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M8X 1A7 (CA). ADAMS, Jarrett; 1801 Bayview Ave., Unit 107, Toronto, Ontario M4G 4K2 (CA).

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(74) Agent: LENTZ, Shannon; Crowell & Moring LLP, 1001 Pennsylvania Ave. NW Fl. 10, Washington, District of Columbia 20004 (US).

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(71) Applicant: ANTLERA THERAPEUTICS INC.
[CA/CA]; 2400-333 Bay Street, P.O. Box 20, ICO Fasken Martineau, Toronto, Ontario M5H 2T6 (CA).

(72) Inventor; and

(71) Applicant (for ZW only): SESHAGIRI, Somasekar [US/US]; 2400-333 Bay Street, P.O. Box 20, ICO Fasken Martineau, Toronto, Ontario M5H 2T6 (CA).

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(72) Inventors: ANGERS, Stephane; 29 Callisto Court, Mississauga, Ontario L5M 0A1 (CA). SIDHU, Sachdev; 134 Brunswick Ave., Toronto, Ontario M5S 2M3 (CA). BLAZER, Levi; 2816 Bloor St. West Apt. 2, Etobicoke, Ontario

(54) Title: TETRAVALENT FZD AND WNT CO-RECEPTOR BINDING ANTIBODY MOLECULES AND USES THEREOF

(57) Abstract: Described herein are tetraivalent binding antibody molecules comprising a FZD receptor binding domain and an LRP5/6 co-receptor binding domain on opposite termini of an Fc domain that activate a Wnt beta-catenin signaling pathway, nucleic acids and vectors encoding said molecules and methods for their use.

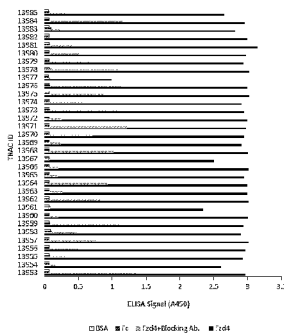


FIG 1A

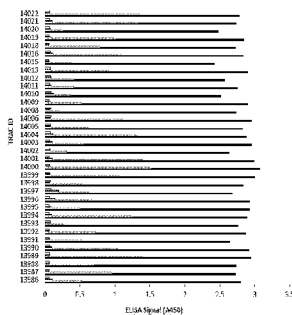


FIG 1B



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SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

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 practicable, search terms used)
EPO-Internal, BIOSIS, EMBASE, 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,P	WO 2022/130341 A1 (ANTLERA THERAPEUTICS INC [CA]) 23 June 2022 (2022-06-23) abstract, page 2 line 4 - page 9 line 26, examples and claims -----	1-56
X	WO 2019/159084 A1 (ANGERS STEPHANE [CA]; SIDHU SACHDEV [CA]; TAO YUYONG [CN]) 22 August 2019 (2019-08-22) abstract, [0003] - [0023], [0032]-[0037], [0084] - [0087], examples I-IV, claims, Fig. 3A, SEQ ID NOs 14, 16 and 44 -----	1-56
X	US 2021/292422 A1 (LI YANG [US]) 23 September 2021 (2021-09-23) abstract, [0008] - [0041], [0117]-[0123], examples 1-10, claims, Fig. 1, 18 -----	1-56
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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
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"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Hermann, Patrice
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2023/068848

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:

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International application No

PCT/US2023/068848

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2021/026652 A9 (MODMAB THERAPEUTICS INC [CA]) 8 July 2021 (2021-07-08) abstract, [0007]-[0029], Tables 3a, 3b and 3c, examples and claims -----	1-56
A	WO 2021/026665 A1 (MODMAB THERAPEUTICS INC [CA]) 18 February 2021 (2021-02-18) abstract, [0009] - [0022], [0125], [0132], examples and claims; sequences 71, 73, 79, 90, 101 -----	1-56
A	J. KE ET AL: "Structure and function of Norrin in assembly and activation of a Frizzled 4-Lrp5/6 complex", GENES & DEVELOPMENT, vol. 27, no. 21, 1 November 2013 (2013-11-01), pages 2305-2319, XP055417426, US ISSN: 0890-9369, DOI: 10.1101/gad.228544.113 the whole document -----	1-56
A	KRISTINA ELLWANGER ET AL: "Redirected optimized cell killing (ROCK): A highly versatile multispecific fit-for-purpose antibody platform for engaging innate immunity", MABS, vol. 11, no. 5, 7 June 2019 (2019-06-07), pages 899-918, XP055605336, US ISSN: 1942-0862, DOI: 10.1080/19420862.2019.1616506 the whole document -----	1-56
A	WO 2013/109819 A1 (GENENTECH INC [US]; HOFFMANN LA ROCHE [CH]) 25 July 2013 (2013-07-25) the whole document -----	1-56
A	WO 2018/220080 A1 (BOEHRINGER INGELHEIM INT [DE]) 6 December 2018 (2018-12-06) the whole document -----	1-56
	-/--	

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2023/068848

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>CHEN: "Development of Potent, Selective Surrogate WNT Molecules and Their Application in Defining Frizzled Requirements", CELL CHEMICAL BIOLOGY, vol. 27, 21 May 2020 (2020-05-21), pages 598-609, XP055971848, DOI: doi.org/10.1016/j.chembiol.2020.02.009 Retrieved from the Internet: URL:https://www.cell.com/cell-chemical-biology/pdf/S2451-9456(20)30073-8.pdf> the whole document</p> <p style="text-align: center;">-----</p>	1-56

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2023/068848

Patent document cited in search report	Publication date	Patent family member(s)	Publication date		
WO 2022130341 A1	23-06-2022	AU 2021399278 A1	29-06-2023		
		AU 2021404080 A1	29-06-2023		
		CA 3204321 A1	23-06-2022		
		CA 3204322 A1	23-06-2022		
		CN 116917332 A	20-10-2023		
		CN 116964102 A	27-10-2023		
		EP 4263617 A1	25-10-2023		
		EP 4263618 A1	25-10-2023		
		IL 303342 A	01-08-2023		
		IL 303344 A	01-08-2023		
		KR 20230122077 A	22-08-2023		
		US 2023118983 A1	20-04-2023		
		WO 2022130341 A1	23-06-2022		
		WO 2022130342 A1	23-06-2022		
WO 2019159084 A1	22-08-2019	CA 3129736 A1	22-08-2019		
		CN 111989345 A	24-11-2020		
		EP 3752537 A1	23-12-2020		
		IL 276646 A	30-09-2020		
		JP 2021519574 A	12-08-2021		
		SG 11202007675V A	29-09-2020		
		US 2021032352 A1	04-02-2021		
		WO 2019159084 A1	22-08-2019		
		US 2021292422 A1	23-09-2021	AU 2019297522 A1	28-01-2021
				CA 3104526 A1	09-01-2020
CN 112566940 A	26-03-2021				
EP 3820906 A1	19-05-2021				
JP 2021529796 A	04-11-2021				
US 2021292422 A1	23-09-2021				
WO 2020010308 A1	09-01-2020				
WO 2021026652 A9	08-07-2021			AU 2020328475 A1	31-03-2022
		CA 3147689 A1	18-02-2021		
		CN 114616246 A	10-06-2022		
		EP 4013793 A1	22-06-2022		
		JP 2022551380 A	09-12-2022		
		US 2022356256 A1	10-11-2022		
		WO 2021026652 A1	18-02-2021		
		WO 2021026665 A1	18-02-2021	AU 2020329092 A1	31-03-2022
CA 3147827 A1	18-02-2021				
CN 114599679 A	07-06-2022				
EP 4013791 A1	22-06-2022				
IL 290509 A	01-04-2022				
JP 2022544308 A	17-10-2022				
KR 20220078568 A	10-06-2022				
US 2023183336 A1	15-06-2023				
WO 2021026665 A1	18-02-2021				
WO 2013109819 A1	25-07-2013			AR 089752 A1	17-09-2014
		AU 2013209707 A1	24-07-2014		
		BR 112014017518 A2	04-09-2018		
		CA 2862422 A1	25-07-2013		
		CL 2014001888 A1	03-10-2014		
		CN 104066449 A	24-09-2014		
		CO 7000747 A2	21-07-2014		
		CR 20140382 A	07-10-2014		

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2023/068848

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EA 201491357 A1	28-11-2014
		EP 2804629 A1	26-11-2014
		HK 1197187 A1	09-01-2015
		JP 6242813 B2	06-12-2017
		JP 2015511119 A	16-04-2015
		KR 20140116490 A	02-10-2014
		MA 35898 B1	01-12-2014
		NZ 626520 A	30-09-2016
		PE 20141561 A1	12-11-2014
		PH 12014501605 A1	08-10-2014
		SG 10201601747X A	28-04-2016
		SG 11201404198T A	28-08-2014
		TW 201335187 A	01-09-2013
		US 2013183320 A1	18-07-2013
		US 2016185855 A1	30-06-2016
		US 2017166636 A1	15-06-2017
		US 2019010228 A1	10-01-2019
		WO 2013109819 A1	25-07-2013
		ZA 201404675 B	30-11-2016

WO 2018220080	A1	06-12-2018	AR 111840 A1
			AU 2018276409 A1
			BR 112019022729 A2
			CA 3060401 A1
			CL 2019003419 A1
			CN 110637030 A
			CO 2019012329 A2
			EA 201992808 A1
			EP 3630816 A1
			IL 270854 A
			JP 7216024 B2
			JP 2020521478 A
			KR 20200011933 A
			MA 48760 A
			PE 20200610 A1
			PH 12019502602 A1
			TW 201906858 A
			UA 125761 C2
			US 2018344868 A1
			US 2022362393 A1
			WO 2018220080 A1
			06-12-2018
