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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))

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(54) Title: FUSION PROTEINS COMPRISING CANINE FC PORTIONS

(57) Abstract: The present invention relates to therapeutic peptides and proteins fused to a canine antibody Fc domain. Methods and compositions of using the same are described.

INTERNATIONAL SEARCH REPORT

INTERNATIONAL SEARCH REPORT

PCT/US 10/29151

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61K 39/00 (2010.01)

USPC - 424/178.1

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 39/00 (2010.01)

USPC-424/178.1

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

USPC-424/179.1; 424/809

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

PubWEST(PGPB,USPT,USOC,EPAB,JPAB); Google Patents; Google Scholar; GenCor 6.3

natriuretic peptide, fusion protein, recombinant, anp, bnp, canine, Fc, Ig, IgG, antibody, constant domain, diuretic, diuresis, hypertension, nephro\$, NPR A receptor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| X | US 2003/0139365 A1 (LO et al.) 24 July 2003 (24.07.2003) (para [0002], [0011]-[0013], [0017], [0022], [0028], [0042], [0046], [0057]-[0064], [0067],) | 1, 2, 10, and 23-26 |
| Y | | 3, 15-21, and 27-33 |
| Y | US 2002/0165135 A1 (MCCALL et al.) 07 November 2002 (07.11.2002) (para [0011], [0041], pg 39 Sequence 2, residues 6-13) | 3, 15, 16, and 19-21 |
| A | | |
| Y | US 6,028,055 A (LOWE et al.) 22 February 2000 (22.02.2000) (col 2 ln 10-65; col 10 ln 20-30; col 20 ln 1-25) | 27-33, |
| Y | US 6,525,022 B1 (LOWE et al.) 25 February 2003 (25.02.2003) (col 9 ln 45-60; col 16 ln 15-30) | 17, and 18 |
| Y | WO 2008/154226 A1 (CANADA et al.) 18 Dec 2008 (18.12.2008) SEQ ID NO: 27, para [0177]; [0183]; Fig1a | 19-21 |

 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

31 August 2010 (31.08.2010)

Date of mailing of the international search report

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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.:
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 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.: 1-3, 10, and 15-33, wherein claim 3 is limited to SEQ ID NOS: 18 or 20, claims 19-21 are limited to SEQ ID NO: 2 or 3, and claim 22 is limited to SEQ ID NO: 1

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.

Continuation of Box No. III Lack of Unity:

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 1-3, 10, and 15-33 drawn to a fusion protein, an isolated fusion protein, an isolated nucleic acid, a pharmaceutical composition comprising the fusion protein, and methods of treatment using pharmaceutical composition, where the first named invention will be searched and includes claims 1-3 and 15-33, wherein claim 3 is limited to the hinge SEQ ID NOS: 18 and 20 (both contain SEQ ID NO: 18), claims 19-21 are limited to the isolated sequences: SEQ ID NO: 2 and 3 (both contain SEQ ID NO: 18), and claim 22 is limited to the isolated sequence SEQ ID NO: 1 (encodes SEQ ID NO: 18) Applicant may have the hinge sequences: SEQ ID NO: 19 (and 21 as both share SEQ ID NO: 19), SEQ ID NO: 22, or SEQ ID NO: 23, along with the isolated fusion proteins which comprise the respective hinge sequences and the isolated nucleotides which encode the respective hinge sequences searched for an additional search fee per hinge sequence.

Group II: Claims 1, 2, 4, 5-9, and 19-22 drawn to a fusion protein, an isolated fusion protein, and an isolated nucleic acid, where the special technical features of Group II is a fusion protein comprising a natiuretic peptide as the therapeutic peptide.

Group III: Claims 1, 2, 11-14, and 19-22 drawn to a fusion protein, an isolated fusion protein, and an isolated nucleic acid, , where the special technical features of Group II is a fusion protein comprising an amino acid linker, a glycine linker, or a linker with a length of 6-30 amino acids.

The groups listed above 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.

Groups I-III share the technical feature of Claims 1 and 2. However, this does not represent an improvement over the prior art. US 2003/0139365 A1 (LO et al.) teaches claims 1 and 2. Specifically:

Lo et al disclose a fusion protein comprising a therapeutic peptide or protein (para [0002], [0011]) and a canine antibody Fc domain (para [0061]) wherein the therapeutic peptide or protein is linked to the Fc domain directly or through a linker (para [0057], [0058]), wherein the Fc domain comprises a hinge region (para [0035]) having a sequence selected from the group consisting of the hinge region of a canine IgG (para [0061]) selected from the group consisting of canine IgGA, and canine IgGD (para [0013], [0061]).

Lo et al. further disclose wherein the fusion protein comprises the following formula:

X-La-F:F-La-X or X-La-F:F, (para [0022], [0028], Fig 1a) wherein,

X is a therapeutic peptide or protein (para [0022], [0028]);

L is a linker comprising a amino acid residues; a is an integer of at least 0;

":" is a chemical association or crosslink (Fig 1a); and

F is at least a portion of a canine immunoglobulin Fc domain comprising an FcRn binding site (i.e. CH2-CH3 separated by a hinge; para [0013]) and comprises a hinge region selected from a canine IgGA, and canine IgGD (para [0013]).

Accordingly, unity of invention is lacking.