

DRAWINGS

[Figure 1]

Common Light Chain	SEQ ID No.	Amino Acid Sequence
Variable Region	25	DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPK LLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQS YSTPPTFGQGTKVEIK
Constant Region	29	RTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVD NALQSGNSQESVTEQDSKDSYSTLSSTLTLSKADYEEKHKVYACE VTHQGLSSPVTKSFNRGEC

[Figure 2]

Common Light Chain	SEQ ID No.	CDR1	SEQ ID No.	CDR2	SEQ ID No.	CDR3
CDRs	26	RASQSISSYLN	27	AASSLQS	28	QQSYSTPPT

[Figure 3]

Germline V gene	SEQ ID No.	Amino Acid Sequence
IGHV7-4-1	21	QVQLVQSGSELKKPGASVKVSCKASGYTFTSYAMNWVRQ APGQGLEWMGWINTNTGNPTYAQGFTGRFVFSLDTSVST AYLQICSLKAEDTAVYYCAR
IGHV5-51	22	EVQLVQSGAEVKKPGESLKISCKGSGYSFTSYWIGWVRQM PGKGLEWMGHIYPGDSDFRYSPSFQGGVTISADKSISTAYLQ WSSLKASDTAMYYCAR

[Figure 4]

Alignment between the respective VH of PD1-1 to PD1-5 and IGHV7-4-1/JH6c

	FR1	CDR1	FR2	CDR2
IGHV7-4-1 (SEQ ID No. 21)	QVQLVQSGSELKKPGASVKVSCKASGYTFT	SYAMN	WVRQAPGQGLEWMG	WINTNTGNPTYAQGFTG
PD1-1 VH (SEQ ID No. 1)	Q	H-GLH		L-E-F
PD1-2 VH (SEQ ID No. 2)	Q-V	H-GLH		
PD1-3 VH (SEQ ID No. 3)	M	H-LH		L-E
PD1-4 VH (SEQ ID No. 4)	Q	H-LH	L	L-E-F
PD1-5 VH (SEQ ID No. 5)	Q	H-LH	L	L-E-F

	FR3	CDR3	FR4
IGHV7-4-1 (SEQ ID No. 21)	RFVFSLDTSVSTAYLQICSLKAEDTAVYYCAR		
D gene (unknown)			
JH6c		HYYYYYMDV	WGKGTTVTVSS
PD1-1 VH (SEQ ID No. 1)	T-S	GDMVVPTTIWN-HF	N-L
PD1-2 VH (SEQ ID No. 2)	S	GDLVVPTTIWN-H-E	L
PD1-3 VH (SEQ ID No. 3)	T-N	GDMVVPTTIWN	
PD1-4 VH (SEQ ID No. 4)	T-S	GDMVVPTTIWN-HF	N
PD1-5 VH (SEQ ID No. 5)	T-S	GDMVVPTTIWN-HF	Q

[Figure 5]

Alignment between each VH of CD19-1 to CD19-6 and IGHV5-51

	FR1	CDR1	FR2	CDR2
IGHV5-51 (SEQ ID No. 22)	EVQLVQSGAEVKKPGESLKISCKGSGYSFT	SYWIG	WVRQMPGKGLEWMG	IIYPGDS DTRYSPSFQG
CD19-5 VH (SEQ ID No. 30)	Q-----	-----	-----	-----
CD19-1 VH (SEQ ID No. 31)	-----	-----	-----	-----
CD19-4 VH (SEQ ID No. 32)	Q-----S-----F--	--A-	-----	-----
CD19-2 VH (SEQ ID No. 33)	Q-----I-	-----	-----	--W-----
CD19-3 VH (SEQ ID No. 34)	-----	-----	-----	-----
CD19-6 VH (SEQ ID No. 30)	Q-----	-----	-----	-----

	FR3	CDR3	FR4
IGHV5-51 (SEQ ID No. 22)	QVTISADKSISTAYLQWSSSLKASDTAMYYCAR		
CD19-5 VH (SEQ ID No. 30)	-----I-----	KTIVGVMTAFDI	WGQGTMTVSS
CD19-1 VH (SEQ ID No. 31)	-----V-	QTIVATVMNAFDI	WGQGTMTVSS
CD19-4 VH (SEQ ID No. 32)	-----FT-----N-----I-----	HTIVATIYNAPDF	WGQGTMTVSS
CD19-2 VH (SEQ ID No. 33)	-----NV-----L-V-	QTIVATTGLAFDI	WGQGTMTVSS
CD19-3 VH (SEQ ID No. 34)	-----N-----	RTIVATIHWASDY	WGQGTMTVSS
CD19-6 VH (SEQ ID No. 30)	-----I-----	KTIVGVMTAFDI	WGRGTMTVSS

[Figure 6]

Clone No.	SEQ ID No.	Amino Acid Sequence
PD1-1	1	QVQLVQSGSELKQPGASVKVSKASGYTFTHYGLHWVRQAPGQGLEWMGW LNTNTENPTFAQGFTGRFVFSLDTSVTTAYLQISSLKAEDTAVYYCARGDMV VPTTIWNYYHFMDVWGNGTLTVSS
PD1-2	2	QVQLVQSGSELKQPGVSVKVSCKASGYTFTHYGLHWVRQAPGQGLEWMGWI NTNTGNPTYAQGFTGRFVFSLDTSVSTAYLQISSLKAEDTAVYYCARGDLV PTTIWNYYHYMEVWGKGLTVSS
PD1-3	3	QVQLVQSGSELKQPGASVMVSKASGYTFTHYALHWVRQAPGQGLEWMGW LNTNTENPTYAQGFTGRFVFSLDTSVTTAYLQINSLKAEDTAVYYCARGDMV VPTTIWNYYYYMDVWGKGTTVSS
PD1-4	4	QVQLVQSGSELKQPGASVKVSKASGYTFTHYALHWLRQAPGQGLEWMGWL NTNTENPTFAQGFTGRFVFSLDTSVTTAYLQISSLKAEDTAVYYCARGDMV PTTIWNYYHFMDVWGNGTTVSS
PD1-5	5	QVQLVQSGSELKQPGASVKVSKASGYTFTHYALHWLRQAPGQGLEWMGWL NTNTENPTFAQGFTGRFVFSLDTSVTTAYLQISSLKAEDTAVYYCARGDMV PTTIWNYYHFMDVWGQGTTVSS

[Figure 7]

Clone No.	SEQ ID No.	CDR1	SEQ ID No.	CDR2	SEQ ID No.	CDR3
PD1-1	6	HYGLH	7	WLNTNTENPTFAQGFTG	8	GDMVVPTTIWNYYHFMDV
PD1-2	9	HYGLH	10	WINTNTGNPTYAQGFTG	11	GDLVVPTTIWNYYHYMEV
PD1-3	12	HYALH	13	WLNTNTENPTYAQGFTG	14	GDMVVPTTIWNYYYYMDV
PD1-4	15	HYALH	16	WLNTNTENPTFAQGFTG	17	GDMVVPTTIWNYYHFMDV
PD1-5	18	HYALH	19	WLNTNTENPTFAQGFTG	20	GDMVVPTTIWNYYHFMDV

[Figure 8]

Clone No.	SEQ ID No.	Amino Acid Sequence
CD19-5	30	QVQLVQSGAEVKKPGESLKISCKGSGYSFTSYWIGWVRQMPGKGLEWMG IIYPGDS DTRYSPSFQGGQVTISADKSISTAYLQWSSLKASDTAIYYCARKTI VGVVMTAFDIWGQGTMTVTVSS
CD19-1	31	EVQLVQSGAEVKKPGESLKISCKGSGYSFTSYWIGWVRQMPGKGLEWMG IIYPGDS DTRYSPSFQGGQVTISADKSISTAYLQWSSLKASDTAMYYCVRQT IVATVMNAFDIWGQGTMTVTVSS
CD19-4	32	QVQLVQSGAEVKKSGESLKISCKGSGFSFTSYWIAWVRQMPGKGLEWMG IIYPGDS DTRYSPSFQGGQVTISADKSFTTAYLQWNSLKASDTAIYYCARHT IVATIYNAFDFWGQGTMTVTVSS
CD19-2	33	QVQLVQSGAEVKKPGESLKISCKGSGYSFISYWIGWVRQMPGKGLEWMGI IWPGDSD DTRYSPSFQGGQVTISADKSINVAYLQWSSLKASDTALYYCVRQTI VATTGLAFDIWGQGTMTVTVSS
CD19-3	34	EVQLVQSGAEVKKPGESLKISCKGSGYSFTSYWIGWVRQMPGKGLEWMG IIYPGDS DTRYSPSFQGGQVTISADKSINTAYLQWSSLKASDTAMYYCARRT IVATIH WASDYWGQGTMTVTVSS
CD19-6	62	QVQLVQSGAEVKKPGESLKISCKGSGYSFTSYWIGWVRQMPGKGLEWMG IIYPGDS DTRYSPSFQGGQVTISADKSISTAYLQWSSLKASDTAIYYCARKTI VGVVMTAFDIWGRGTMVTVSS

[Figure 9]

Clone No.	SEQ ID No.	CDR1	SEQ ID No.	CDR2	SEQ ID No.	CDR3
CD19-5	35	SYWIG	36	IIYPGDS DTRYSPSFQG	37	KTIVGVVMTAFDI
CD19-1	38	SYWIG	39	IIYPGDS DTRYSPSFQG	40	QTIVATVMNAFDI
CD19-4	41	SYWIA	42	IIYPGDS DTRYSPSFQG	43	HTIVATIYNAFDF
CD19-2	44	SYWIG	45	IWPGDSD DTRYSPSFQG	46	QTIVATTGLAFDI
CD19-3	47	SYWIG	48	IIYPGDS DTRYSPSFQG	49	RTIVATIH WASDY

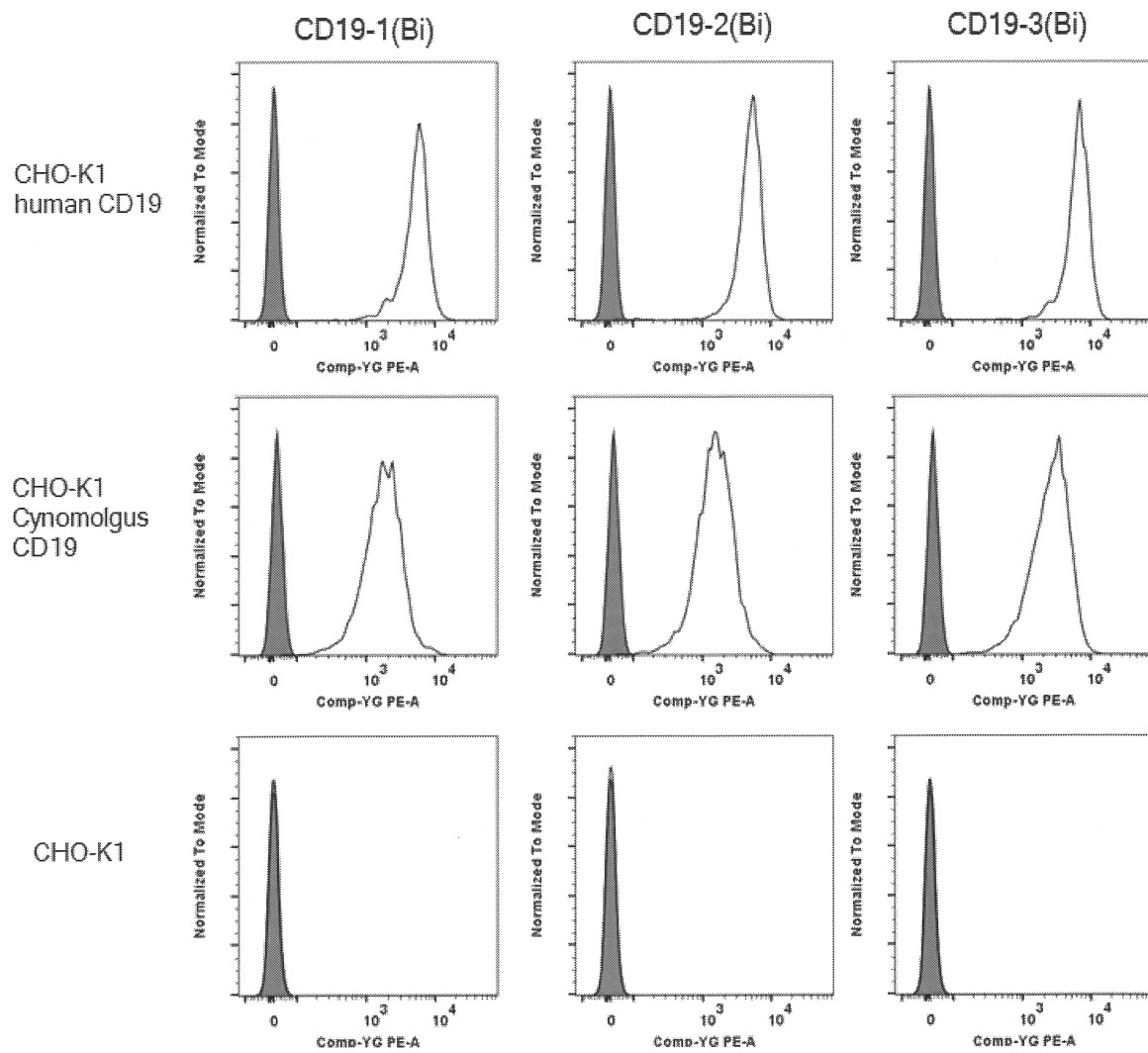
[Figure 10]

	SEQ ID No.	Amino Acid Sequence
Heavy chain constant region having the VH of the first arm specifically binding to PD-1	23	ASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPA VLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHTCPP CPAPELGRGSPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK AKGQPREPQVYTTDPPSREEMTKNQVSLTCEVKGFYPSDIAVEWESNGQPENNYK TTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPG
Heavy chain constant region having the VH of the second arm specifically binding to CD19	24	ASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPA VLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHTCPP CPAPELGRGSPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK AKGQPREPQVYTKPPSREEMTKNQVSLKCLVKGFYPSDIAVEWESNGQPENNYK TTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPG
Heavy chain constant region having the VH of the second arm specifically binding to CD19	71	ASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPA VLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHTCPP CPAPELGRGSPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK AKGQPREPQVYTKPPSREEMTKNQVSLKCLVKGFYPSDIAVEWESNGQPENNYK TTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK GKKA

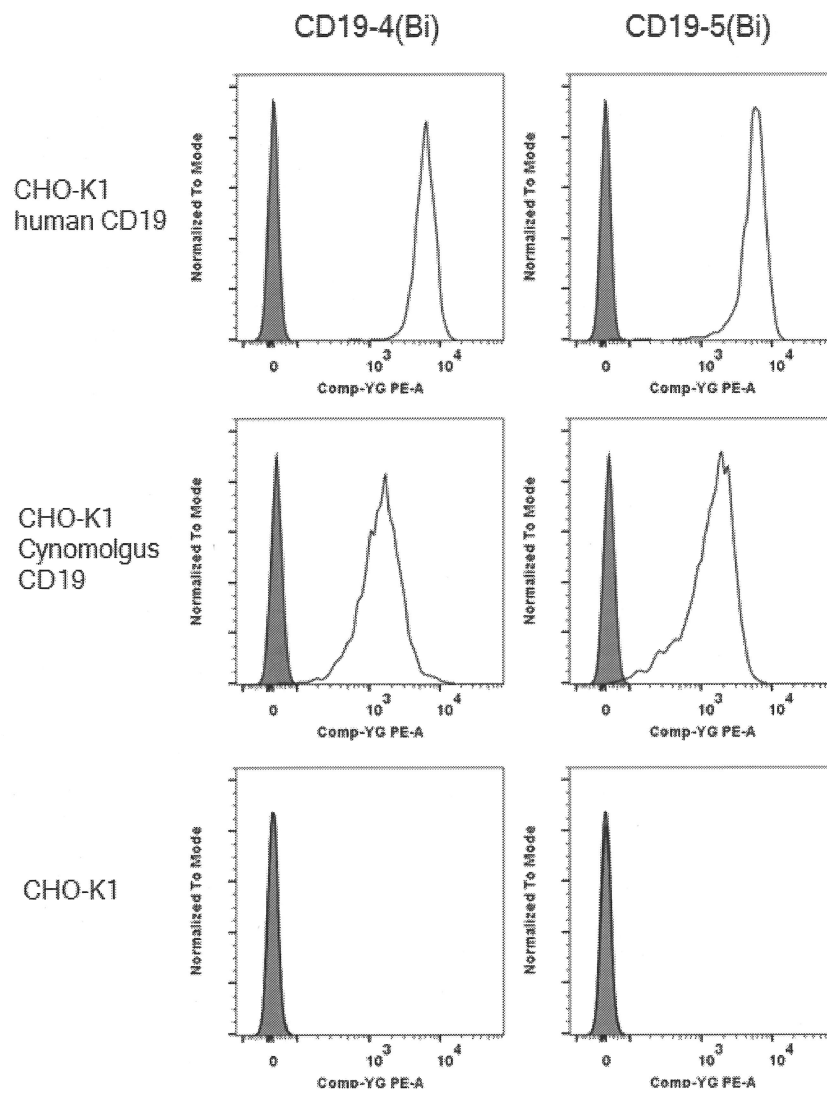
[Figure 11]

Clone No.	Human CD19	Human PD-1
	Kd (nmol/L)	Kd (nmol/L)
CD19-1(Bi)	11.3	7.6
CD19-2(Bi)	13.6	6.7
CD19-3(Bi)	5.7	6.8
CD19-4(Bi)	12.5	6.7
CD19-5(Bi)	6.6	7.6
CD19-6(Bi)	3.1	1.4

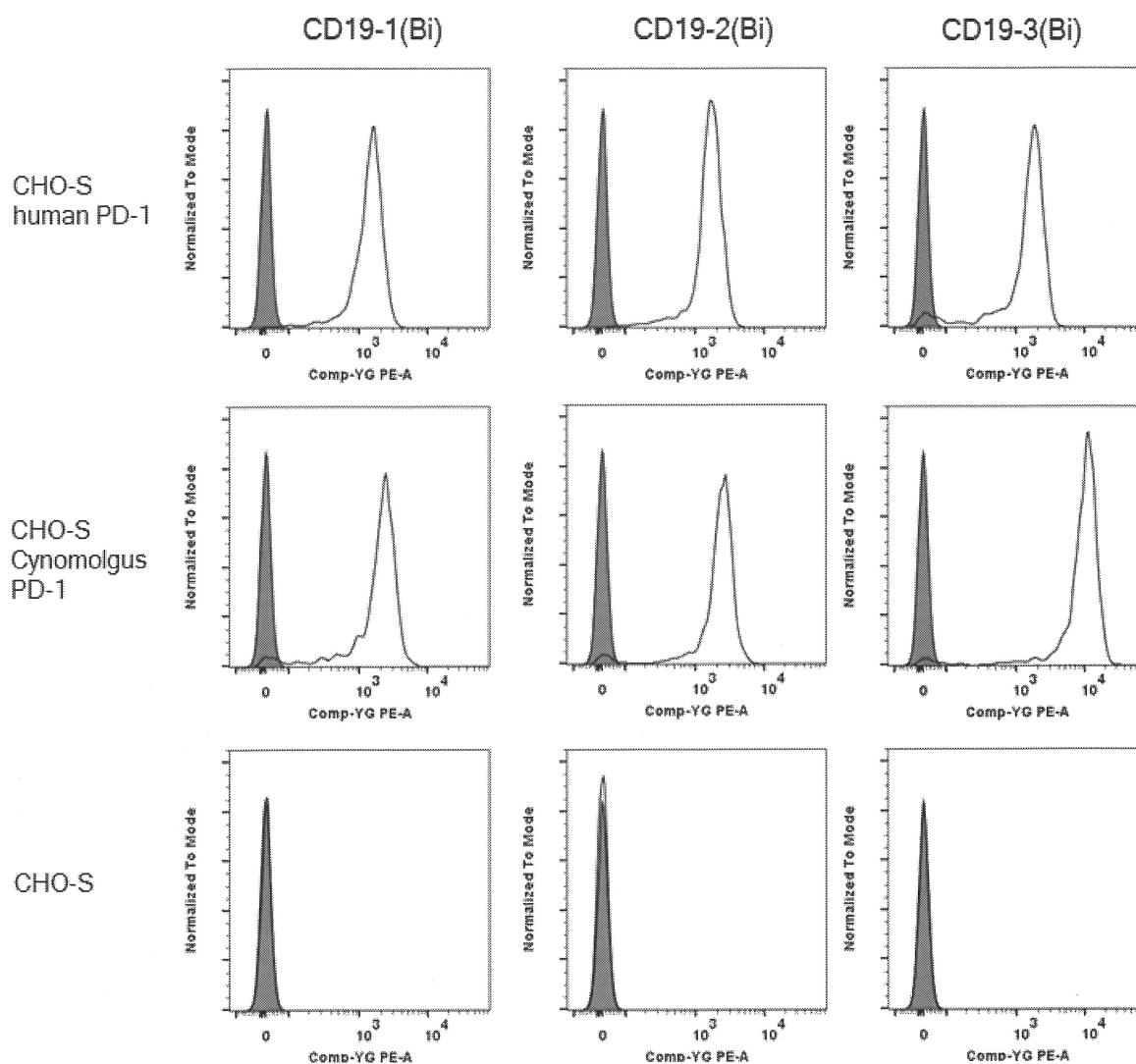
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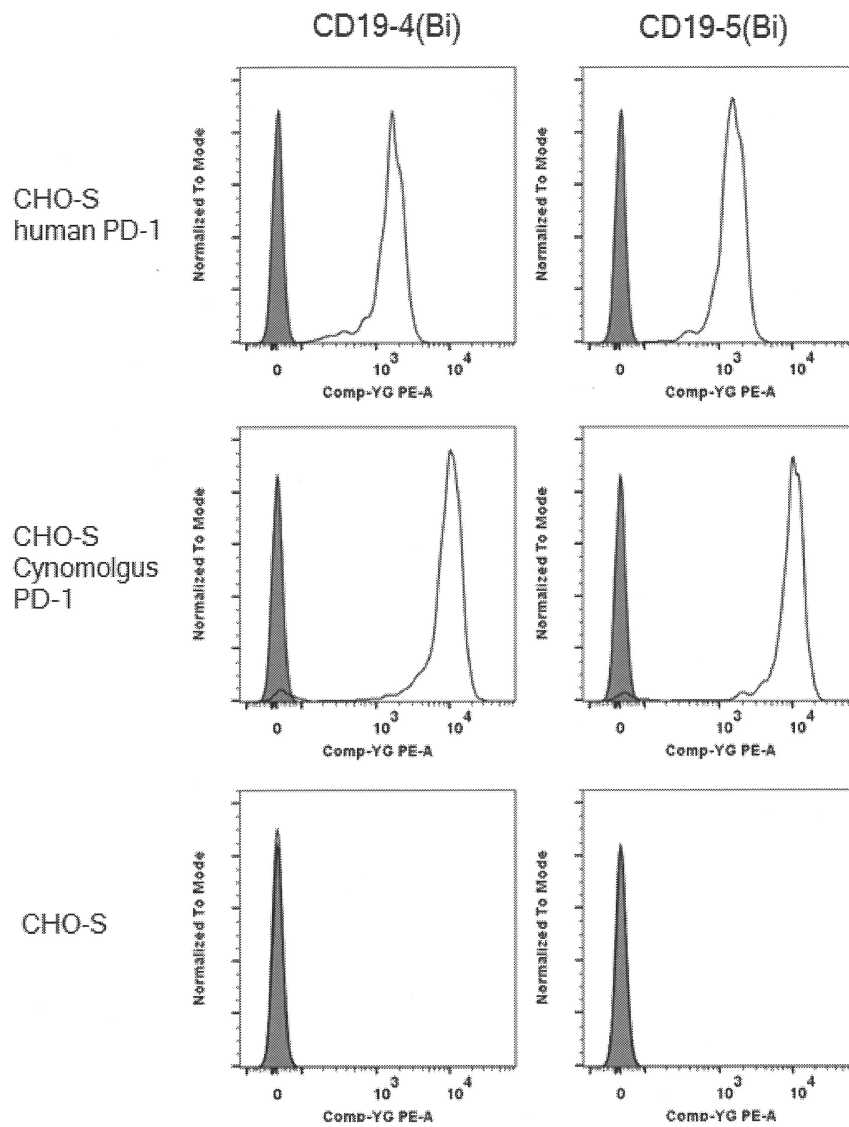
[Figure 13]



[Figure 14]

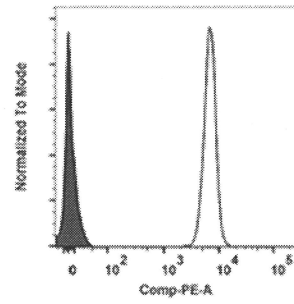


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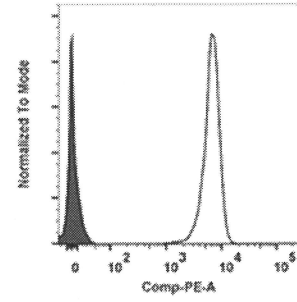


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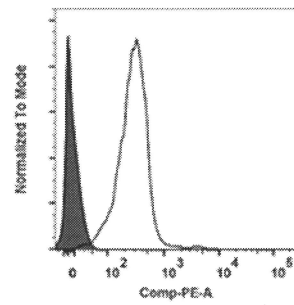
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human CD19



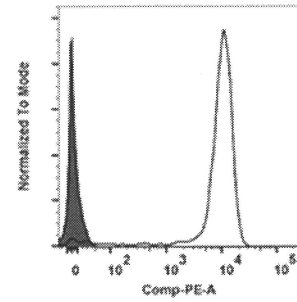
CHO-S
human PD-1



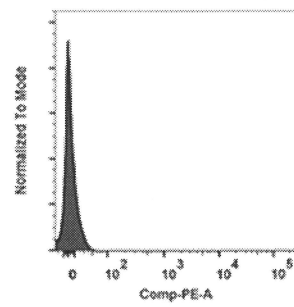
CHO-K1
cynomolgus CD19



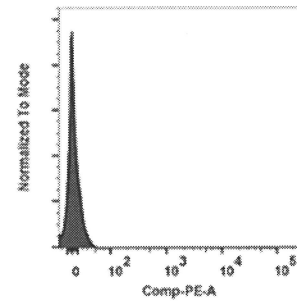
CHO-S
cynomolgus PD-1



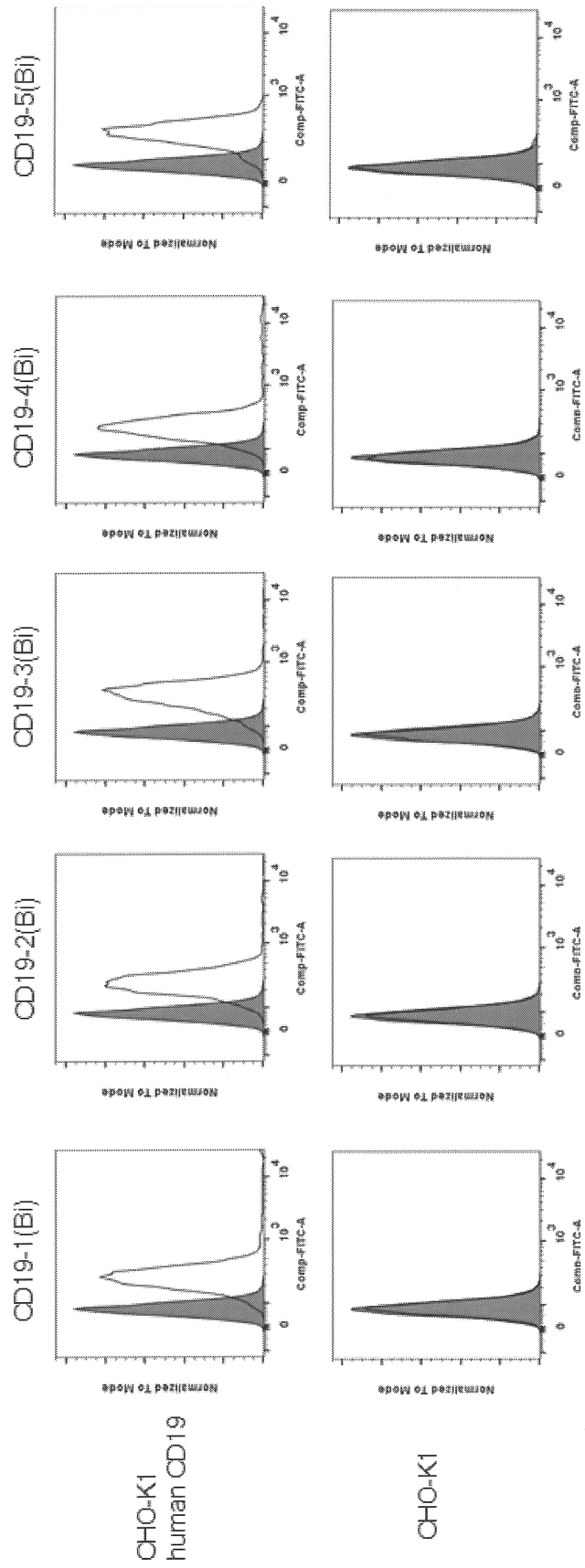
CHO-K1



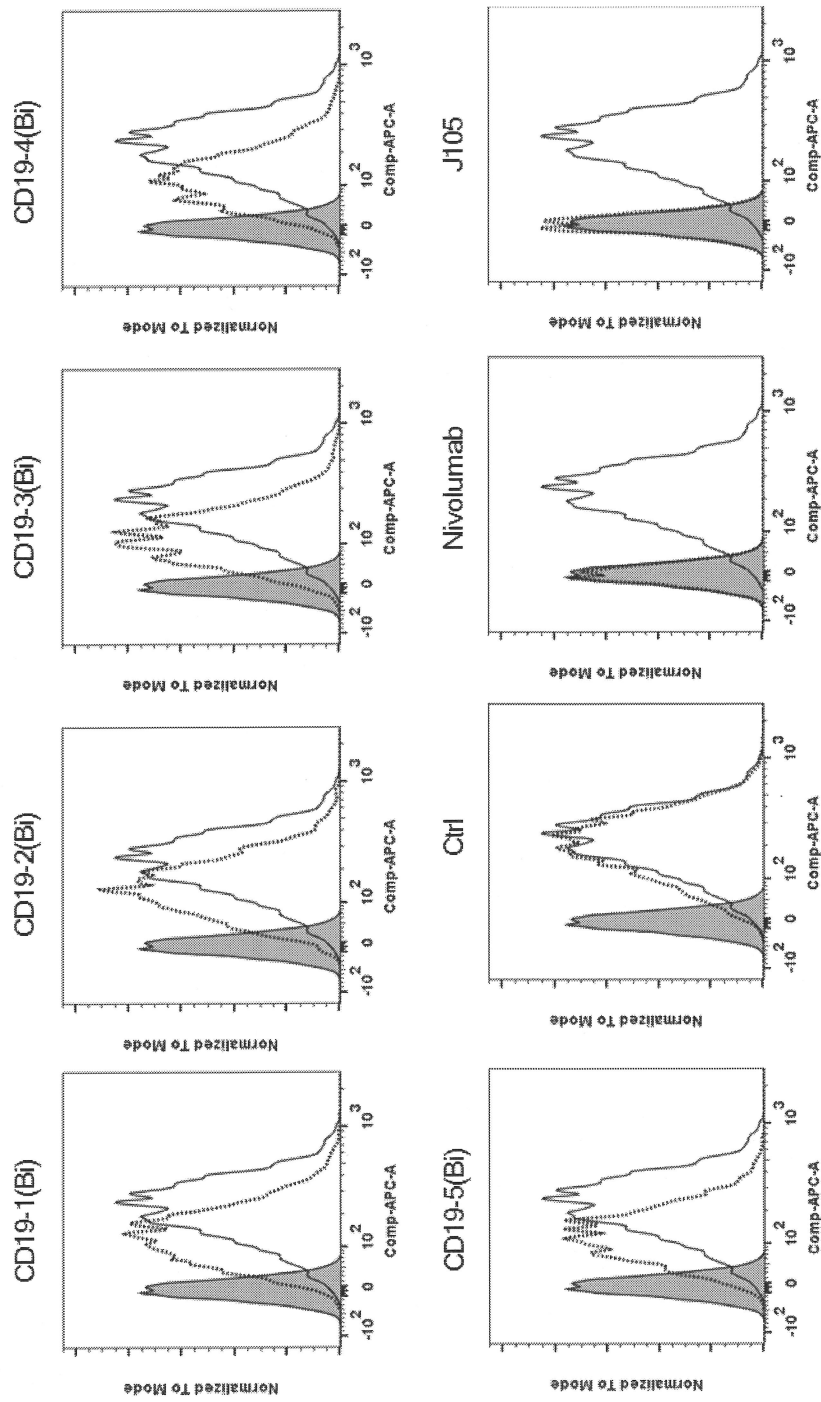
CHO-S



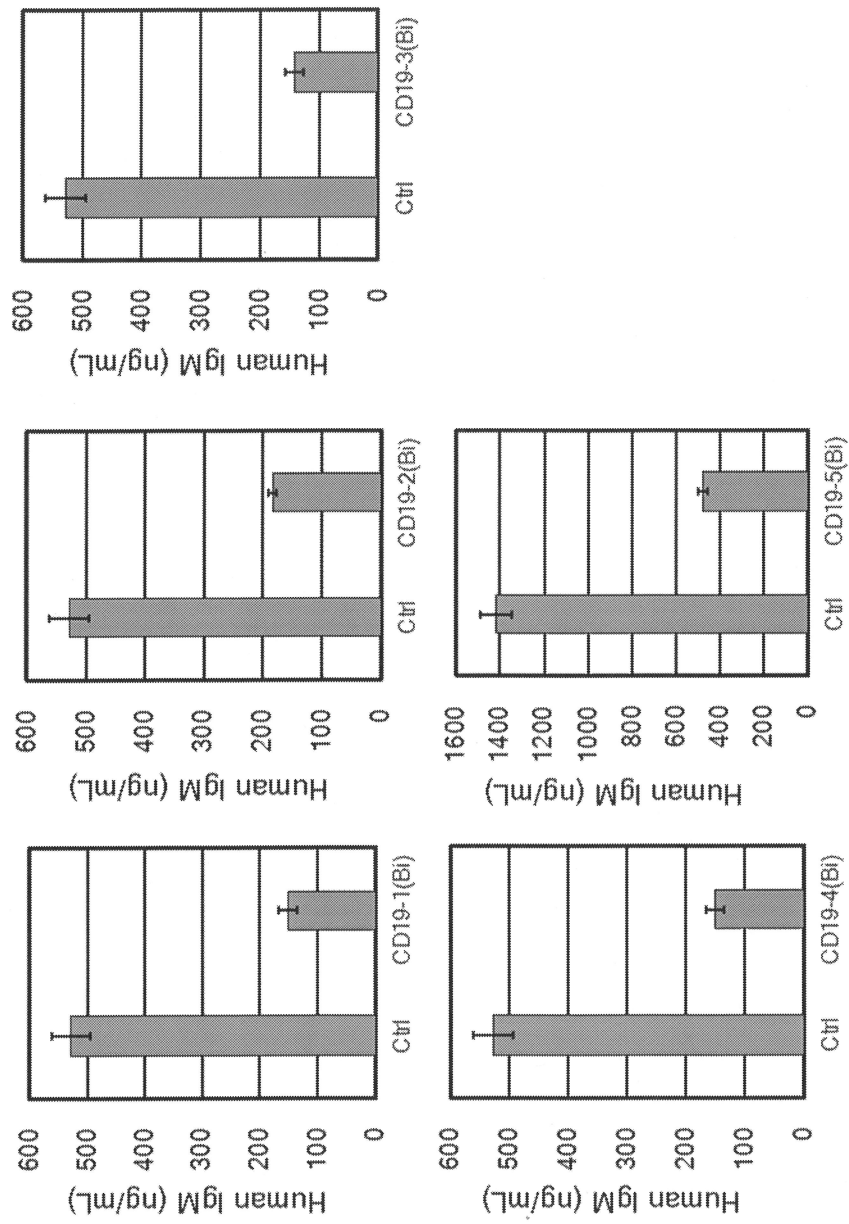
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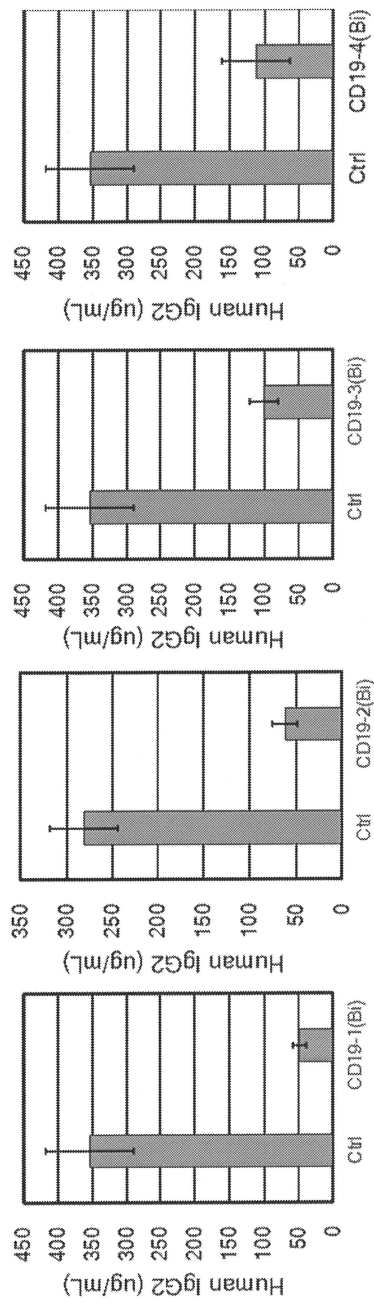
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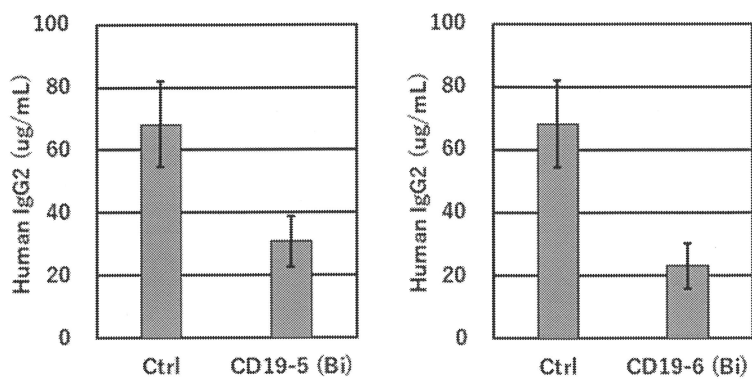
[Figure 19]



[Figure 20]



[Figure 21]



[Figure 22]

