12 ---------- 9-11, 13-16, 19-24, 46-50, 58, 59
Y	WO 2007/133746 A2 (Relton et al.) 22 November 2007 (22.11.2007) para [0007], [0010], [0011], [0012], [0013], [0014], [0024], [0047], [0067], [0226]	9-11, 13-16, 19-24, 46-50
Y	US 2003/0134414 A1 (Ferguson) 17 July 2003 (17.07.2003) para [0005], [0007], [0048], [0076]	58, 59
Y	US 2005/0271655 A1 (Lee et al.) 08 December 2005 (08.12.2005) para [0010], [0016]	48

☐ Further documents are listed in the continuation of Box C. ☐

* 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	Date of mailing of the international search report
09 September 2009 (09.09.2009)	16 SEP 2009
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

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

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Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c 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 sequence listing filed or furnished:

   a. (means)

   ☒ on paper

   ☒ in electronic form

   b. (time)

   ☒ in the international application as filed

   ☒ together with the international application in electronic form

   ☐ 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 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:

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 09/01635

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.: 25-45, 55 and 56
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 1-16, 19-24, 46-50, 58 and 59, directed to a method of treating a chronic spinal cord injury, comprising administering a nogo-receptor antagonist, wherein the nogo-1 receptor polypeptide is limited to SEQ ID NO: 10.
Group II: claims 1-16, 19-24, 46-50, 58 and 59, directed to a method of treating a chronic spinal cord injury, comprising administering a nogo-receptor antagonist, wherein the nogo-1 receptor polypeptide is limited to SEQ ID NO: 11.
Group III: claims 1-18, 46-50, 58 and 59, directed to a method of treating a chronic spinal cord injury, comprising administering a nogo-receptor antagonist, wherein the nogo-1 receptor polypeptide is limited to SEQ ID NO: 14.

- 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.:
1-16, 19-24, 46-50, 58 and 59, restricted to SEQ ID NO: 10

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.

Group IV: claims 1-17, 46-50, 58 and 59, directed to a method of treating a chronic spinal cord injury, comprising administering a nogo-receptor antagonist, wherein the nogo-1 receptor polypeptide is limited to SEQ ID NO: 13.
Group V: claims 1-17, 46-50, 58 and 59, directed to a method of treating a chronic spinal cord injury, comprising administering a nogo-receptor antagonist, wherein the nogo-1 receptor polypeptide is limited to SEQ ID NO: 15.
Group VI: claims 1-17, 46-50, 58 and 59, directed to a method of treating a chronic spinal cord injury, comprising administering a nogo-receptor antagonist, wherein the nogo-1 receptor polypeptide is limited to SEQ ID NO: 16.
Group VII: claims 51-54 and 57, directed to a method for monitoring or determining axomal growth using Positron Emission Tomography.

The inventions listed as Groups I - VII 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 claims of Groups I-VI is a method of treating a chronic spinal cord injury, comprising administering a nogo-receptor antagonist, wherein the receptor comprises a different specific sequence for each Group. The special technical feature of the Group VII claims is a method for monitoring or determining axomal growth using Positron Emission Tomography.

There is no common technical element shared by all of the above groups. Groups I-VI share the common technical elements of treatment for spinal cord injury by administration of a nogo receptor antagonist, wherein each Group is directed to antagonism of a different specific receptor polypeptide. These common technical element does not represent an improvement over the prior art of US 2002/0012965 to Strittmatter (see abstract, para [0126], SEQ ID NO: 2). Therefore, the inventions of Groups I VII lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.