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15 February 2007

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(54) Title: SARS NUCLEIC ACIDS, PROTEINS, VACCINES, AND USES THEREOF

(57) Abstract: Codon-optimized nucleic acids, proteins, vaccines, and antibodies are provided herein.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/25372

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8) : C12N 15/50, 15/62, 15/63, 5/10; A61K 48/00
 US CL : 536/23.72, 23.4; 435/320.1, 325, 366; 514/44
 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)
 U.S. : 536/23.72, 23.4; 435/320.1, 325, 366; 514/44

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

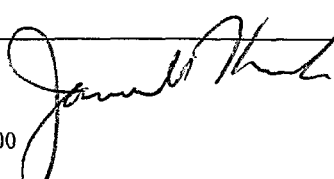
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	LI et al. The structural Characterization and Antigeneicity of the S protein of SARS-CoV. Genomics, Proteomics, and Bioinformatics. May 2003. Vol. 1, no. 2, pages 108-117, see entire document.	1-10, 28-30, 34-43, 50-54
Y	Robinson et al. DNA vaccines. Seminars in Immunology. 1997. Vol. 9, pages 271-283, see entire document.	1-10, 28-30, 34-43, 50-54
Y	MARRA et al. The Genome Sequence of the SARS-Associated Coronavirus. Science. 30 May 2003 (published online 30 April 2003), vol. 300, pages 1399-1404, see page 1402.	1-10, 28-30, 34-43, 50-54
Y	HAAS et al. Codon usage limitation in the expression of HIV-1 envelope glycoprotein. Current Biology. 1996. Vol. 6, no. 3, pages 315-324, see entire document.	1-10, 28-30, 34-43, 50-54
Y	BRADEL-TRETHEWAY et al. Effects of codon-optimization of protein expression by the human herpesvirus 6 and 7 U51 open reading frame. Journal of Virological Methods. 2003. Vol. 111, pages 145-156.	1-10, 28-30, 34-43, 50-54
Y	ASHOK et al. Protective efficacy of a plasmid DNA encoding Japanese encephalitis virus envelope protein fused to tissue plasminogen activator signal sequences: studies in a murine intracerebral virus challenge model. Vaccine. 2002. Vol. 20, pages 1563-1570, see entire document.	3, 4

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	"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
"E" earlier application or patent published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 18 January 2006 (18.01.2006)	Date of mailing of the international search report 25 OCT 2006
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 Mary E. Mosher, Ph.D. Telephone No. 571-272-1600 

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:
Please See Continuation 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 any 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.: 1-10,28-30,34-43 and 50-54
- 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.

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BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

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 1, claim(s) 1-10, 28, 29, 30, 34-43, 50-54, drawn to codon-optimized nucleic acid encoding SARS S polypeptide or fragment.

Group 2, claim(s) 1, 11-16, 28, 29, 31, 34-43, 50-54, drawn to drawn to codon-optimized nucleic acid encoding SARS M polypeptide or fragment.

Group 3, claim(s) 1, 17-22, 28, 29, 32, 50-54, drawn to drawn to codon-optimized nucleic acid encoding SARS E polypeptide or fragment.

Group 4, claim(s) 1, 23-27, 28, 29, 33, 34-43, 50-54, drawn to drawn to codon-optimized nucleic acid encoding SARS N polypeptide or fragment.

Group 5, claim(s) 44-46, drawn to isolated SARS S polypeptide or fragment.

Group 6, claim(s) 44-46, drawn to isolated SARS M polypeptide or fragment.

Group 7, claim(s) 44-46, drawn to isolated SARS E polypeptide or fragment.

Group 8, claim(s) 44-46, drawn to isolated SARS N polypeptide or fragment.

Group 9, claim(s) 47-49, drawn to isolated antibody binding SARS S polypeptide or fragment.

Group 10, claim(s) 47-49, drawn to isolated antibody binding SARS M polypeptide or fragment.

Group 11, claim(s) 47-49, drawn to isolated antibody binding SARS E polypeptide or fragment.

Group 12, claim(s) 47-49, drawn to isolated antibody binding SARS N polypeptide or fragment.

The inventions listed as Groups 1-12 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: In groups 1-4, the claims share a common feature in the use of host-optimized codons in a nucleic acid encoding a SARS protein. However, the SARS proteins listed in the claim do not share a significant structural element, and do not belong to a recognized class of chemical compounds where there is an expectation from the knowledge in the art that members of the class will behave in the same way in the context of the claimed invention (each member could not be substituted one for the other with the expectation that the same intended result would be achieved). Therefore the group of codon-optimized nucleic acids do not share the same or corresponding special technical feature. In addition, the nucleic acid codon usage has no effect upon the structure of the encoded protein, therefore groups 5-12 do not share the same special technical feature with any of groups 1-4. Each of the proteins of groups 5-8 is different in structure and in function from each other, and requires divergent search; each of the antibodies of groups 9-12 is different in structure and function from the others, can be made without use of the isolated proteins of groups 5-8 e.g. by isolating antisera from a person recovering from infection, and requires different search from the proteins of groups 5-8. Therefore unity of invention is lacking.

INTERNATIONAL SEARCH REPORT

International application No.

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Continuation of B. FIELDS SEARCHED Item 3:

EAST USPAT, PGPUB, EPO, JPO, Derwent; Dialog files 155, 5, 357; GenEmbl, N_Geneseq_21, Issued_Patents_NA, Published_Applications_NA_Main, Published_Applications_NA_New, EST. Search terms: CODON, CODONS, OPTIM?, HUMAN, PY<2004, DT=REVIEW?, SARS, SPIKE, S, PY=2003, DNA, GENE, GENETIC, VACCINE?, CORONA?, PY=2000:2003, TPA, LEADER, SIGNAL, BGH, BOVINE, GROWTH, HORMONE, POLYA, EXPRESSION, VECTOR; SEQ ID NO: 1, 3, 5, 17.