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(88) Date of publication of the international search report:
24 September 2015

(54) Title: ANTIBODIES AGAINST GLIOMA BIOMARKERS

(57) Abstract: The present disclosure is directed to antibodies binding to ELTDI, Plexin-B2, Spondin-1, fibulin-1, LINGO I or SLIT3 and methods of using such antibodies to treat and/or diagnose gliomas. Thus, in accordance with the present disclosure, there is provided a method of inhibiting a glioma cell comprising contacting said glioma cell with a first antibody or antibody fragment that binds immunologically to ELTDI, Plexin-B2, Spondin-1 or SLIT3. The method may further comprise contacting said glioma cell with a second anti-cancer agent or treatment.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/10355

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61K 39/395, C07K 16/00 (2015.01)

CPC - A61K 47/48561, A61K 51/1027

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)

IPC(8) - A61K 39/395, C07K 16/00 (2015.01)

CPC - A61K 47/48561, A61K 51/1027

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CPC - A61K 2039/505, C07K 16/28

(keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Patents, Google Scholar

Search terms: ELTD1, Plexin-B2, Spondin-1, SLIT3, antibody, glioma, cancer, tumor, malignancy, immunotherapy, treat, therapy, single chain, single domain, chimeric, IgG, humanized, chemotherapy, radiotherapy, immunotherapy, hormonal therapy, toxin, drug conjugate,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	WO 2008/055889 A1 (KIKUTANI et al.) 15 May 2008 (15.05.2008) p 6, ln 31–p 7, ln 5; p 7, ln 9–13; p 7, ln 30; p 8, ln 2–3; p 10, ln 27–28; p 14, ln 23–25; p 14, ln 30–p 15, ln 2; p 17, ln 10–13; p 17, ln 24–25; p 17, ln 30–31; p 18, ln 16–22	1-2, 4-6, 10-11, 19, 22, 25-26, 28-30, 34-35, 43, 46, 48-52 3, 7-9, 12-18, 20-21, 23-24, 27, 31-33, 36-42, 44-45, 47
Y	US 2009/0068202 A1 (CHEN et al.) 12 March 2009 (12.03.2009) para [0020], [0052], [0176], [0315], [0507], [0735], [0966]	3, 7-9, 12-18, 20-21, 23, 27, 31-33, 36-42, 44-45, 47
Y	TOWNER et al., Experimental validation of 5 in-silico predicted glioma biomarkers. Neuro Oncol. December 2013, Vol 15, No 12, pp 1625-34. Especially abstract	24

☐ 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

28 May 2015 (28.05.2015)

Date of mailing of the international search report

02 JUL 2015

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/10355

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:

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 1-52, drawn to methods of inhibiting glioma or treating glioma

Group II: Claims 53-70, drawn to methods of detecting or diagnosing a glioma

*Note that claim 53 depends on claim 62 and therefore is in Group II

—please see continuation on extra 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 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.:
1-52

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/10355

Continuation of: Box No. III Observations where unity of invention is lacking

The inventions listed as Groups I and II 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:

Special Technical Features

Group I requires treating a glioma by administering a therapeutic composition to a cell or a subject, comprising an antibody or antibody fragment, including an antibody that binds immunologically to ELTDI, not required by Group II.

Group II requires making a diagnosis of glioma by detecting an antibody or antibody fragment conjugated to a detectable agent, including an antibody that binds immunologically to fibulin-1 or LINGO1, not required by Group I.

Common Technical Features

The features shared by Groups I and II is an antibody that binds immunologically to Plexin-B2, Spondin-1, or SLIT3 on glioma cells..

However, these shared technical features do not represent a contribution over prior art, because the shared technical features are taught by the article entitled "Experimental validation of 5 in-silico predicted glioma biomarkers" by Towner et al. (Neuro Oncol., December 2013, Vol 15, No 12, pp 1625-1634) (hereinafter "Towner"). Towner discloses that antibodies that bind immunologically to Plexin-B2, Spondin-1, or SLIT3 have been used to identify highly expressed biomarkers for human gliomas (abstract "We have identified 5 potential biomarkers-spondin1, Plexin-B2, SLIT3, fibulin-1, and LINGO1-that were validated as proteins highly expressed on the surface of human gliomas using immunohistochemistry"). As the technical features were known in the art at the time of the invention, they cannot be considered special technical features that would otherwise unify the groups.

Groups I and II therefore lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.