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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))

(88) Date of publication of the international search report:

17 December 2009

(54) Title: CD4-RELATED POLYPEPTIDES AND METHODS OF USE

(57) Abstract: This invention features, in one aspect, mutant CD4 polypeptides. For example, described herein are polypeptides that include or consist of an amino acid sequence conforming to Formula I: Xaa<sub>1</sub>-Arg-Xaa<sub>2</sub>-Leu-Xaa<sub>3</sub>-Asp-Gln (SEQ ID NO:1), where Xaa<sub>1</sub> is any amino acid residue; Xaa<sub>2</sub> is any amino acid residue; and Xaa<sub>3</sub> is Trp, Phe, or Tyr; with the proviso that the polypeptide is not a wild type CD4 protein or a fragment thereof (*i.e.*, with the proviso that the polypeptide is not a fragment of a wild type CD4 protein). The mutant residue can be cysteine or selenocysteine. Other mutants, protein complexes, nucleic acids, vectors, and methods of use are also described.



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**INTERNATIONAL SEARCH REPORT**

International application No  
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**A. CLASSIFICATION OF SUBJECT MATTER**

INV. C07K14/16  
ADD. C12N15/00 C12N5/00 A61K35/00

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, CHEM ABS Data, EMBASE, BIOSIS, Sequence Search, PAJ, 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	ZAGURY J F ET AL: "Identification of CD4 and major histocompatibility complex functional peptide sites and their homology with oligopeptides from human immunodeficiency virus type 1 glycoprotein gp120: role in AIDS pathogenesis." PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 15 AUG 1993, vol. 90, no. 16, 15 August 1993 (1993-08-15), pages 7573-7577, XP002539047 ISSN: 0027-8424 page 7576 - page 7577; table 1	1,2,7,8, 16-34
X	WO 2004/048414 A2 (AXIS SHIELD ASA [NO]; ORNING LARS [NO]; RIAN ANNE [NO]; COCKBAIN JULIA) 10 June 2004 (2004-06-10) sequence 11	1,2,7,8, 16-34

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) of 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.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

31 July 2009

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB2009/051287

## 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:  
**see FURTHER INFORMATION sheet PCT/ISA/210**
  
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.:
  
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.:

**see additional sheet(s)**

### 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

Continuation of Box II.2

Claims Nos.:

The present claims 1, 2, 7-8 and 16-34 relates to an extremely large number of possible peptide molecules. Support and disclosure in the sense of Article 6 and 5 PCT is to be found however for only a very small proportion of the peptides claimed, see Fig.2. The non compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non compliance in determining the extent of the search of claims 1, 2, 7-8 and 16-34 (PCT Guidelines 9.19 and 9.23). The search of claims 1, 2, 7-8 and 16-34 was restricted to those claimed peptides which appear to be supported and a generalisation of their structural formulae, e.g. the peptides the peptides of claim 5.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 2(completely); 1, 7-8, 16-34(partially)

A polypeptide comprising the amino acid sequence Xaa1-Arg-Xaa2-Leu-Xaa3-Asp-Gln wherein Xaa is any amino acid residue; Xaa 2 is any amino acid residue; Xaa 3 is Trp, Phe, or Tyr; and the polypeptide binds gp120 or competes with an antibody that specifically binds the gp120 binding site of CD4 with the proviso that the polypeptide is not a wild type CD4 protein or a fragment thereof, wherein Xaa1 is Cys or Sec

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2. claims: 3(completely); 1, 7-8, 16-34(partially)

A polypeptide comprising the amino acid sequence Xaa1-Arg-Xaa2-Leu-Xaa3-Asp-Gln wherein Xaa is any amino acid residue; Xaa 2 is any amino acid residue; Xaa 3 is Trp, Phe, or Tyr; and the polypeptide binds gp120 or competes with an antibody that specifically binds the gp120 binding site of CD4 with the proviso that the polypeptide is not a wild type CD4 protein or a fragment thereof, wherein Xaa2 is Cys or Sec

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3. claims: 4(completely); 1, 7-8, 16-34(partially)

A polypeptide comprising the amino acid sequence Xaa1-Arg-Xaa2-Leu-Xaa3-Asp-Gln wherein Xaa is any amino acid residue; Xaa 2 is any amino acid residue; Xaa 3 is Trp, Phe, or Tyr; and the polypeptide binds gp120 or competes with an antibody that specifically binds the gp120 binding site of CD4 with the proviso that the polypeptide is not a wild type CD4 protein or a fragment thereof, wherein Xaa3 is Trp

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4. claims: 5(completely); 1, 7-34(partially)

A polypeptide comprising the amino acid sequence as set out in claim 5 and the polypeptide binds gp120 or competes with an antibody that specifically binds the gp120 binding site of CD4

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5. claims: 6(completely); 1, 7-34(partially)

The polypeptide of any of claims 1, wherein the polypeptide further comprises amino acid residues 1-57 of a mature wild type CD4 at the polypeptide's amino terminus and amino acid residues 65-433 of a mature wild type CD4 at the polypeptide's carboxy terminus.

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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

6. claims: 9-34(partially)

A complex comprising the polypeptide comprising the amino acid sequence Xaa1-Arg-Xaa2-Leu-Xaa3-Asp-Gln wherein Xaa 1 is any amino acid residue; Xaa 2 is any amino acid residue; Xaa 3 is Trp, Phe, or Tyr, in non-linear association with a heterologous polypeptide.

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7. claims: 35-37

A Method of detecting gp120 using the peptide comprising the amino acid sequence Xaa1-Arg-Xaa2-Leu-Xaa3-Asp-Gln wherein Xaa 1 is any amino acid residue; Xaa 2 is any amino acid residue; Xaa 3 is Trp, Phe, or Tyr

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8. claims: 38-40

A method of purifying gp120 using the peptide comprising the amino acid sequence Xaa1-Arg-Xaa2-Leu-Xaa3-Asp-Gln wherein Xaa 1 is any amino acid residue; Xaa 2 is any amino acid residue; Xaa 3 is Trp, Phe, or Tyr

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9. claim: 41

A polypeptide comprising a sequence that is identical to one or more of residues 26-59 of SEQ ID NO:22, wherein the sequence is contiguous at the C-terminus with a selenocysteine residue followed by a variable region that differs from the sequence of residues 86-99 of SEQ ID NO:22 at one or more positions.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2009/051287

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2004048414 A2	10-06-2004	AU 2003286272 A1	18-06-2004
		CA 2505995 A1	10-06-2004
		EP 1565490 A2	24-08-2005
		JP 2007516408 T	21-06-2007
		US 2006240570 A1	26-10-2006

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