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CT 06897 (US). **CHIN, Jason, W., K.** [GB/US]; 469 Whitney Avenue, #1, New Haven, CT 06511 (US). **ZUT-SHI, Reena** [IN/US]; 5751 N.Kolb Road, Apt.#_10202, Tucson, AZ 85750 (US). **RUTLEDGE, Stacey, Erin** [US/US]; 469 Whitney Avenue, #1, New Haven, CT 06511 (US). **KEHLBECK MARTIN, Joanne, D.** [US/US]; 106 Heritage Road, #12, Guilderland, NY 12084 (US). **ZONDLO, Neal, Joseph** [US/US]; 153 Brooks Avenue, Arlington, MA 02474-6623 (US).

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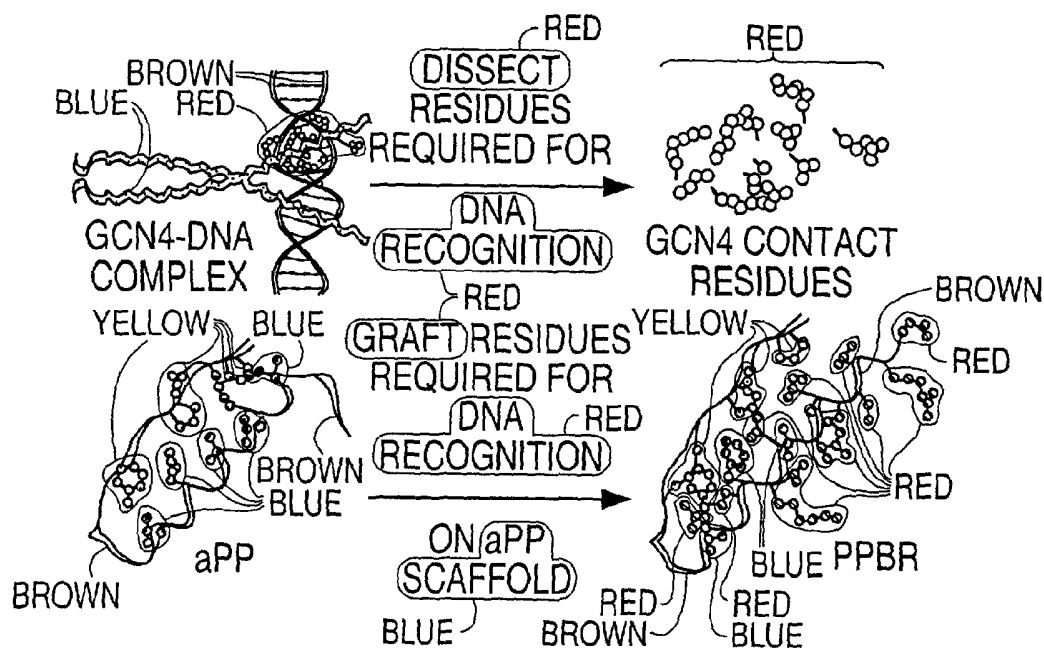
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[Continued on next page]

(54) Title: DNA & PROTEIN BINDING MINIATURE PROTEINS



(57) Abstract: The present invention provides a protein scaffold, such as an avian pancreatic polypeptide, that can be modified by substitution of two or more amino acid residues that are exposed on the alpha helix domain of the polypeptide when the polypeptide is in a tertiary form.



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/13023

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/10 C12N15/12 C12N15/62 G01N33/50 G01N33/68
 C07K14/465 C07K14/47

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 7 C12N 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)

BIOSIS, MEDLINE, EPO-Internal, 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	ZONDLO, N.J. AND SCHEPARTZ, A.: "Highly Specific DNA Recognition by a Designed Miniature Protein" J. AM CHEM. SOC., vol. 121, 1999, pages 6938-6939, XP002196756 cited in the application the whole document --- -/--	1-10,21

Further documents are listed in the continuation of box C.

Patent family members are listed in 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) 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

22 April 2002

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/13023

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WU HERREN ET AL: "Building zinc fingers by selection: Toward a therapeutic application." PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES, vol. 92, no. 2, 1995, pages 344-348, XP002196757 1995 ISSN: 0027-8424 the whole document</p> <p style="text-align: center;">---</p>	16
P,X	<p>CHIN, J.W. AND SCHEPARTZ, A.: "Concerted evolution of structure and function in a" JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, 28 March 2001 (2001-03-28), pages 2929-2930, XP002196758 the whole document</p> <p style="text-align: center;">---</p>	1-10, 14-18, 21,22
A	<p>MCCAFFERTY J ET AL: "PHAGE ANTIBODIES FILAMENTOUS PHAGE DISPLAYING ANTIBODY VARIABLE DOMAINS" NATURE (LONDON), vol. 348, no. 6301, 1990, pages 552-554, XP002196759 ISSN: 0028-0836 cited in the application</p> <p style="text-align: center;">---</p>	
A	<p>NYGREN PER-AKE ET AL: "Scaffolds for engineering novel binding sites in proteins." CURRENT OPINION IN STRUCTURAL BIOLOGY, vol. 7, no. 4, 1997, pages 463-469, XP002196760 ISSN: 0959-440X cited in the application</p> <p style="text-align: center;">---</p>	
T	<p>CHIN JASON W ET AL: "Methodology for optimizing functional miniature proteins based on avian pancreatic polypeptide using phage display." BIOORGANIC & MEDICINAL CHEMISTRY LETTERS, vol. 11, no. 12, 18 June 2001 (2001-06-18), pages 1501-1505, XP002196761 ISSN: 0960-894X the whole document</p> <p style="text-align: center;">-----</p>	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 01/13023

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.

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.:

1-22 partially

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

Invention 1: Claims 1-22 Partially

A modified avian pancreatic polypeptide comprising DNA-binding residues of GCN4 (Seq Ids no 8, 9,10,11,12,13). Phages displaying said polypeptides, nucleotides encoding said polypeptides and methods of preparing/identifying said polypeptide with modified interaction surface with another protein.

Invention 2-41: Claims 1-22 Partially

A modified avian pancreatic polypeptide of Seq Ids no: 17,18,19,20,21,22,23,24,25,26,27,28,29,31,33,34,35,36,37,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,70,71,72, phages displaying said polypeptides, nucleotides encoding said polypeptides and methods of preparing/identifying said polypeptides with modified interaction surface with another protein.