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Declarations under Rule 4.17:

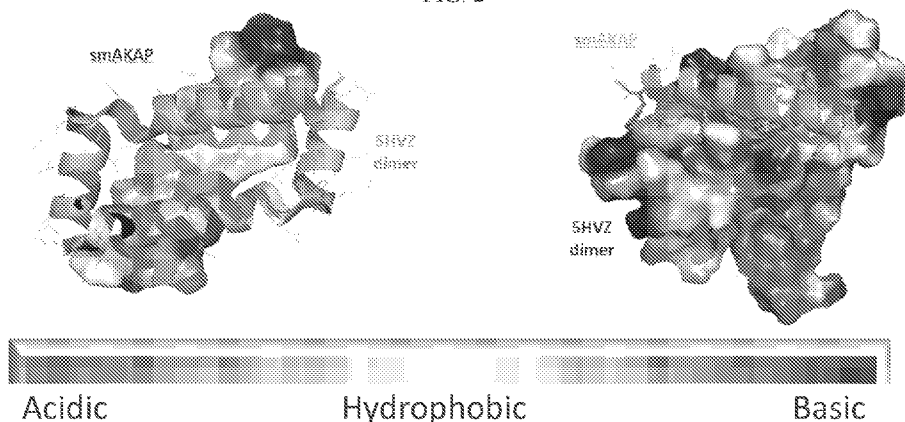
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))
- with sequence listing part of description (Rule 5.2(a))

(54) Title: RECOMBINANT *SPIRULINA* EXPRESSING SCAFFOLDS AND METHODS OF UTILIZING THE SAME

FIG. 2



(57) Abstract: The present disclosure provides scaffolds comprising heterologous moieties and *Spirulina* expressing the same. Also provided are recombinant *Spirulina* expressing scaffolds and methods of utilizing the same for the treatment of diseases and conditions. Homomeric and heteromeric scaffolds comprising VHH antibodies linked by way of a modified smAKAP linker can be utilized to increase binding affinity as compared to VHH antibody alone.

(88) Date of publication of the international search report:
22 May 2025 (22.05.2025)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2024/036189

A. CLASSIFICATION OF SUBJECT MATTER

IPC - INV. A61K 35/748; A61K 9/00; A61K 38/17; C07K 14/47 (2024.01)

ADD.

CPC - INV. A61K 35/748; A61K 9/0053; A61K 38/17; C07K 14/47

ADD. C07K 2317/569; C07K 2319/00

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)
See Search History documentDocumentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History documentElectronic database consulted during the international search (name of database and, where practicable, search terms used)
See Search History document

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 2022/140696 A1 (LUMEN BIOSCIENCE, INC.) 30 June 2022; abstract; paragraphs [0018], [0081], [0082], [0088], [0089], [0133], [0199]	1-2, 4, 43-46, 49-51, 55, 57/55 --- 56, 57/56
Y	US 2006/0099710 A1 (DONNELLY, MI et al.) 11 May 2006; paragraph [0065]	56, 57/56
A	(BURGERS, PP et al.) Structure of smAKAP and its regulation by PKA-mediated phosphorylation. The FEBS Journal. Epub 6 May 2016, Vol. 283, No. 11; pages 2132-2148; entire document; DOI: 10.1111/febs.13726.	1-2, 4, 43-46, 49-51, 55-57

☐ 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

"D" document cited by the applicant in the international application

"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

18 September 2024 (18.09.2024)

Date of mailing of the international search report

DEC 02 2024

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2024/036189

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing:
 - a. ☒ forming part of the international application as filed.
 - b. ☐ furnished subsequent to the international filing date for the purposes of international search (Rule 13~~ter~~:1(a)),
☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
2. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this report has been established to the extent that a meaningful search could be carried out without a WIPO Standard ST.26 compliant sequence listing.
3. Additional comments:

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2024/036189

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.: 5-42, 47-48, 52-54
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:

Groups I+, Claims 1-4, 43-46, 49-51, 55-57, and 2 mutated residues (number of mutated residues in smAKAP), C16S, C24S (mutations in smAKAP), SEQ ID NO: 5 (mutated smAKAP sequence); Exemplary elections: 5 mutated residues (number of mutated residues in smAKAP), ESD Y6H C16S W22S C24G (mutations in smAKAP), SEQ ID NO: 7 (mutated smAKAP sequence).

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, 2 (in-part), 4, 43, 44 (in-part), 45-46, 49-51, 55 (in-part), 56-57; 2 mutated residues (number of mutated residues in smAKAP), C16S, C24S (mutations in smAKAP), SEQ ID NO: 5 (mutated smAKAP sequence).

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.