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huCS1 cDNA and Encoded huCS1 Polypeptide

```

atg gct ggt tcc cca aca tgc ctc acc ctc atc tat atc ctt tgg cag ctc aca ggg tca
M A G S P T C L T L I Y I L W Q L T G S
- A - - A S G P V K E L V G S V G G A V T F P
gca gcc tct gga ccc gtg aaa gag ctg gtc ggt tcc gtt ggt ggg gcc gtg act ttc ccc
A A S G P V K E L V G S V G G A V T F P
ctg aag tcc aaa gta aag caa gtt gac tct att gtc tgg acc ttc aac aca acc cct ctt
L K S K V K Q V D S I V W T F N T T P L
gtc acc ata cag cca gaa ggg ggc act atc ata gtg acc caa aat cgt aat agg gag aga
V T I O P E G G T I I V T Q N R N R E R
gta gac ttc cca gat gga ggc tac tcc ctg aag ctc agc aaa ctg aag aag aat gac tca
V D F P D G G Y S L K L S K L K K N D S
ggg atc tac tat gtg ggg ata tac agc tca tca ctc cag cag ccc tcc acc cag gag tac
G I Y Y V G I Y S S S L Q Q P S T Q E Y
gtg ctg cat gtc tac gag cac ctg tca aag cct aaa gtc acc atg ggt ctg cag agc aat
V L H V Y E H L S K P K V T M G L Q S N
aag aat ggc acc tgt gtg acc aat ctg aca tgc tgc atg gaa cat ggg gaa gag gat gtg
K N G T C V T N L T C C M E H G E E D V
att tat acc tgg aag gcc ctg ggg caa gca gcc aat gag tcc cat aat ggg tcc atc ctc
I Y T W K A L G Q A A N E S H N G S I L
ccc atc tcc tgg aga tgg gga gaa agt gat atg acc ttc atc tgc gtt gcc agg aac cct
P I S W R W G E S D M T F I C V A R N P

```

FIG. 1A-1

gtc agc aga aac ttc tca agc ccc atc ctt gcc agg aag ctc tgt gaa ggt gct gct gat
V S R N F S S P I L A R K L C E G A A D
gac cca gat tcc atg gtc ctc ctg tgt ctc ctg ttg gtg ccc ctc ctg ctc agt ctc
D P D S S M V L L C L L L V P L L S L
ttt gta ctg ggg cta ttt ctt tgg ttt ctg aag aga gag aga caa gaa gag tac att gaa
F V L G L F L W F L K R E R Q E E Y I E
gag aag aag aga gtg gac att tgt cgg gaa act cct aac ata tgc ccc cat tct gga gag
E K K R V D I C R E T P N I C P H S G E
aac aca gag tac gac aca atc cct cac act aat aga aca atc cta aag gaa gat cca gca
N T E Y D T I P H T N R T I L K E D P A
aat acg gtt tac tcc act gtg gaa ata ccg aaa aag atg gaa aat ccc cac tca ctg ctc
N T V Y S T V E I P K K M E N P H S L L
acg atg cca gac aca cca agg cta ttt gcc tat gag aat gtt atc tag
T M P D T P P R L F A Y E N V I

Signal peptide is dashed underlined
Ig Domain #1 is underlined
Ig Domain #2 is double underlined
Transmembrane domain is highlighted

FIG. 1A-2

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cmCS1 cDNA and Encoded cmCS1 Polypeptide

```

atg_gct ggt tcc cca aca tgc ttc acc ttc atc tat atc ctt tgg cag ctc aca ggg tca
M_A_G_S_P_T_C_F_T_F_I_Y_I_L_W_Q_L_T_G_S
aca gcc tct gga tcc gtg aaa gag ctg gtc ggt tcc att ggt ggg gct gtg act ttc ccc
T_A_S_G_S_V_K_E_L_V_G_S_I_G_G_A_V_T_F_P
ctg aag tct gaa gta aag caa gtt gac tot att gtc tgg acc ttc aac aca acc act ctt
L_K_S_E_V_K_Q_V_D_S_I_V_W_T_F_N_T_T_T_L
gtc acc ata cag cca gaa ggg ggc cct atg ata gtg acc caa aat cgt aat aag gag aga
V_T_I_O_P_E_G_G_P_M_I_V_T_Q_N_R_N_K_E_R
gta cac ttc cca gat gga ggc tat tcc ctg aag ctc agc aaa ctg aag aag aat gac tca
V_H_F_P_D_G_G_Y_S_L_K_L_S_K_L_K_K_N_D_S
ggg atc tac aat gtg gag ata tac agc tca tcc ctc cag gat ccc ttc acc cgg aag tat
G_I_Y_N_V_E_I_Y_S_S_S_L_Q_D_P_F_T_R_K_Y
gtg ctg cgt gtc tac gag cac ctg tca aag cct aaa gtc acc atg ggt cta cag agt aat
V_L_R_V_Y_E_H_L_S_K_P_K_V_T_M_G_L_Q_S_N
aag aat ggc acc tgt gtg acc aat ctg aca tgc tgc atg gaa cat ggg gaa gag gat gtg
K_N_G_T_C_V_T_N_L_T_C_C_M_E_H_G_E_D_V
att tat acc tgg aag gcc ctg ggg caa gca gtc aat gag tcc cat aat ggg tcc atc cta
I_Y_T_W_K_A_L_G_Q_A_V_N_E_S_H_N_G_S_I_L
ccc atc tcc tgg aga tgg gga gaa agt gat atg acc ttc atc tgc act gtc agg aac cct
P_I_S_W_R_W_G_E_S_D_M_T_F_I_C_T_V_R_N_P

```

FIG. 1B-1

gtc agc agc aac tcc tca agc ccc atc ctt gcc agg aag ctc tgt gaa ggt gct gct gat
V S S N S S S P I L A R K L C E G A A D
gac tca gat tcc atg gtc ctc ctg tgt ctc ctg ttg gtg ccc ctc ctg ctc agt ctc
D S D S S M V L L C L L L V P L L S L
ttt gta ctg ggg cta ttt ctt tgg ttt ctg aag aga gag aca caa gaa gag tcc att gaa
F V L G L F L W F L K R E T Q E S I E
ggg aag aag aga gcg gac att tgt cgg gaa act cct aac ata tgc ccc tat tct gga gag
G K K R A D I C R E T P N I C P Y S G E
aac aca gag tat gac aca atc cct tac act aat aga act atc cca atg gaa gat gca gca
N T E Y D T I P Y T N R T I P M E D A A
aat aca ctt tat tcc act gtg gaa ata cca aaa aag att gaa aat ccc cac tca ctg ctc
N T L Y S T V E I P K K I E N P H S L L
acg atg cca gac aca cca agg cta ttt gcc tat gag aat gtt atc tag
T M P D T P P R L F A Y E N V I

Signal peptide is dashed underlined
Ig Domain #1 is underlined
Ig Domain #2 is double underlined
Transmembrane domain is highlighted

FIG. 1B-2

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Exemplary Anti-huCS1 Antibody V_H Chains

	1	2	3	4
	1234567890	1234567890	1234567890	1234567890
Mu34C3V _H :	EVKLVESEGG	LVQPGSSMKL	SCTASGFTFS	<u>DYYMAWVRQV</u>
Hu34C3V _H .1:	EVQLVESGGG	LVQPGGSLRL	SCAASGFTFS	<u>DYYMAWVRQA</u>
Hu34C3V _H .1b:	EVQLVESGGG	LVQPGGSLRL	SCAASGFTFS	<u>DYYMAWVRQA</u>
Hu34C3V _H S55E:	EVQLVESGGG	LVQPGGSLRL	SCAASGFTFS	<u>DYYMAWVRQA</u>
Mu31D2V _H :	EVKLVESEGG	LVQPGSSMKL	SCTASGFTFS	<u>DYYMAWVRQV</u>
Hu31D2V _H .1:	EVQLVESGGG	LVQPGGSLRL	SCAASGFTFS	<u>DYYMAWVRQA</u>
Hu31D2V _H .1a:	EVQLVESGGG	LVQPGGSLRL	SCAASGFTFS	<u>DYYMAWVRQA</u>
Mu27A12V _H :	EVKLVESEGG	LVQPGSSMKL	SCTASGFTFS	<u>DYYMAWVRQV</u>
Hu27A12V _H .1:	EVQLVESGGG	LVQPGGSLRL	SCAASGFTFS	<u>DYYMAWVRQA</u>
Hu27A12V _H .1b:	EVQLVESGGG	LVQPGGSLRL	SCAASGFTFS	<u>DYYMAWVRQA</u>
Mu12D10V _H :	EVKLVESEGG	LVQPGSSMKL	SCTASGFTFS	<u>DYFMAWVRQV</u>
Mu14C11V _H :	EVKLVESEGG	LVQPGSSMKL	SCTASGFTFS	<u>DYYMAWVRQV</u>
Mu27H1V _H :	QVQLQQSGPE	LVKPGTSVNI	SCKASGYTFT	<u>DHYINWVKQR</u>

	5	6	7	8
	1234567890	12a34567890	1234567890	1234567890
Mu34C3V _H :	PEKGLEWVAS	<u>INYDGSSTYYL</u>	<u>DSLKSRFIIS</u>	RDNAKNILFL
Hu34C3V _H .1:	PGKGLEWVAS	<u>INYDGSSTYYL</u>	<u>DSLKSRFTIS</u>	RDNAKNSLYL
Hu34C3V _H .1b:	PGKGLEWVAS	<u>INYDGSSTYYV</u>	<u>DSVKGRFTIS</u>	RDNAKNSLYL
Hu34C3V _H S55E:	PGKGLEWVAS	<u>INYDGSSTYYV</u>	<u>DSVKGRFTIS</u>	RDNAKNSLYL
Mu12V _H :	PEKGLEWVAD	<u>INYDGGSTYYL</u>	<u>DSLKSRFIIS</u>	RDNAKNILCL
Hu31D2V _H .1:	PGKGLEWVAD	<u>INYDGGSTYYL</u>	<u>DSLKSRFTIS</u>	RDNAKNSLYL
Hu31D2V _H .1a:	PGKGLEWVAD	<u>INYDGGSTYYV</u>	<u>DSVKGRFTIS</u>	RDNAKNSLYL
Mu27A12V _H :	PEKGLEWVAE	<u>INYDGSSTYYL</u>	<u>DSLKSRFIIS</u>	RDNAKNILYL
Hu27A12V _H .1:	PGKGLEWVAE	<u>INYDGSSTYYL</u>	<u>DSLKSRFTIS</u>	RDNAKNSLYL
Hu27A12V _H .1b:	PGKGLEWVAE	<u>INYDGSSTYYV</u>	<u>DSVKGRFTIS</u>	RDNAKNSLYL
Mu12D10V _H :	PEKGLEWVAS	<u>INYDGNSTYFL</u>	<u>DSLKSRFIIS</u>	RDNAKNILYL
Mu14C11V _H :	PEKGLEWVAS	<u>INYDGSSTYYL</u>	<u>DSLKSRFIIS</u>	RDNAKNILYL
Mu27H1V _H :	PGQGLEWIGW	<u>IFPGTGITYYN</u>	<u>ENFKGKATLT</u>	VDKSSSTAYM

FIG. 2A-1

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			1	1
	9		0	1
	<u>12abc34567890</u>	<u>1234567890</u>	<u>1234567890</u>	<u>123</u>
Mu34C3V _H :	QMNSLKSEDATY	YCARD <u>RGYYF</u>	<u>DYWGQGTTLT</u>	VSS
Hu34C3V _H .1:	QMNSLRAEDTAVY	YCARD <u>RGYYF</u>	<u>DYWGQGTTLT</u>	VSS
Hu34C3V _H .1b:	QMNSLRAEDTAVY	YCARD <u>RGYYF</u>	<u>DYWGQGTTLT</u>	VSS
Hu34C3V _H S55E:	QMNSLRAEDTAVY	YCARD <u>RGYYF</u>	<u>DYWGQGTTLT</u>	VSS
Mu31D2V _H :	QMSSLKSEDATY	YCARD <u>RGYYF</u>	<u>DYWGQGTTLT</u>	VSS
Hu31D2V _H .1:	QMNSLRAEDTAVY	YCARD <u>RGYYF</u>	<u>DYWGQGTTLT</u>	VSS
Hu31D2V _H .1a:	QMNSLRAEDTAVY	YCARD <u>RGYYF</u>	<u>DYWGQGTTLT</u>	VSS
Mu27A12V _H :	QMSNLKSEDATY	YCARD <u>RGFYF</u>	<u>DYWGQGTTLT</u>	VSS
Hu27A12V _H .1:	QMNSLRAEDTAVY	YCARD <u>RGFYF</u>	<u>DYWGQGTTLT</u>	VSS
Hu27A12V _H .1b:	QMNSLRAEDTAVY	YCARD <u>RGFYF</u>	<u>DYWGQGTTLT</u>	VSS
Mu12D10V _H :	QMSSLKSEDATY	YCARD <u>RGFYF</u>	<u>DYWGQGTTLT</u>	VSS
Mu14C11V _H :	QMSGKSEDATY	SCARD <u>RGFYF</u>	<u>DYWGQGTTLT</u>	VSS
Mu27H1V _H :	LLSSLTSEDSAVY	FCARR <u>GYGSF</u>	<u>DYWGQGTTLT</u>	VSS

Bold underline = CDRs

Double underline = Hu germline changes

Highlighted = affinity-increasing mutations

FIG. 2A-2

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Exemplary Anti-huCS1 Antibody V_L Chains

	1	2	3	4
	1234567890	1234567890	1234567890	1234567890
Mu34C3V _L :	DVVMTQTPLS	LPVSLGDQAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Hu34C3V _L .1:	DIVMTQTPLS	LSVTPGQPAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Hu34C3V _L .1a:	DVVMTQTPLS	LSVTPGQPAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Hu34C3V _L .1b:	DVVMTQTPLS	LSVTPGQPAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Hu34C3V _L N30L:	DVVMTQTPLS	LSVTPGQPAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Mu31D2V _L :	DVVMTQTPLS	LPVSLGDQAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Hu31D2V _L .1:	DIVMTQSPLS	LPVTPGEPAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Hu31D2V _L .1a:	DVVMTQSPLS	LPVTPGEPAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Hu31D2V _L .1b:	DVVMTQSPLS	LPVTPGEPAS	ISCRSSQSLVHS-NGN	TYLHWYLQKP
Mu27A12V _L :	DVVMTQTPLS	LPVSLGDQAS	ISCRSSQSLVHN-NGN	TYLHWYLQKP
Hu27A12V _L .1:	DIVMTQTPLS	LSVTPGQPAS	ISCRSSQSLVHN-NGN	TYLHWYLQKP
Hu27A12V _L .1a:	DVVMTQTPLS	LSVTPGQPAS	ISCRSSQSLVHN-NGN	TYLHWYLQKP
Hu27A12V _L .1b:	DVVMTQTPLS	LSVTPGQPAS	ISCRSSQSLVHN-NGN	TYLHWYLQKP
Mu12D10V _L :	DVVMTQTPLS	LPVSLGDQAS	ISCRFSQSLVHR-NGN	TYLHWYLQKP
Mu14C11V _L :	DVVMTQTPLS	LPVSLGDQAS	ISCRSSQSLVHR-NGN	TYLHWYLQKP
Mu27H1V _L :	DIVMTQSPSS	LAMSVGQKVT	MSCKSSQSLLNSSNQK	NYLAWYLQKP

	5	6	7	8
	1234567890	1234567890	1234567890	1234567890
Mu34C3V _L :	GQSPKLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu34C3V _L .1:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu34C3V _L .1a:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu34C3V _L .1b:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu34C3V _L N30L:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Mu31D2V _L :	GQSPKLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu31D2V _L .1:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu31D2V _L .1a:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu31D2V _L .1b:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Mu27A12V _L :	GQSPKLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu27A12V _L .1:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu27A12V _L .1a:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Hu27A12V _L .1b:	GQSPQLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Mu12D10V _L :	GQSPKLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Mu14C11V _L :	GQSPKLLIYK	VSNRFS	SGVPD	RFSGSGSGTD
Mu27H1V _L :	GQSLKLMVYF	AYTRES	SGVPD	RFSGSGSGTD

FIG. 2B-1

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		1		0
	9			
	1234567890	12345a67890	1234567	
Mu34C3V _L :	EDLGVYFC <u>SO</u>	<u>STHVPPFT</u> FGG	GTKLEIK	
Hu34C3V _L .1:	EDVGVYYC <u>SO</u>	<u>STHVPPFT</u> FGG	GTKVEIK	
Hu34C3V _L .1a:	EDVGVY <u>FC</u> <u>SO</u>	<u>STHVPPFT</u> FGG	GTKVEIK	
Hu34C3V _L .1b:	EDVGVYYC <u>SO</u>	<u>STHVPPFT</u> FGG	GTKVEIK	
Hu34C3V _L N30L:	EDVGVY <u>FC</u> <u>SO</u>	<u>STHVPPFT</u> FGG	GTKVEIK	
Mu31D2V _L :	EDLGVYFC <u>SO</u>	<u>STHVPPFT</u> FGG	GTKLEIK	
Hu31D2V _L .1:	EDVGVYYC <u>SO</u>	<u>STHVPPFT</u> FGG	GTKVEIK	
Hu31D2V _L .1a:	EDVGVY <u>FC</u> <u>SO</u>	<u>STHVPPFT</u> FGG	GTKVEIK	
Hu31D2V _L .1b:	EDVGVYYC <u>SO</u>	<u>STHVPPFT</u> FGG	GTKVEIK	
Mu27A12V _L :	EDLGVYFC <u>SO</u>	<u>STHVPPYT</u> FGG	GTKLEIK	
Hu27A12V _L .1:	EDVGVYYC <u>SO</u>	<u>STHVPPYT</u> FGG	GTKVEIK	
Hu27A12V _L .1a:	EDVGVY <u>FC</u> <u>SO</u>	<u>STHVPPYT</u> FGG	GTKVEIK	
Hu27A12V _L .1b:	EDVGVYYC <u>SO</u>	<u>STHVPPYT</u> FGG	GTKVEIK	
Mu12D10V _L :	EDLGVYFC <u>SO</u>	<u>STHVRPYT</u> FGG	GTKLEIR	
Mu14C11V _L :	EDLGVYFC <u>SO</u>	<u>STHVPPYT</u> FGG	GTKLEIK	
Mu27H1V _L :	EDPADYFC <u>QQ</u>	<u>HYSSP-YT</u> FGG	GTKLEIK	

Bold underline = CDRs

Highlighted = affinity-increasing mutations

Bold, italic, dashed underline = Mu FR back-mutation

FIG. 2B-2

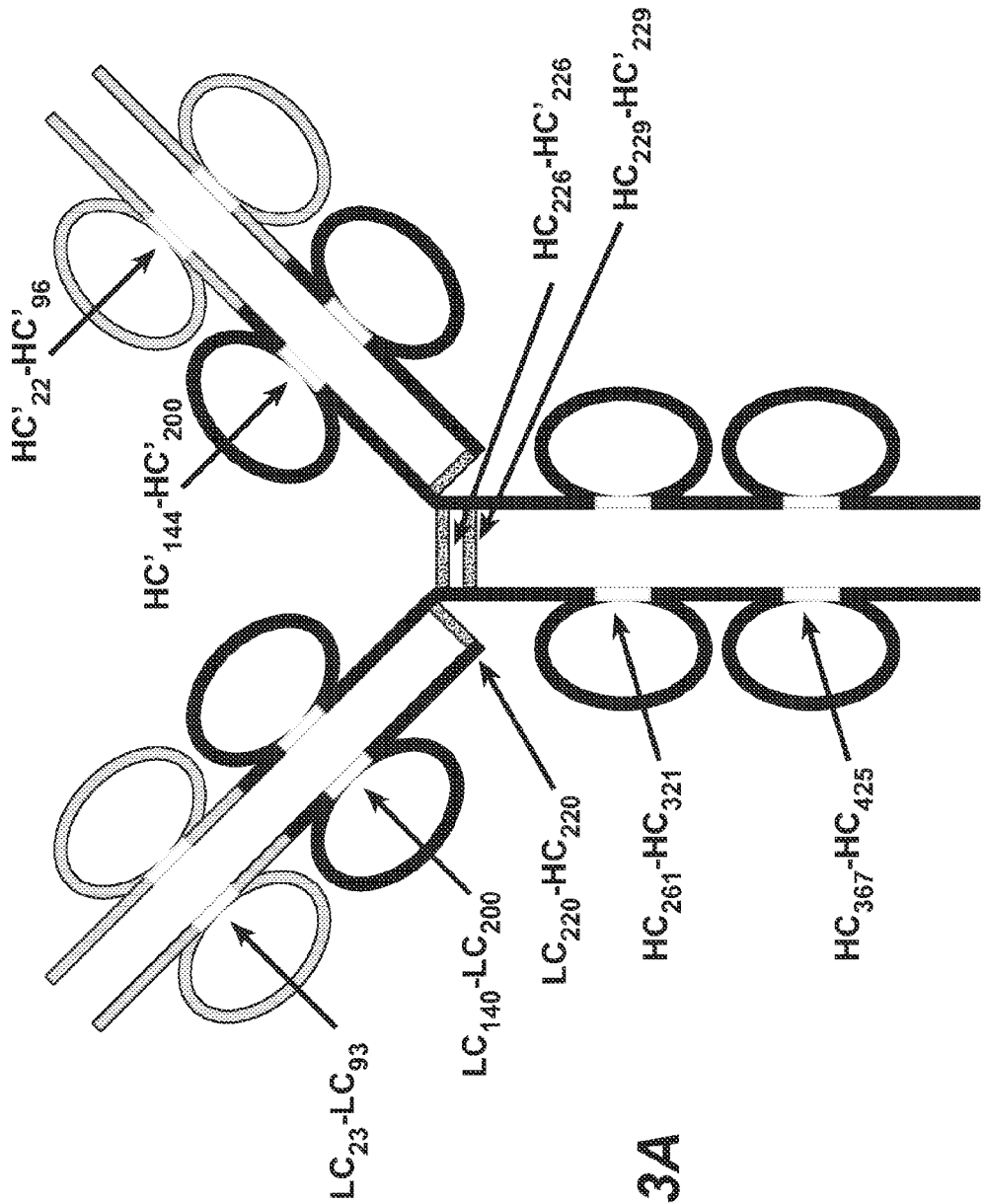
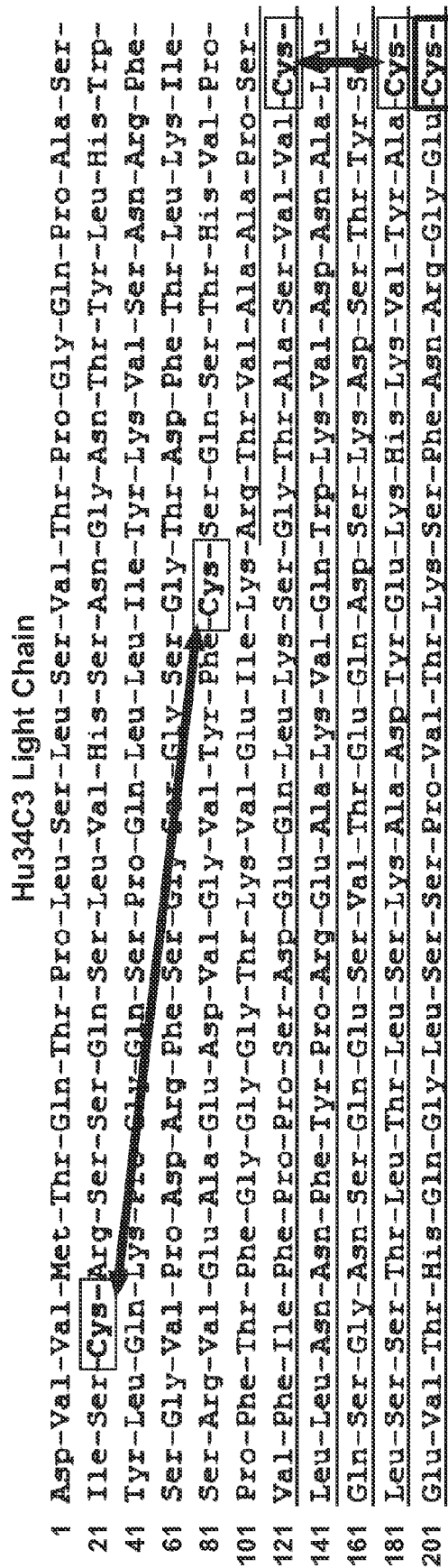


FIG. 3A



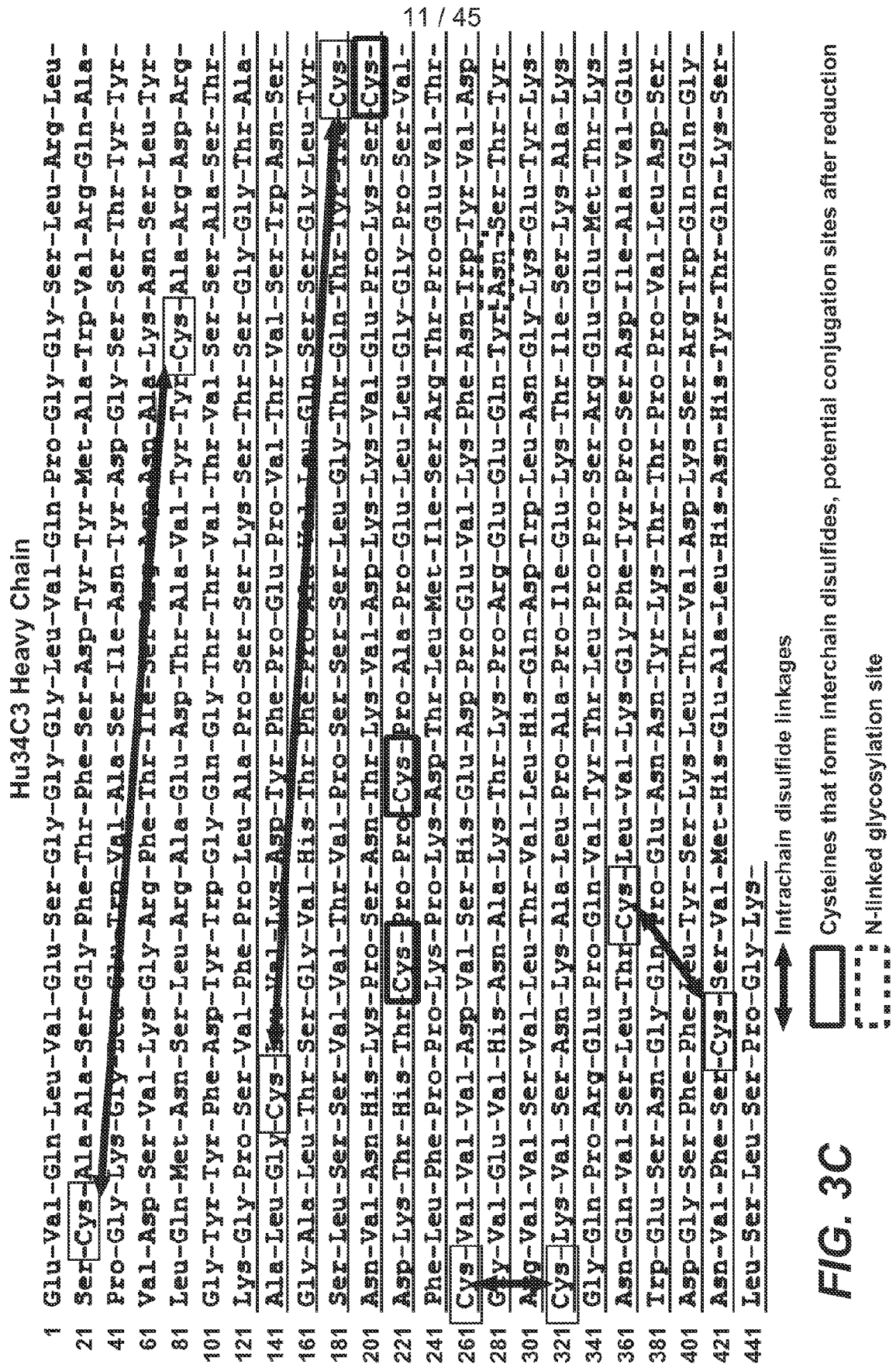
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↔ Intrachain disulfide linkages

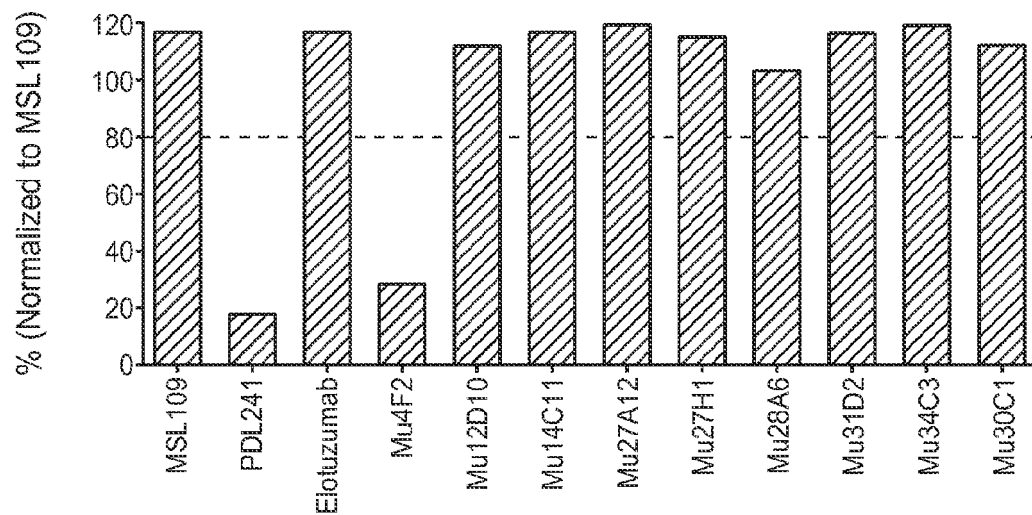
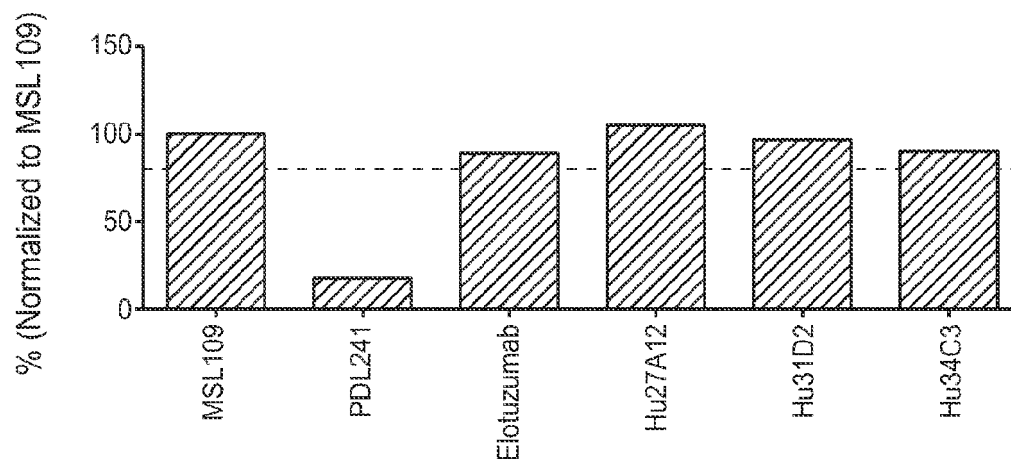


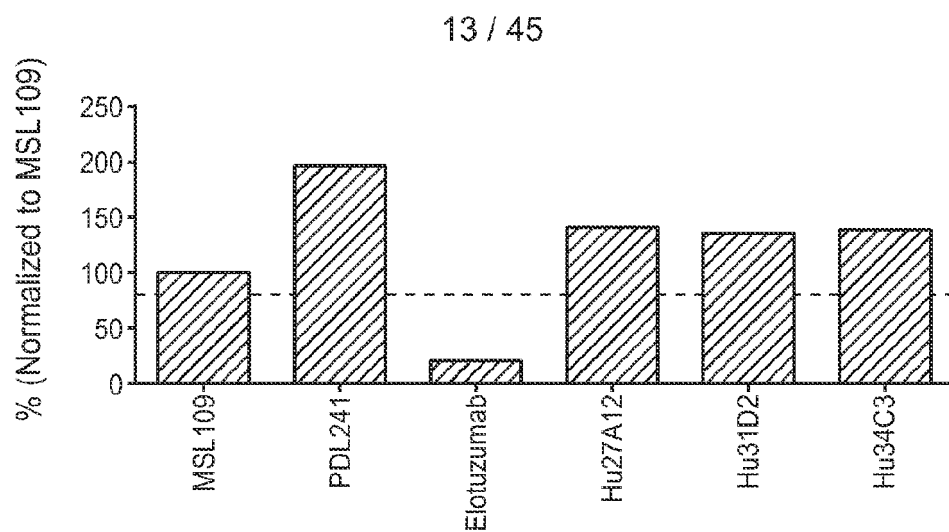
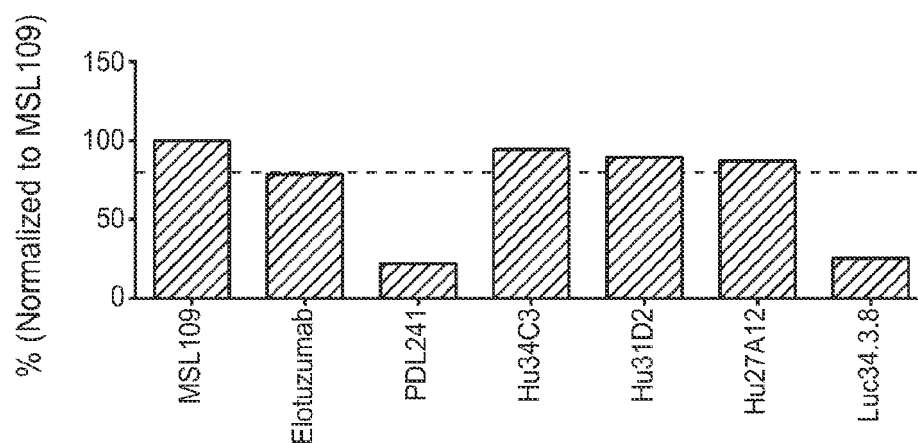
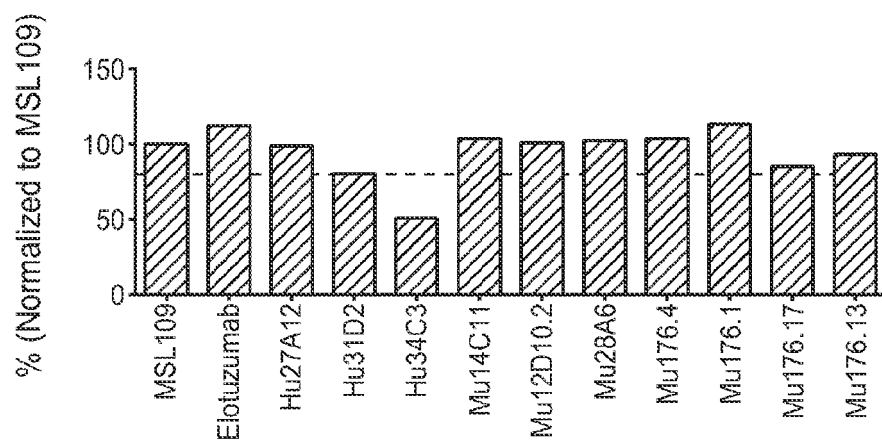
□ Cysteine that forms interchain disulfides, potential conjugation sites after reduction

FIG. 3B



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**FIG. 4****FIG. 5**

**FIG. 6****FIG. 7****FIG. 8**

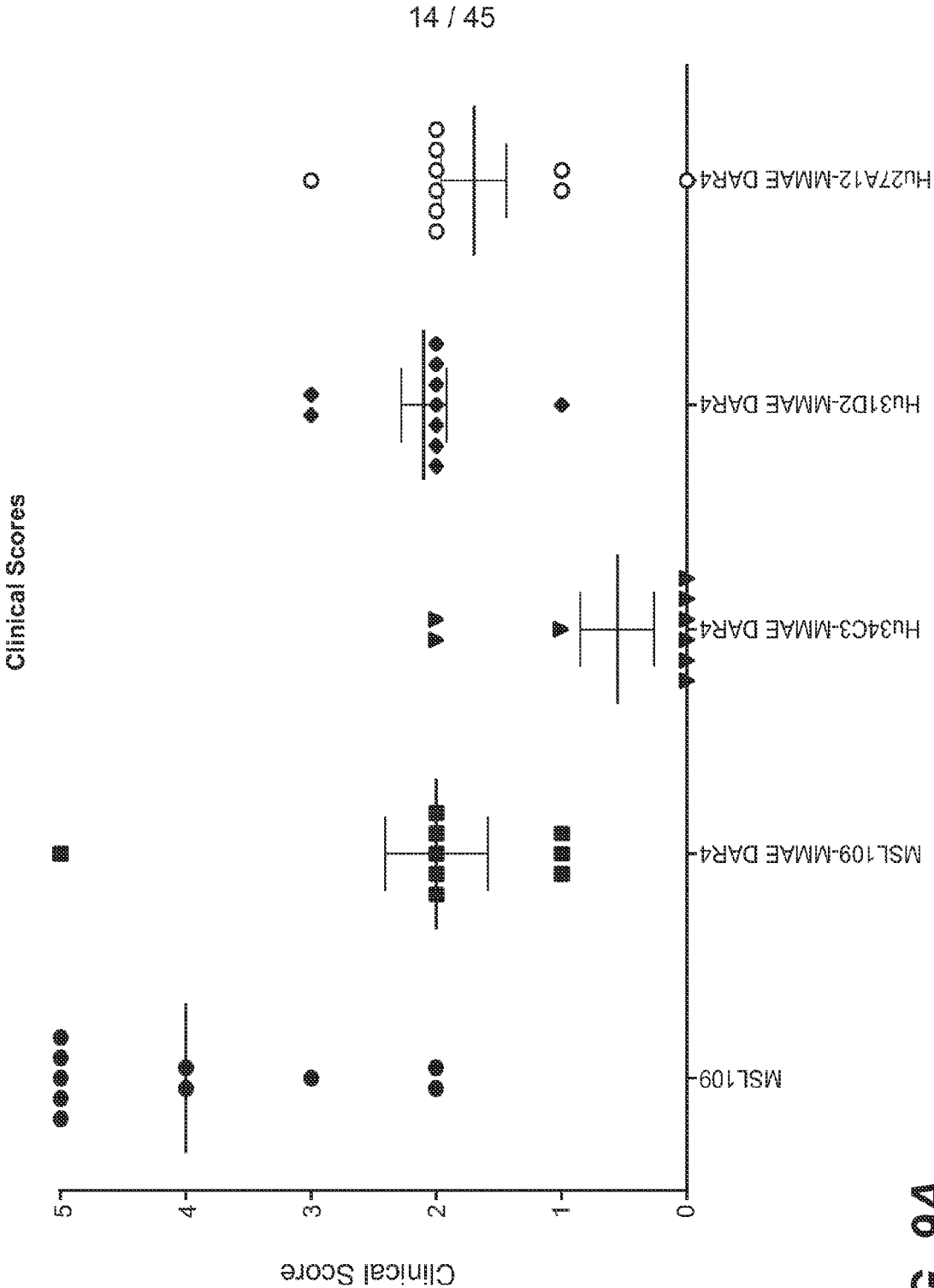


FIG. 9A

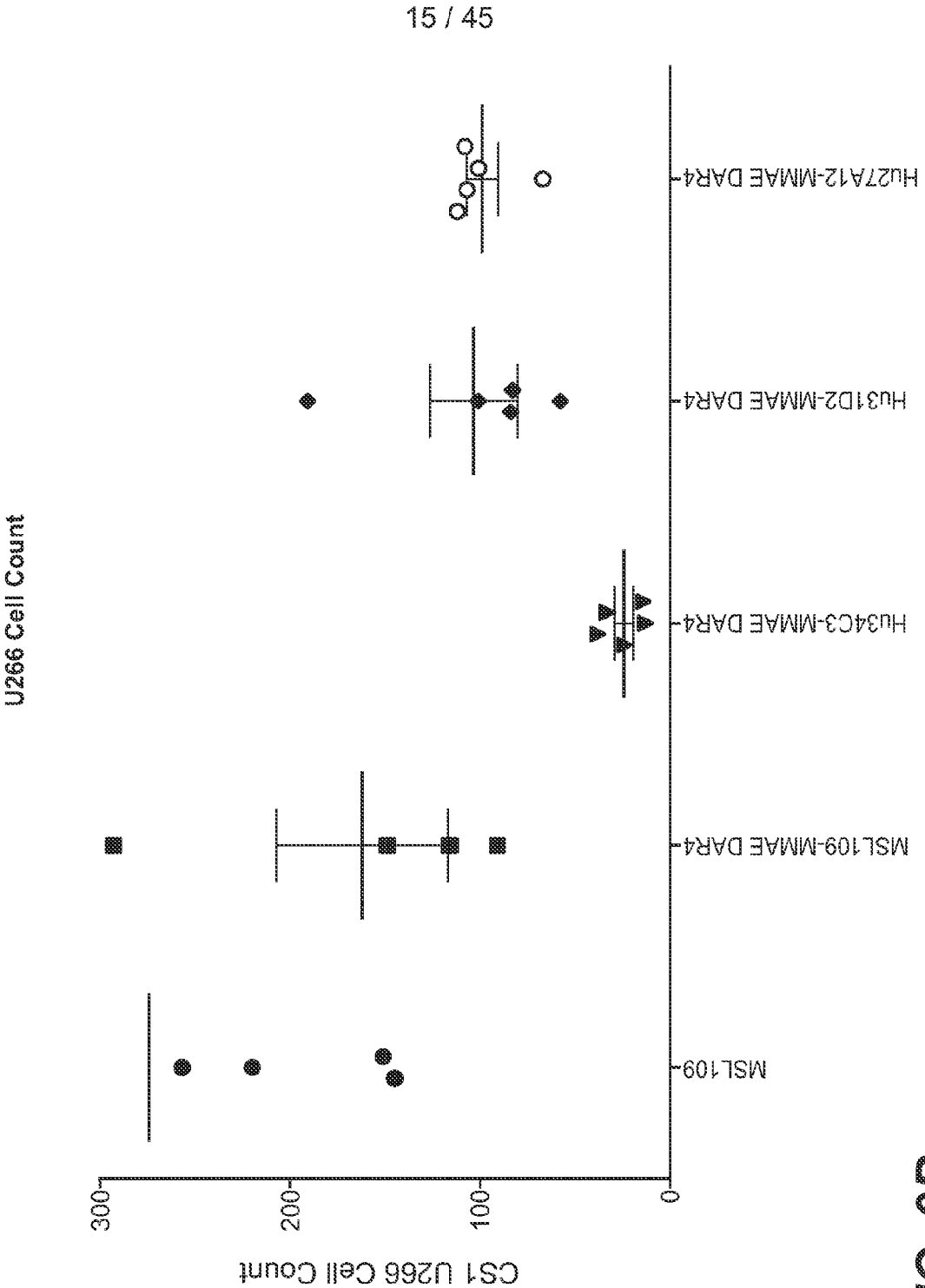
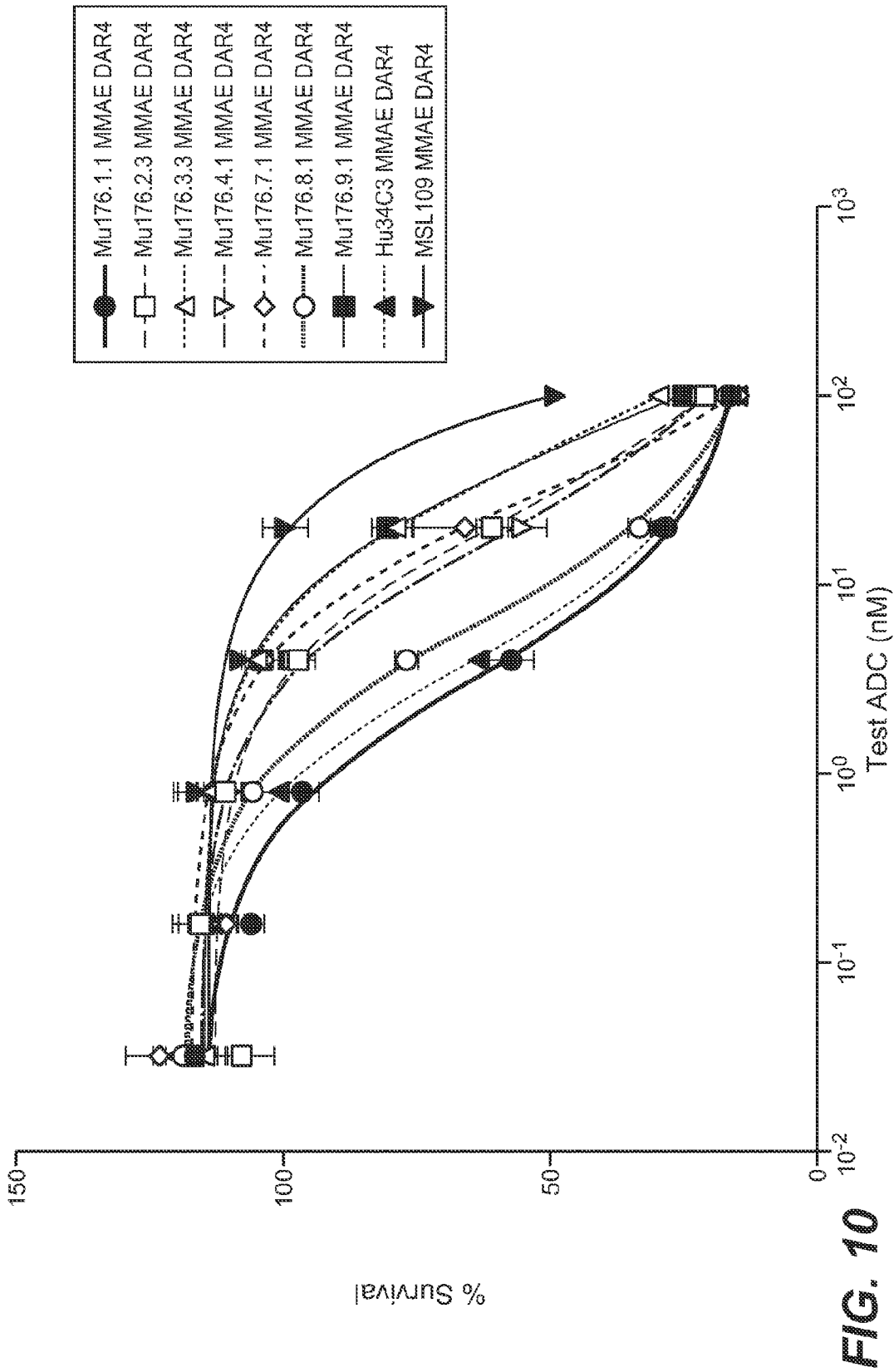


FIG. 9B



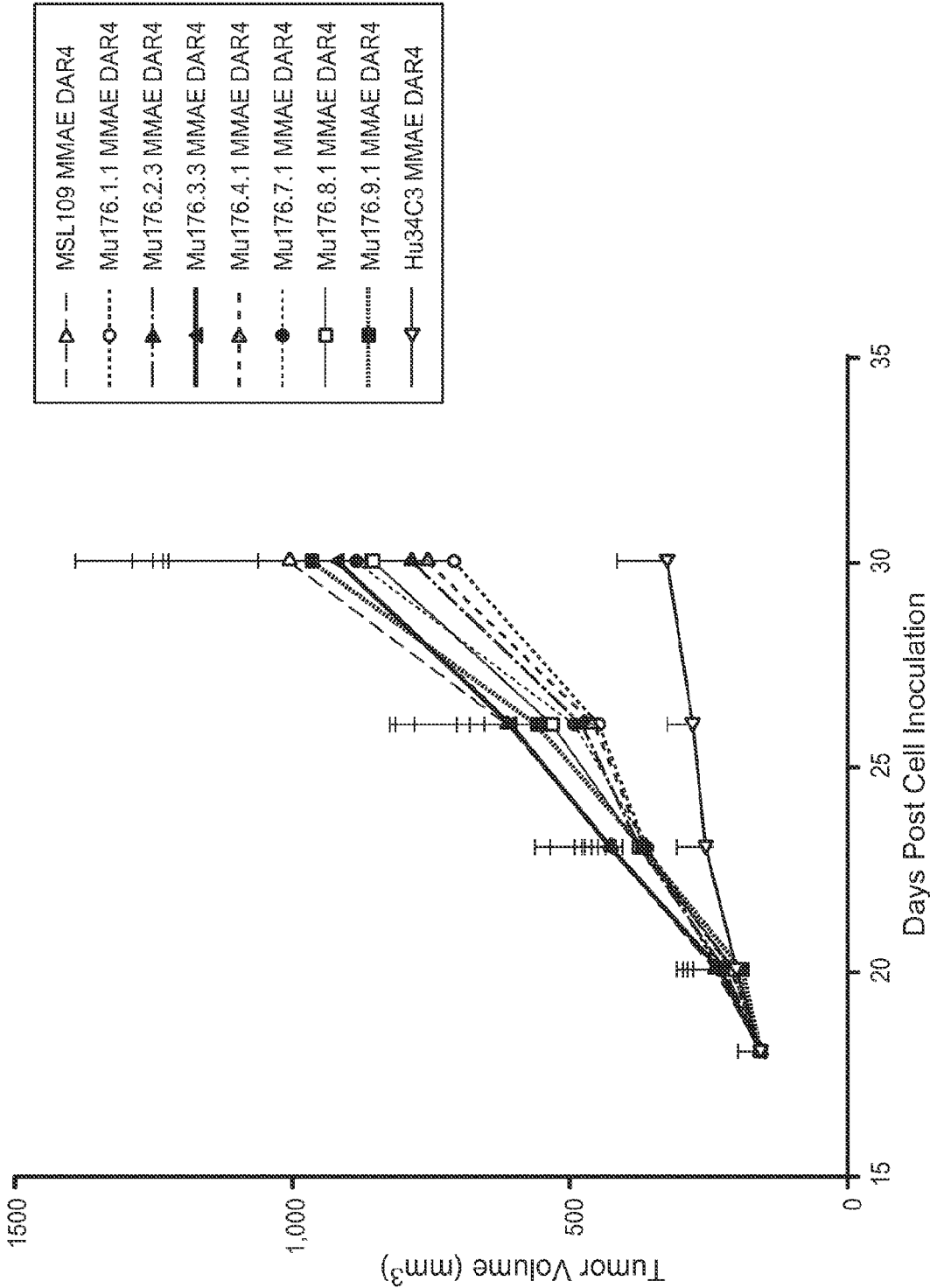


FIG. 11

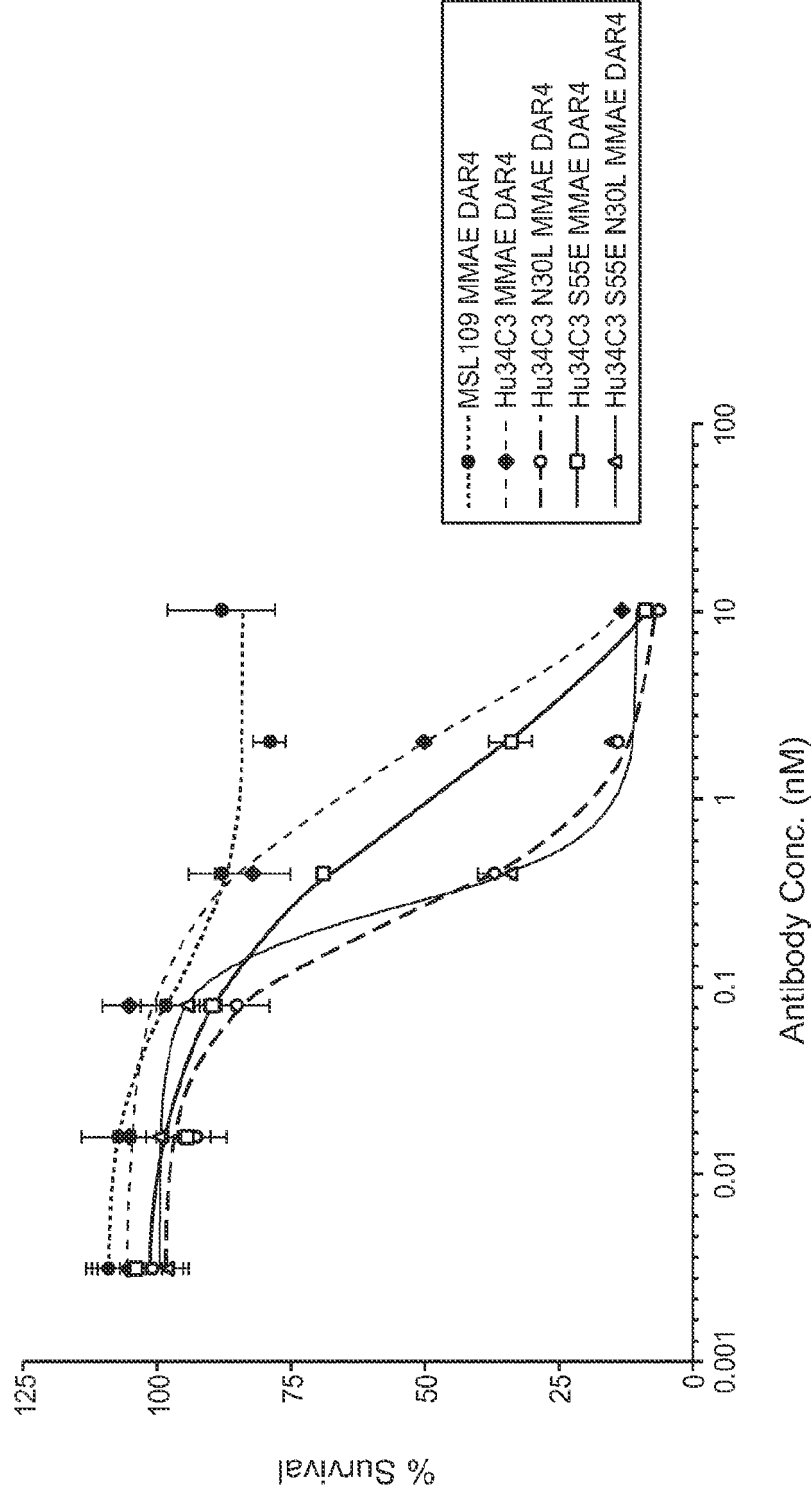


FIG. 12

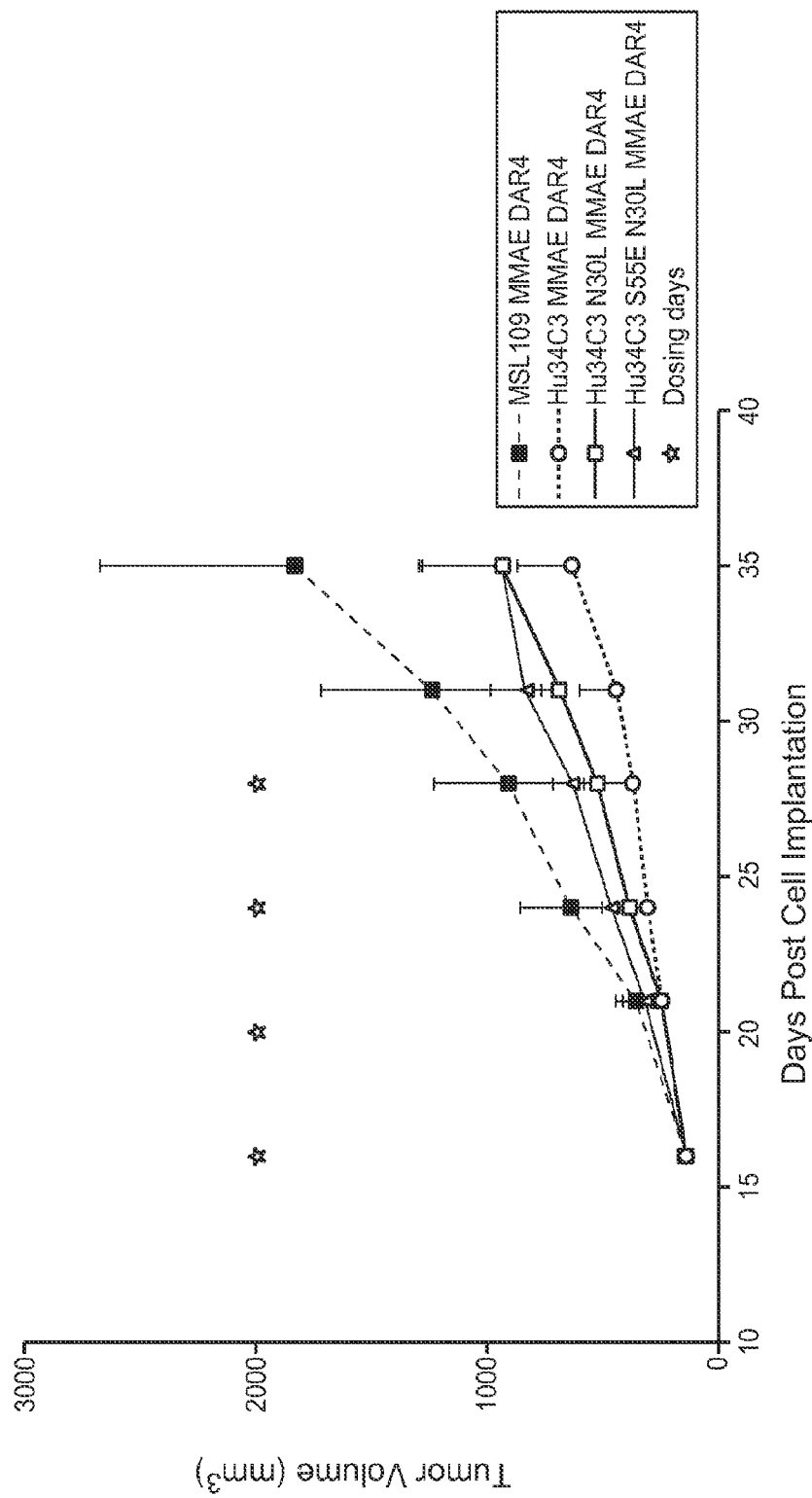


FIG. 13

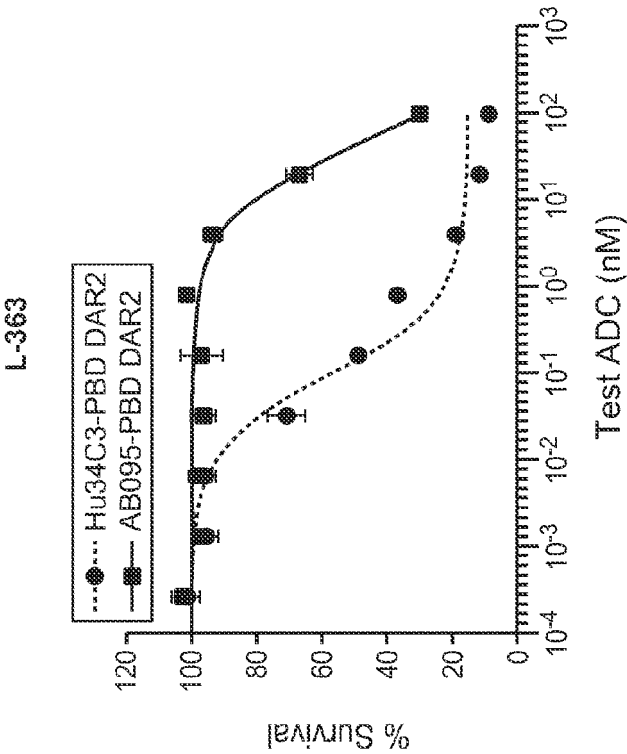


FIG. 14B

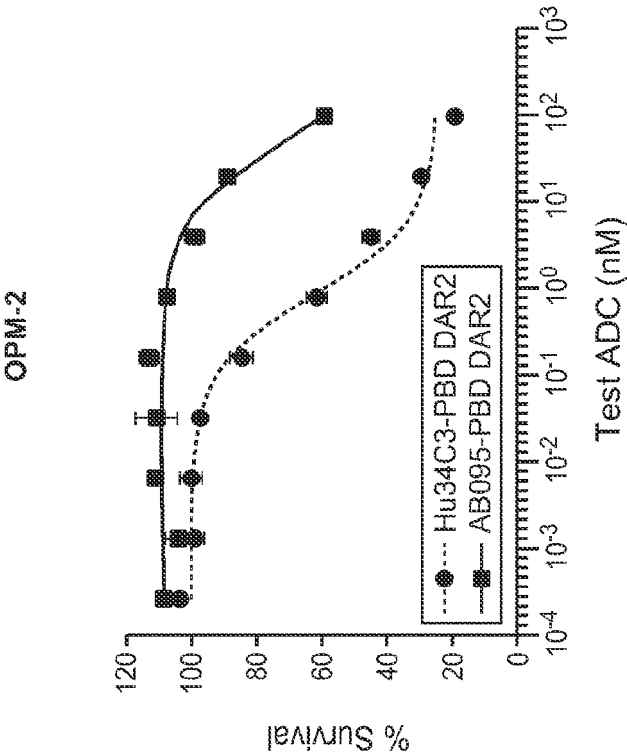


FIG. 14A

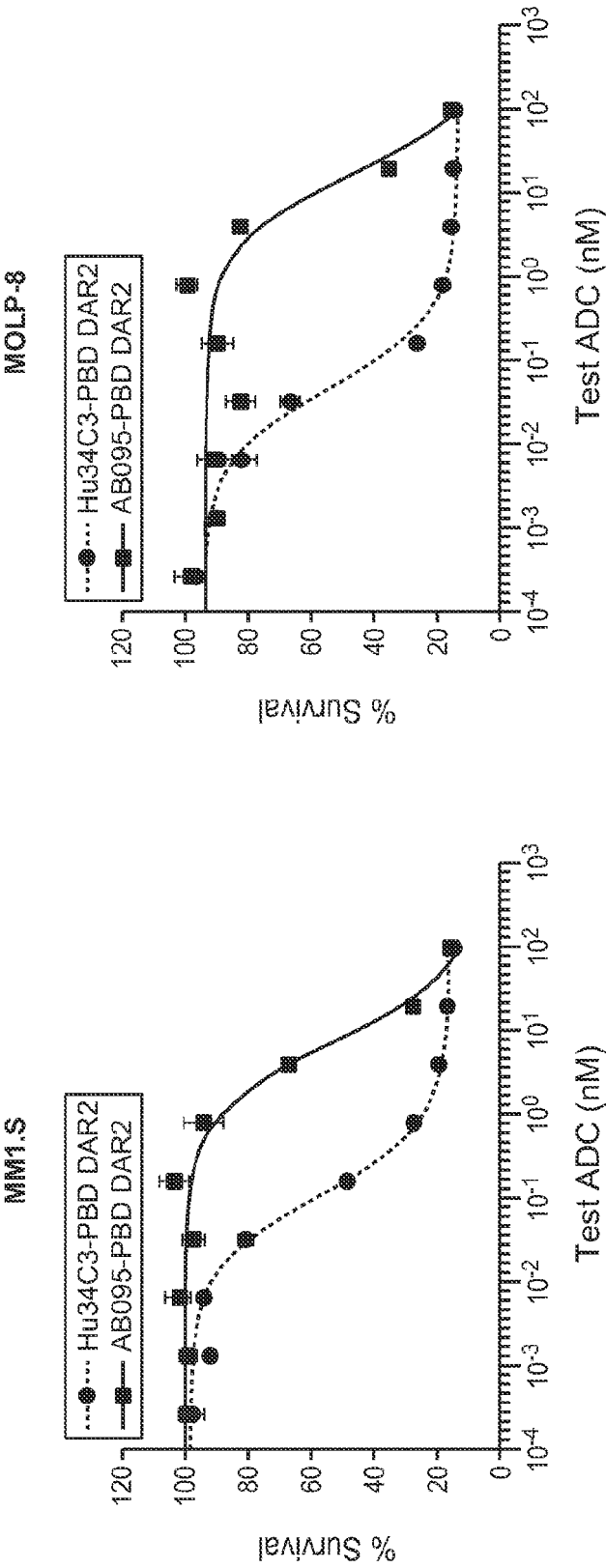


FIG. 14D

FIG. 14C

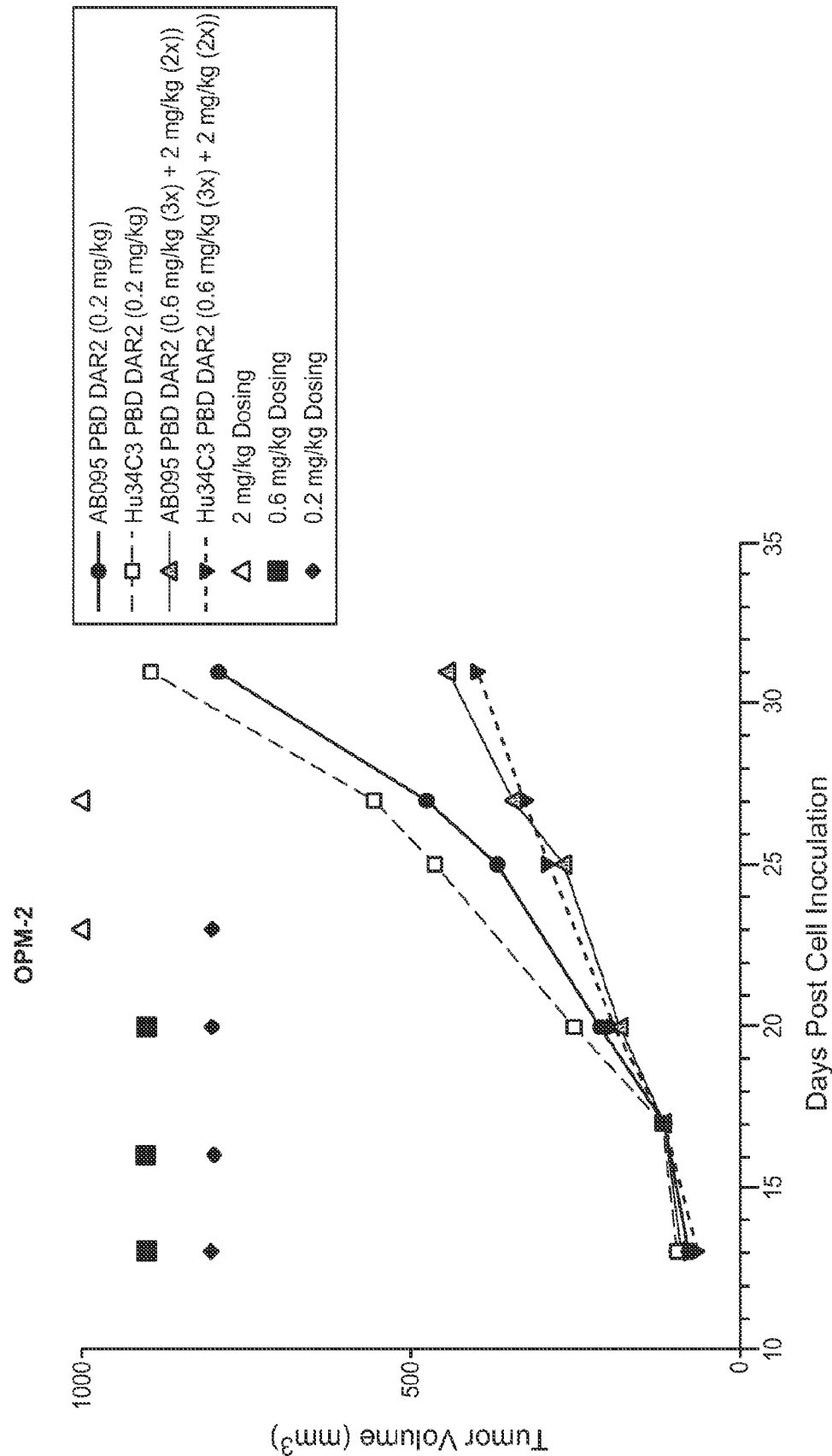


FIG. 15

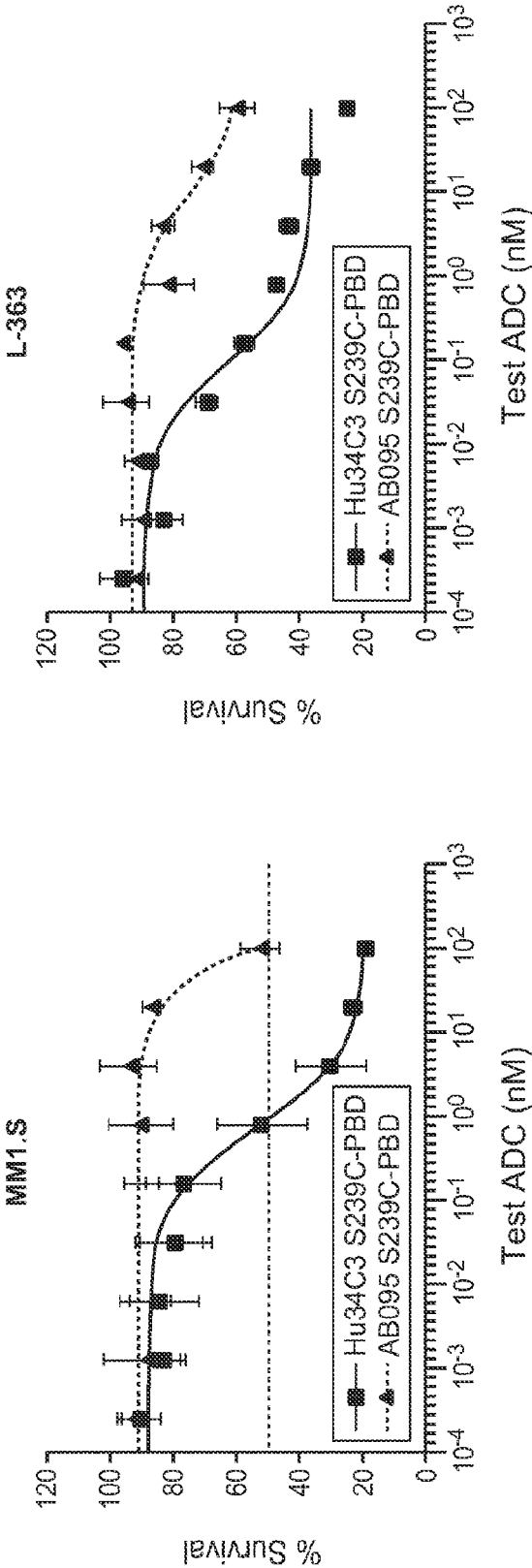


FIG. 16A

FIG. 16B

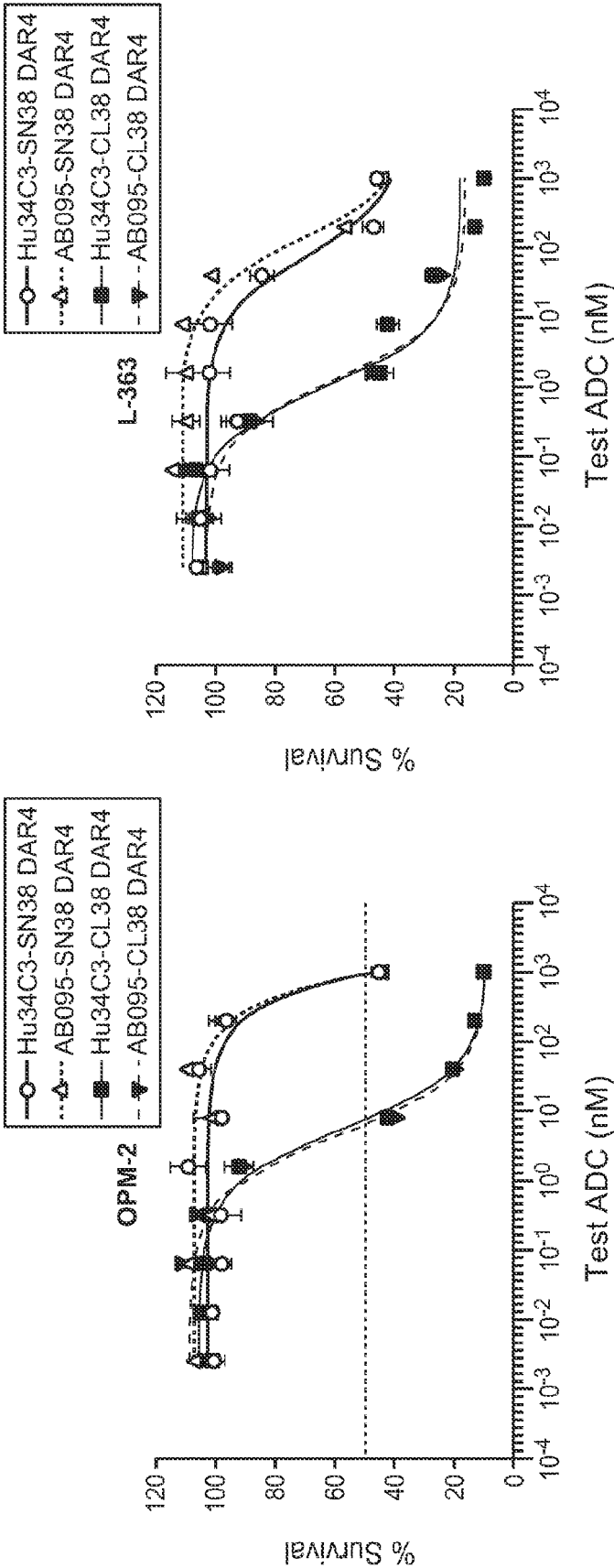


FIG. 17A

FIG. 17B

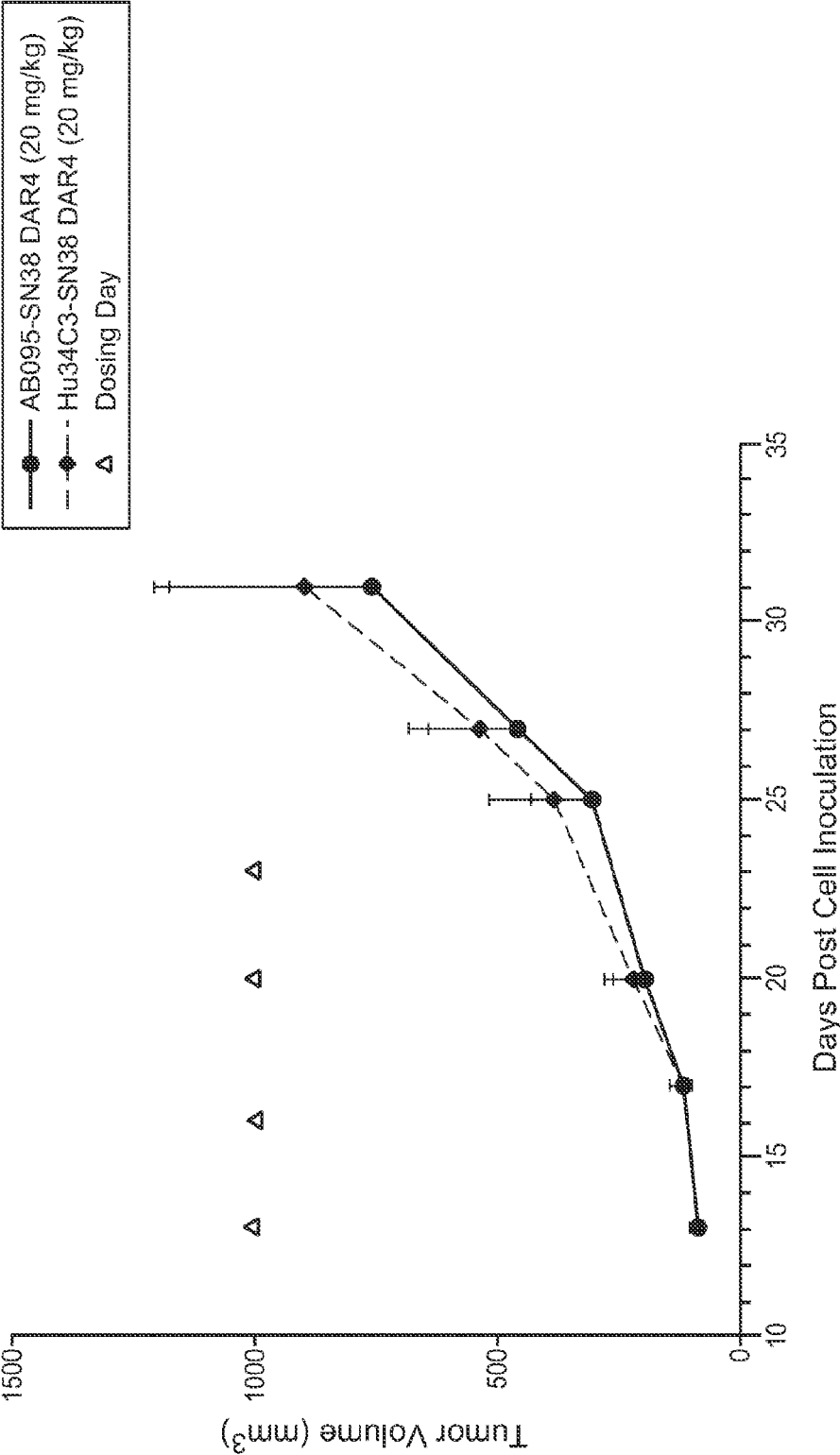


FIG. 18

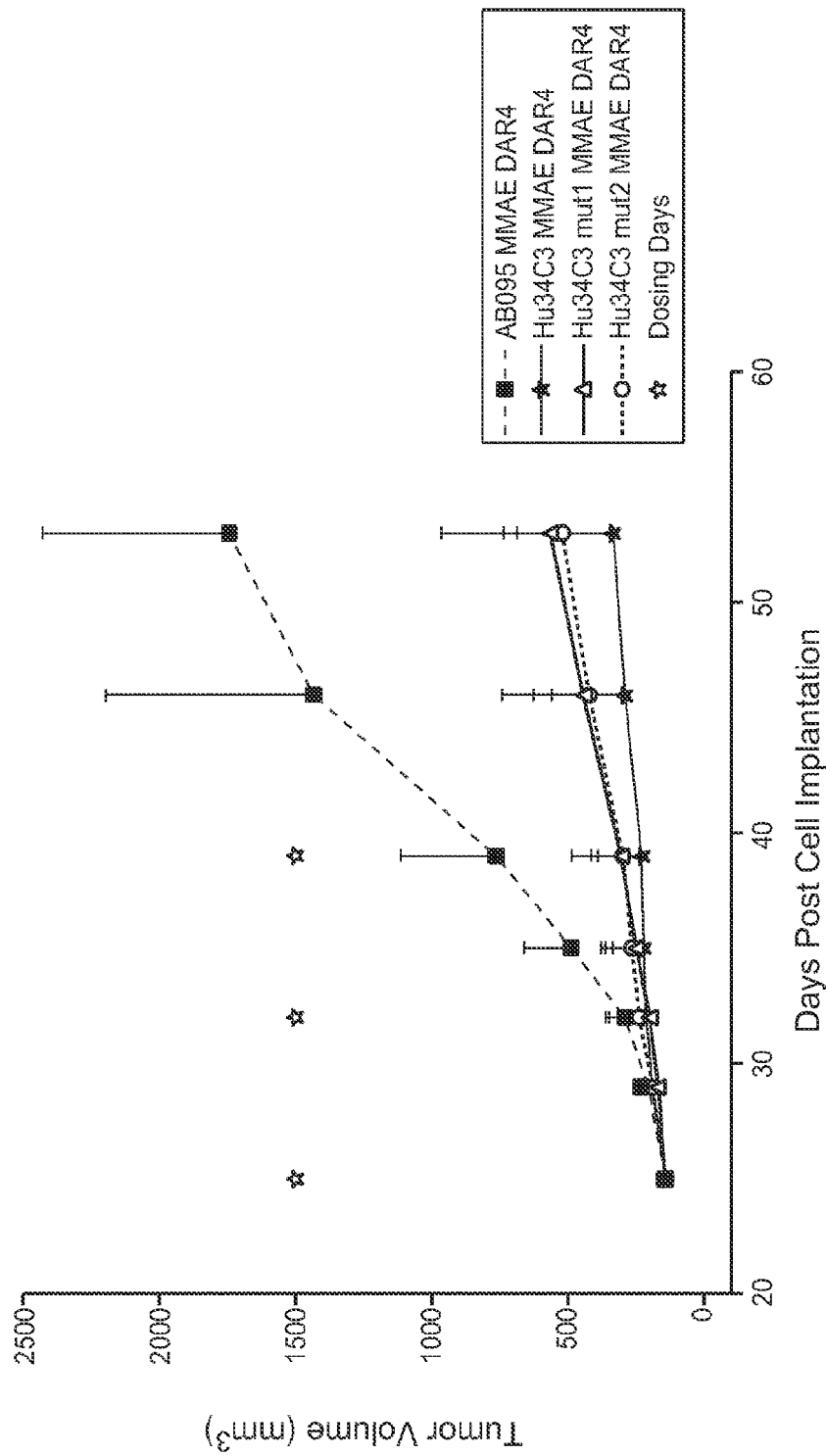


FIG. 19A

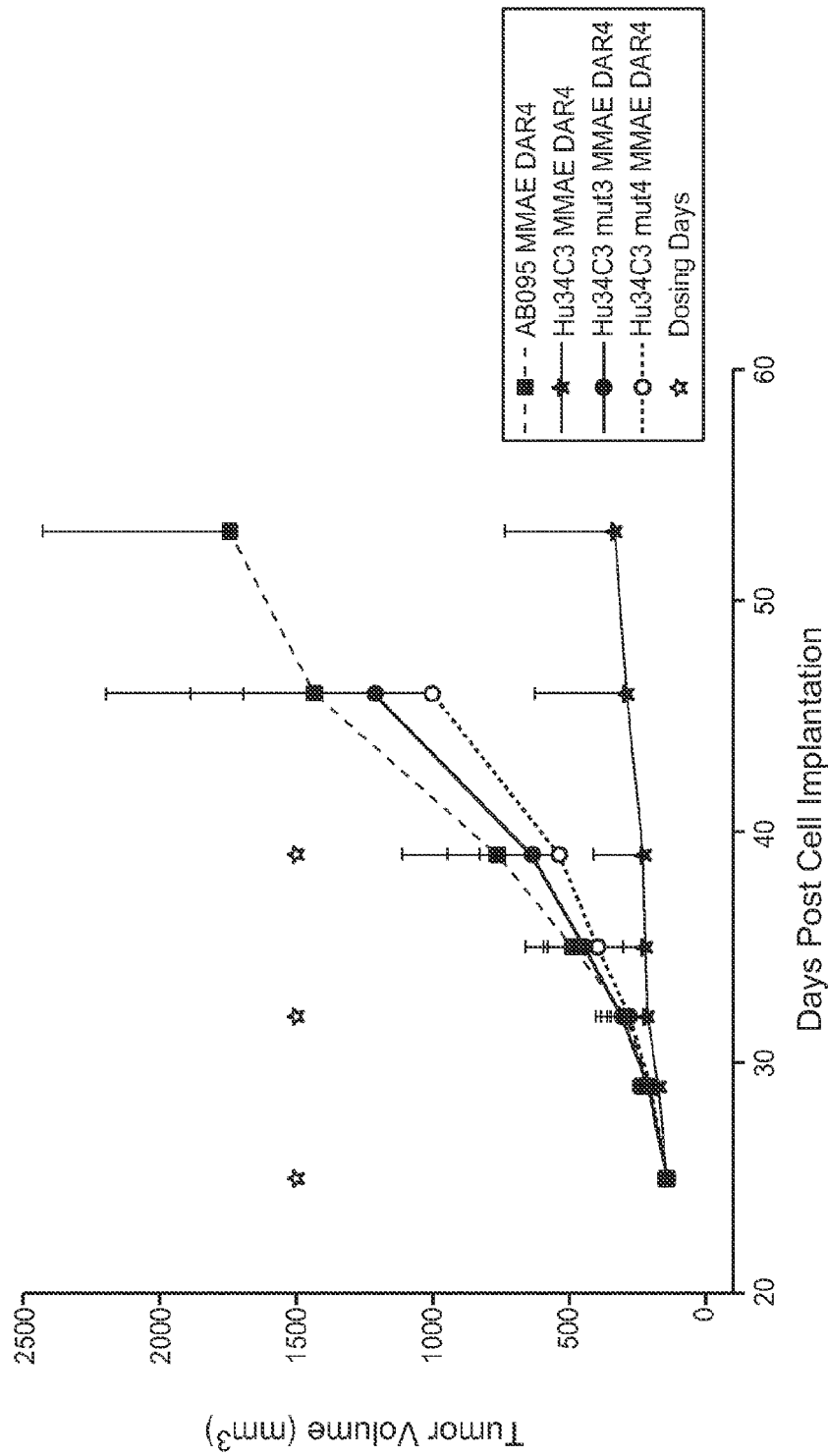


FIG. 19B

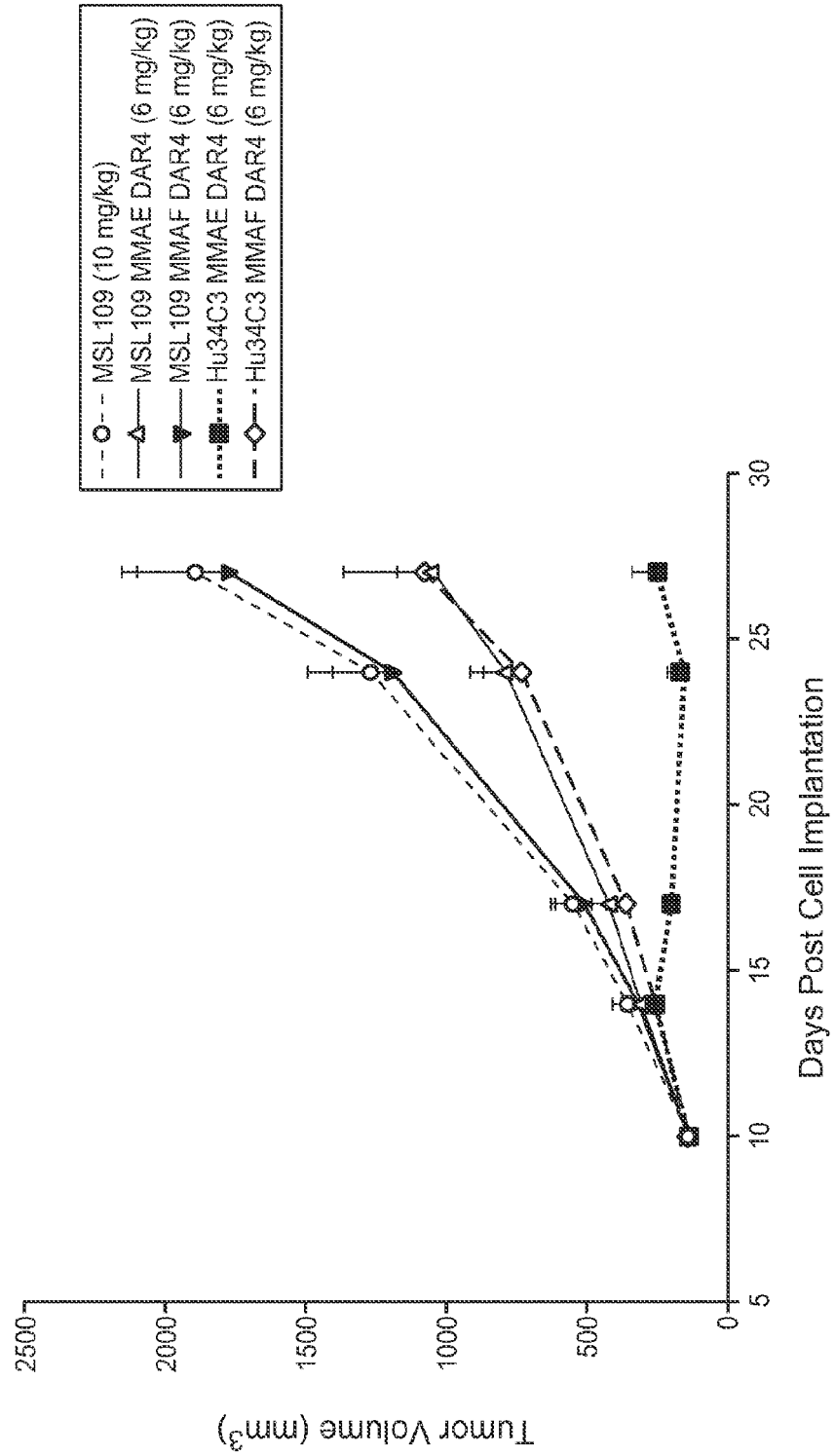


FIG. 20

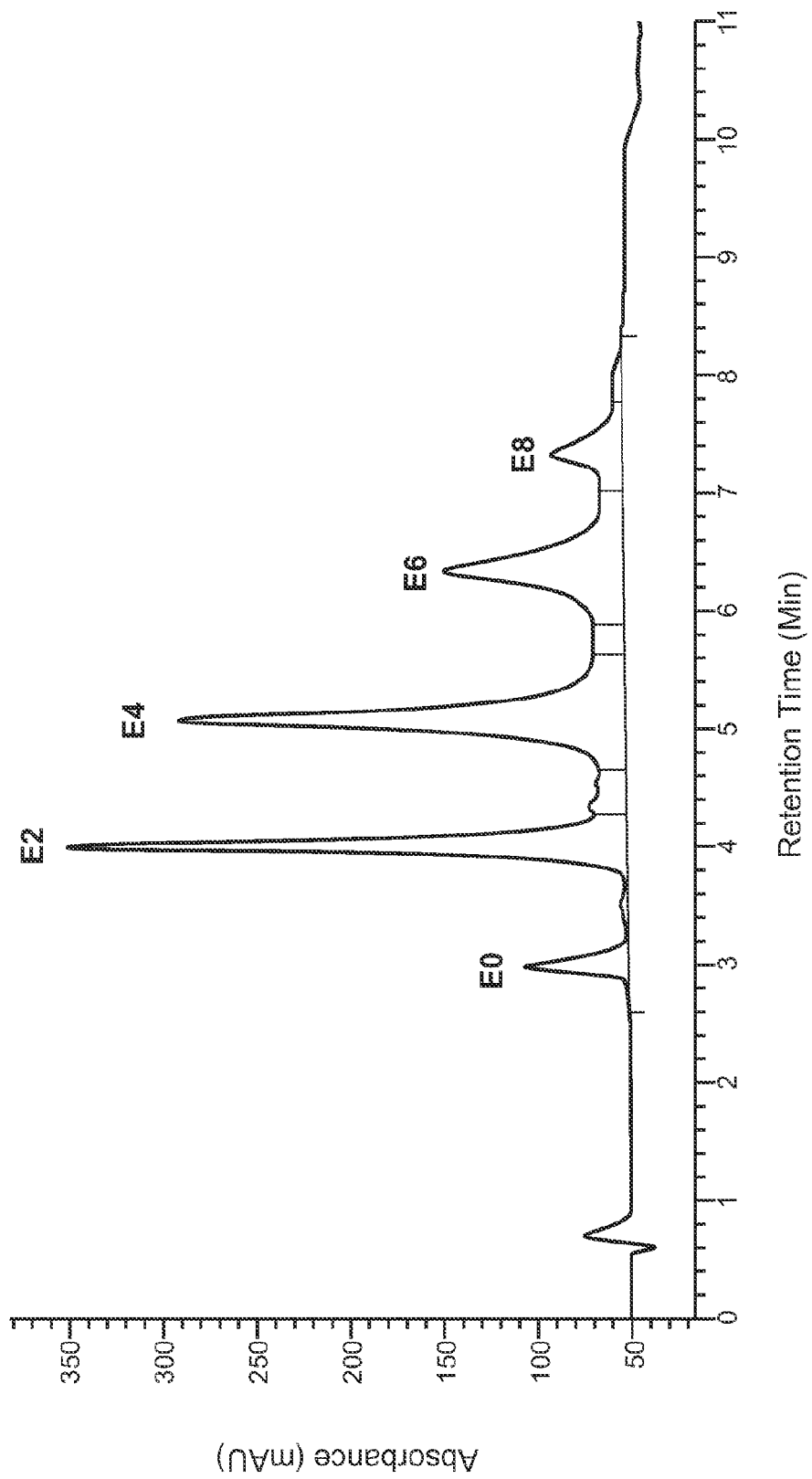


FIG. 21

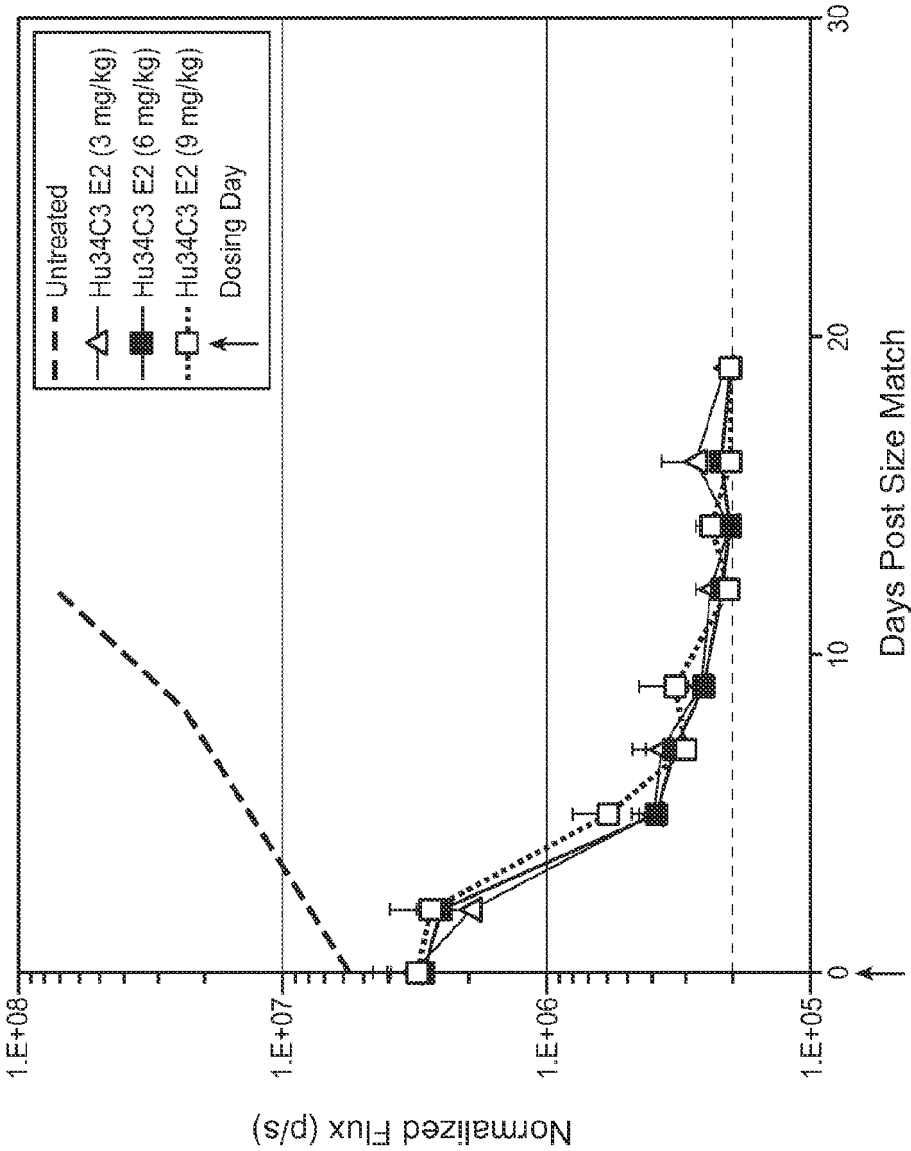


FIG. 22A

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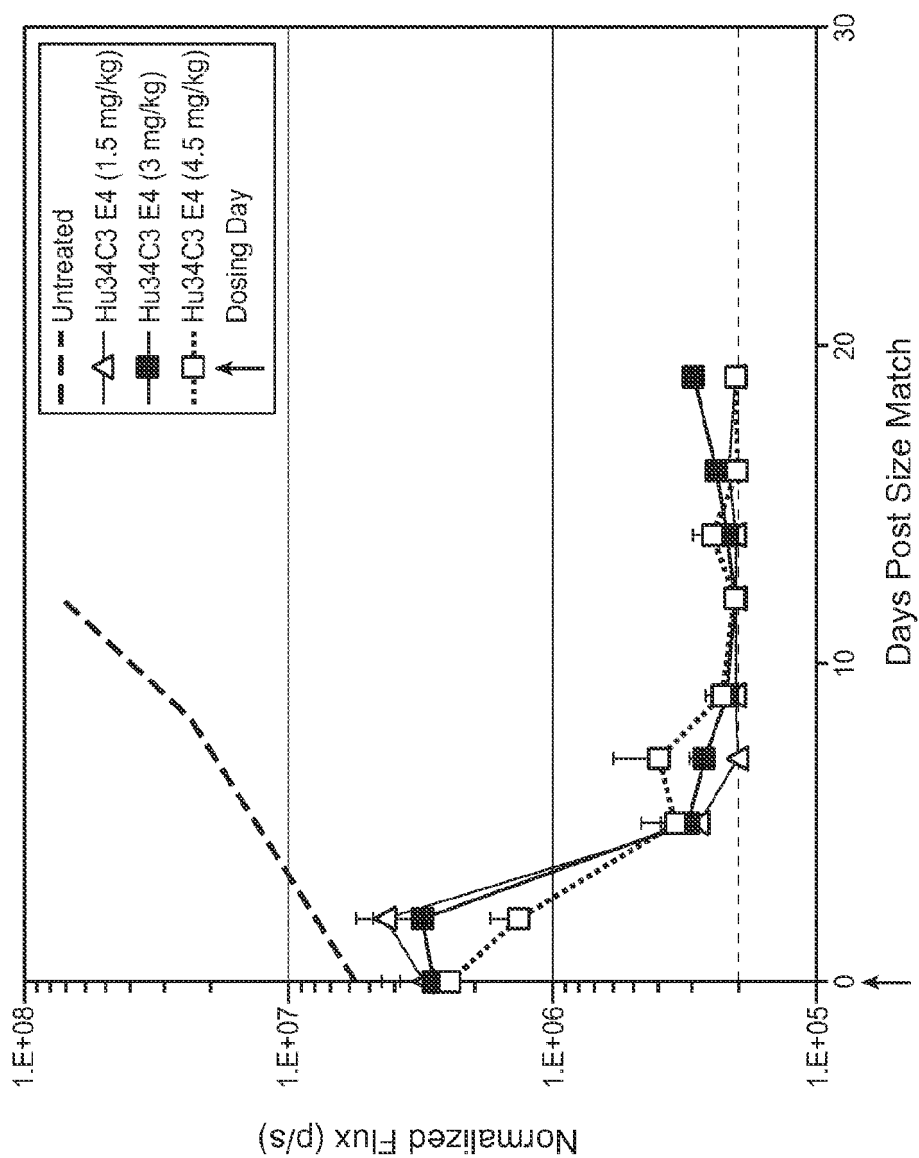


FIG. 22B

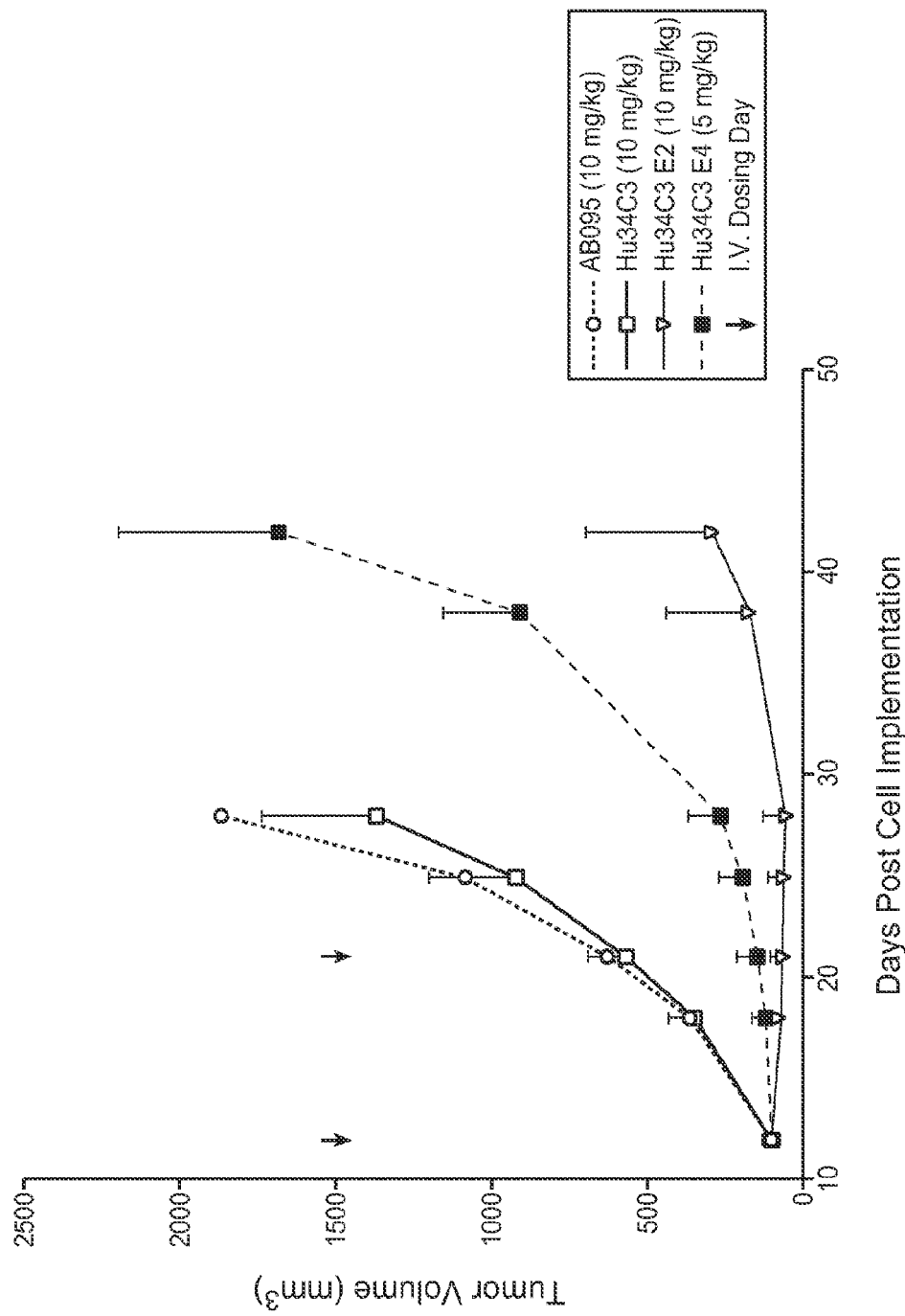


FIG. 23A

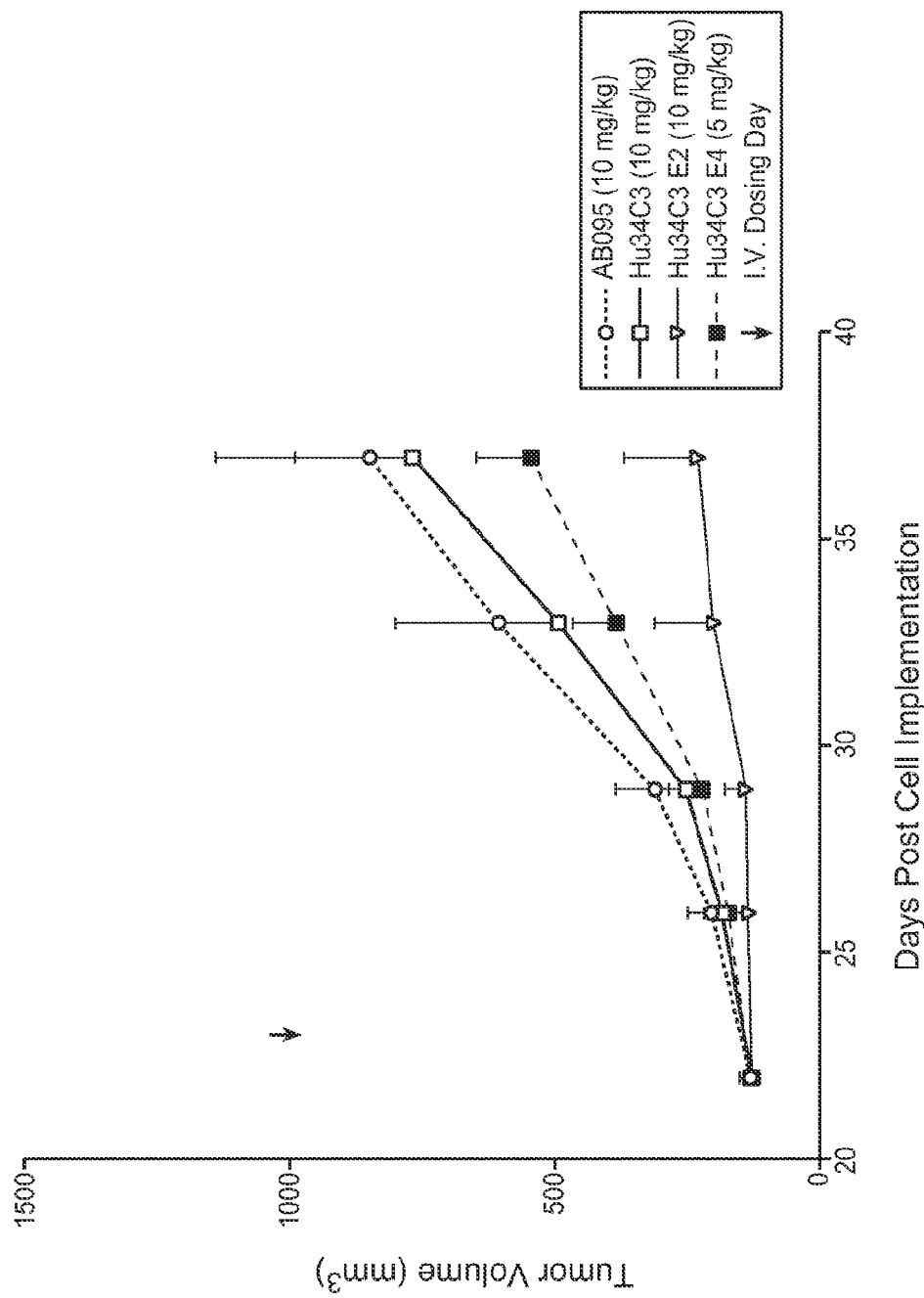


FIG. 23B

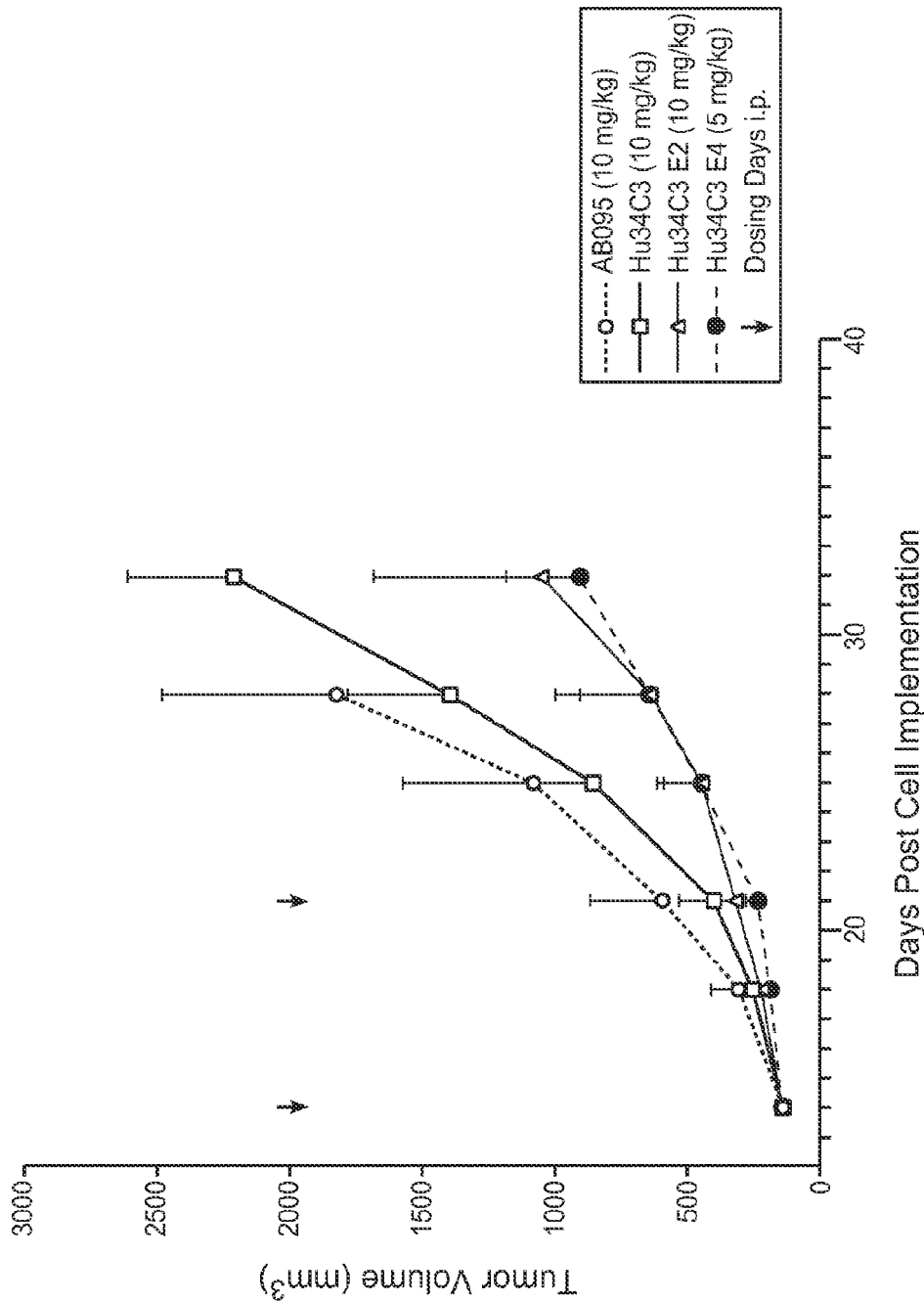


FIG. 23C

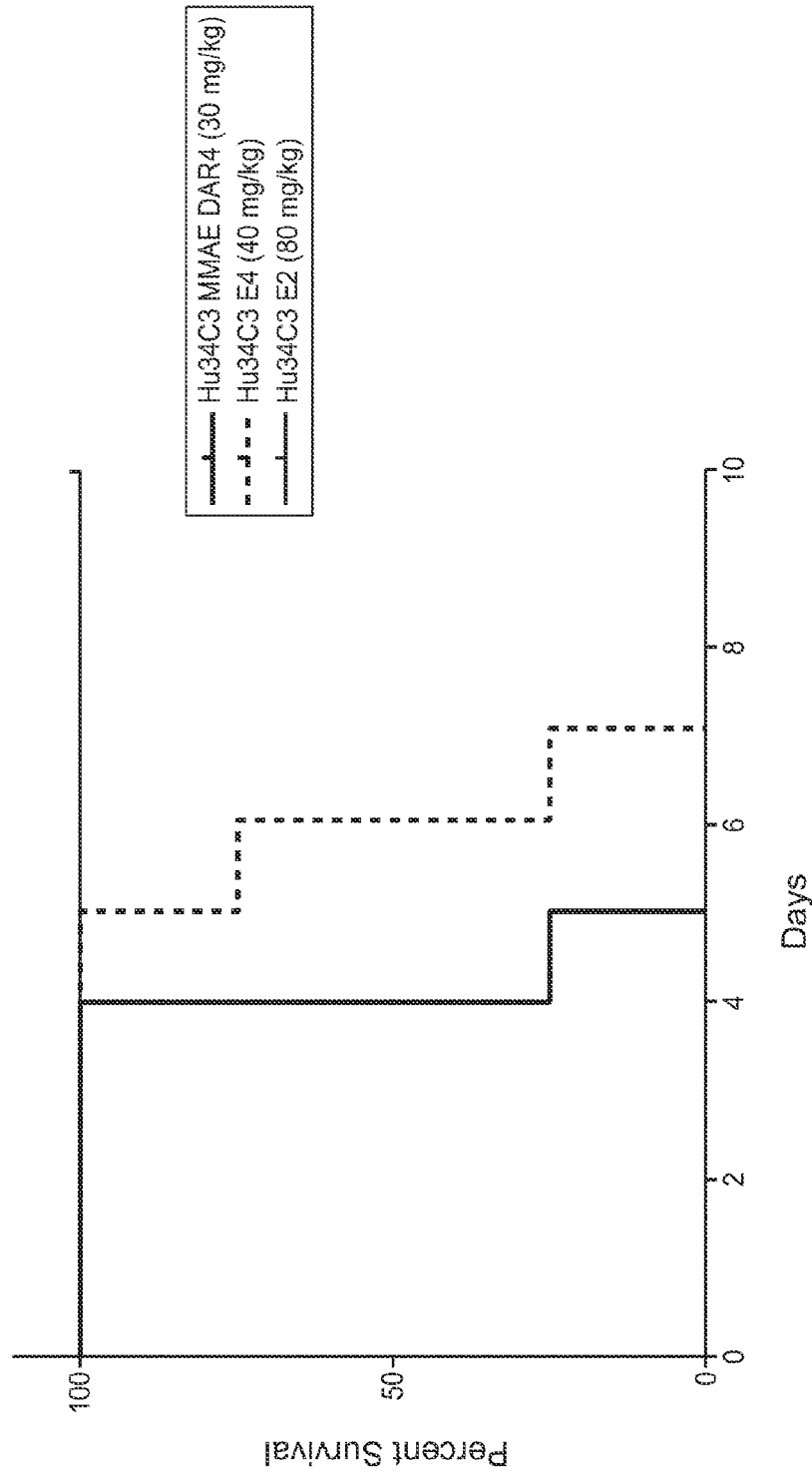
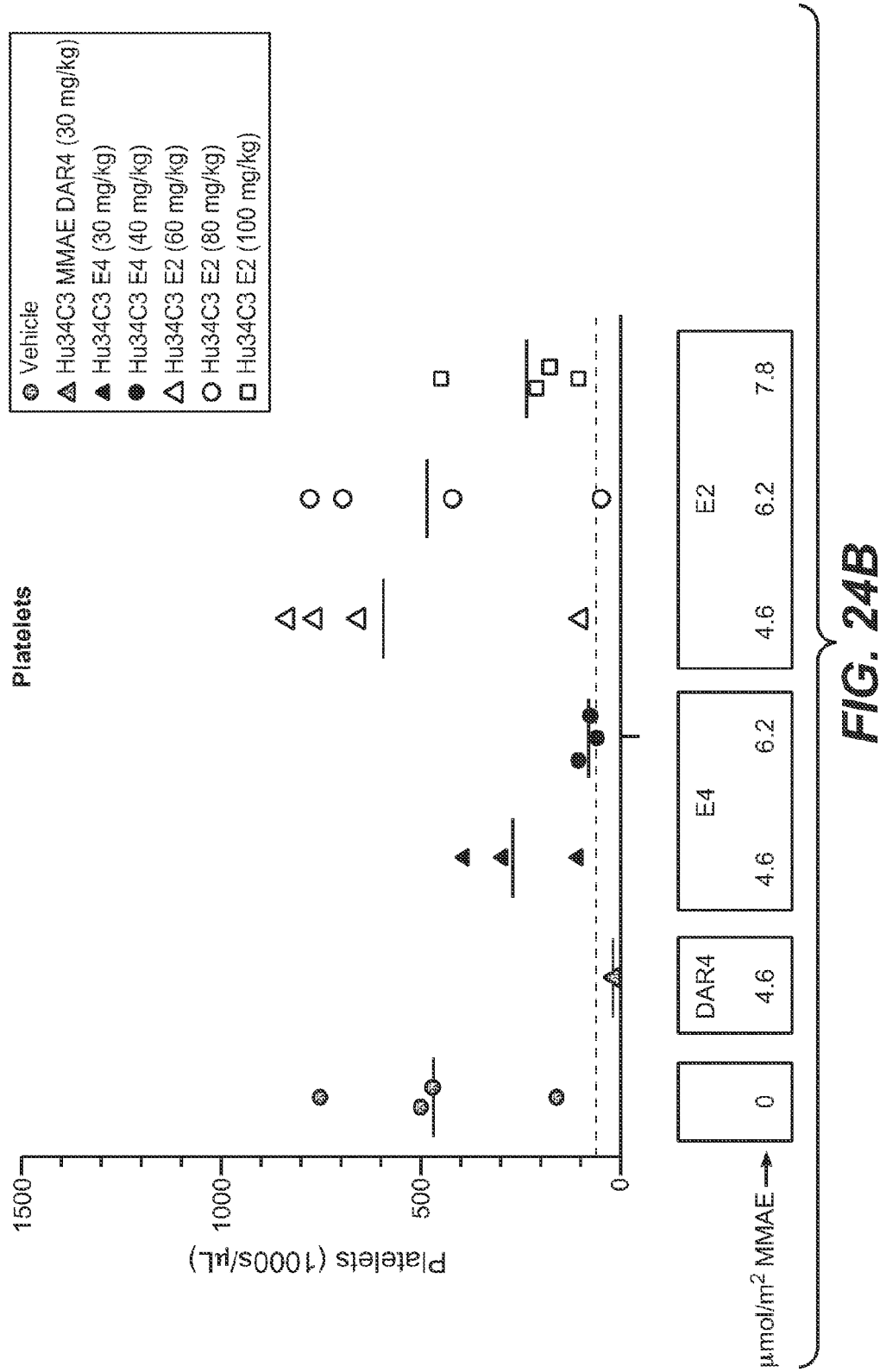
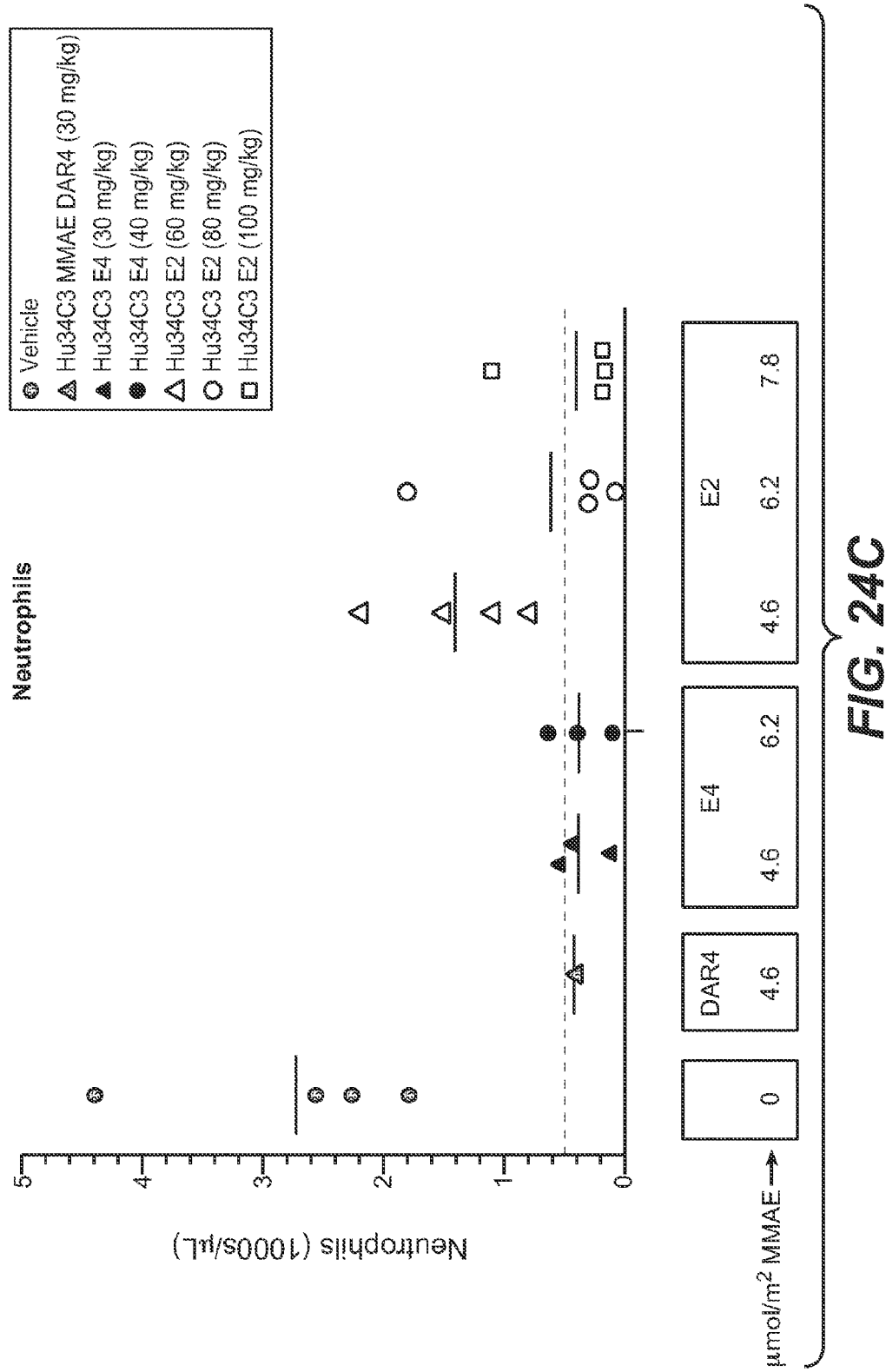


FIG. 24A





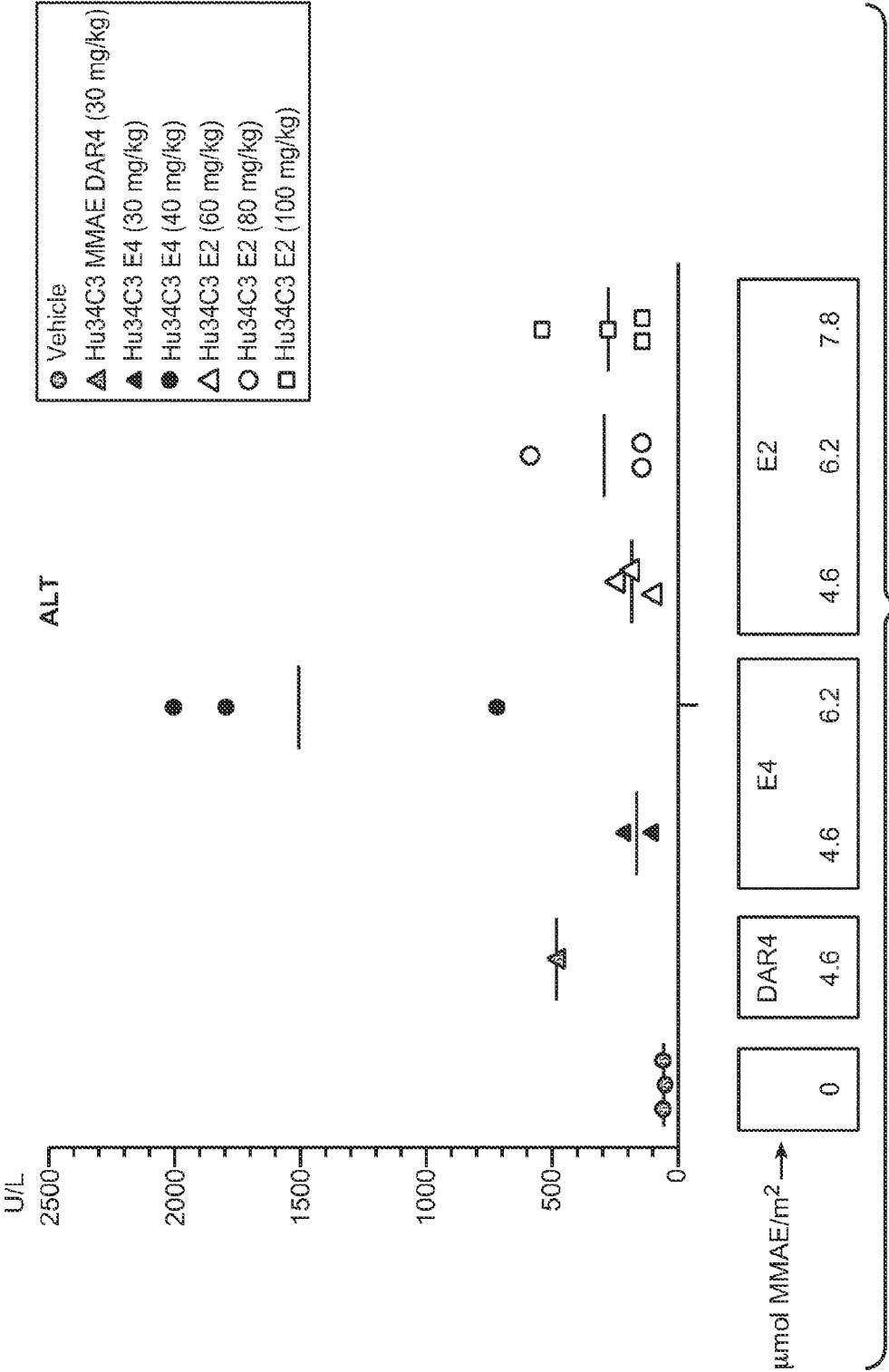


FIG. 24D

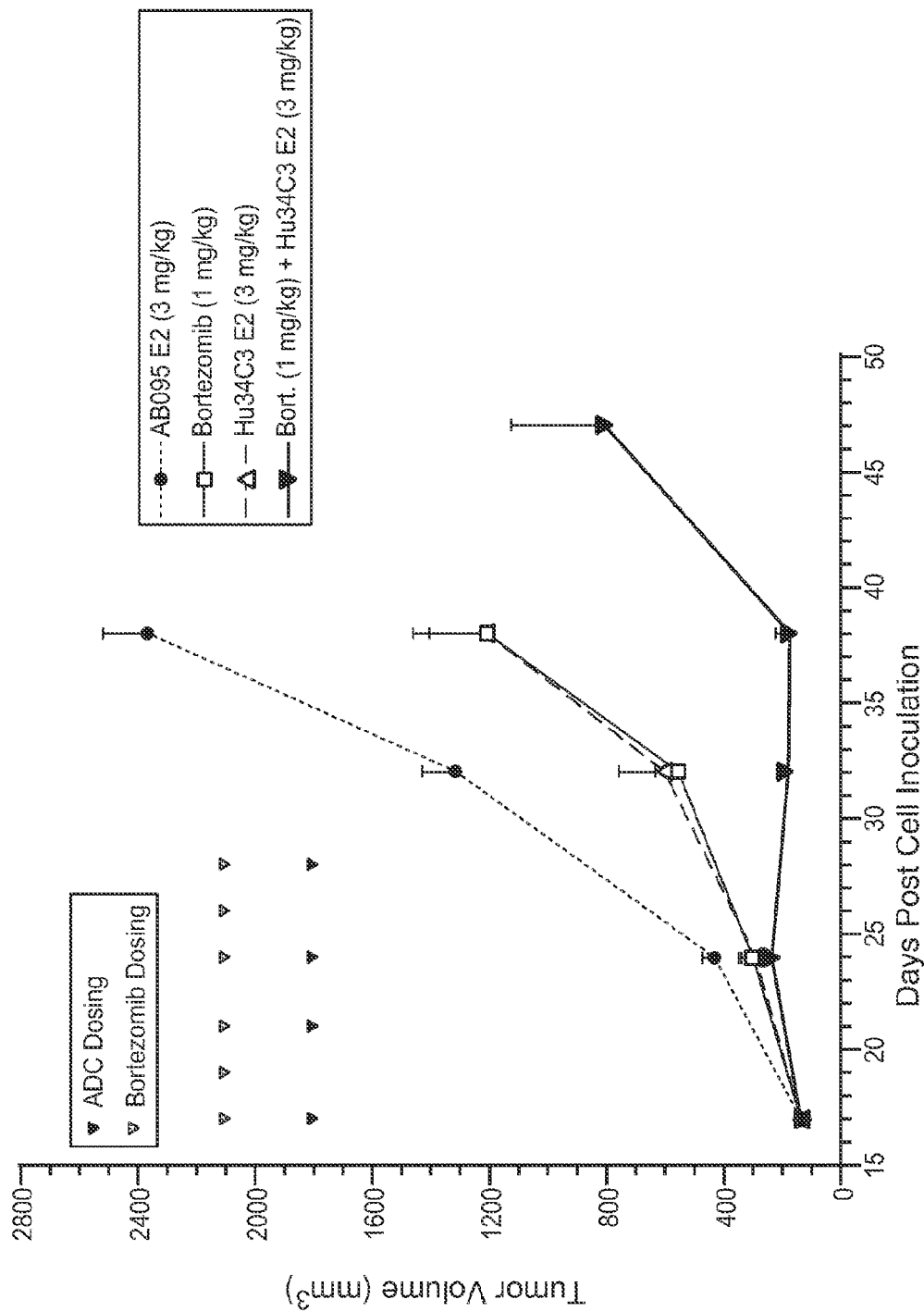


FIG. 25

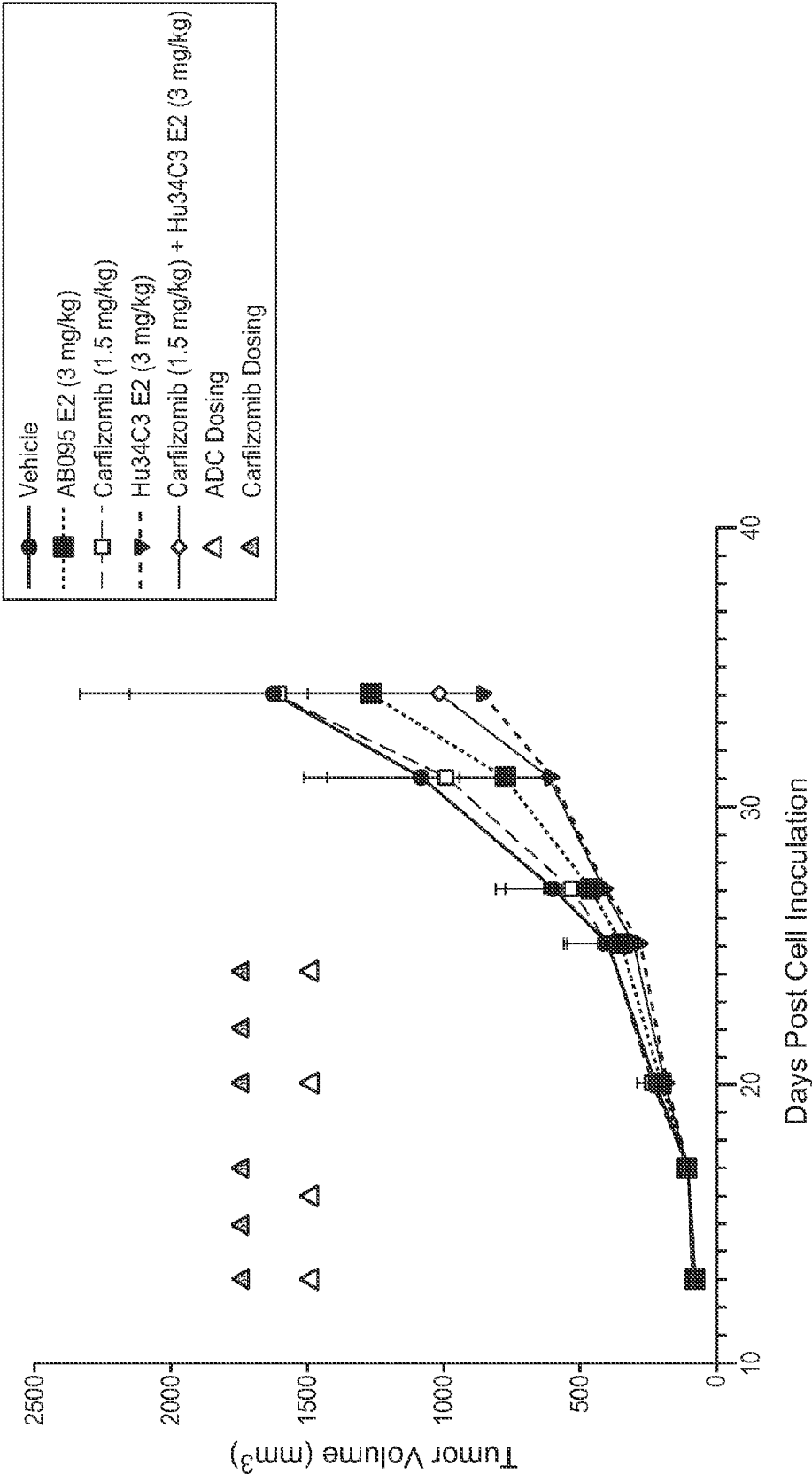


FIG. 26A

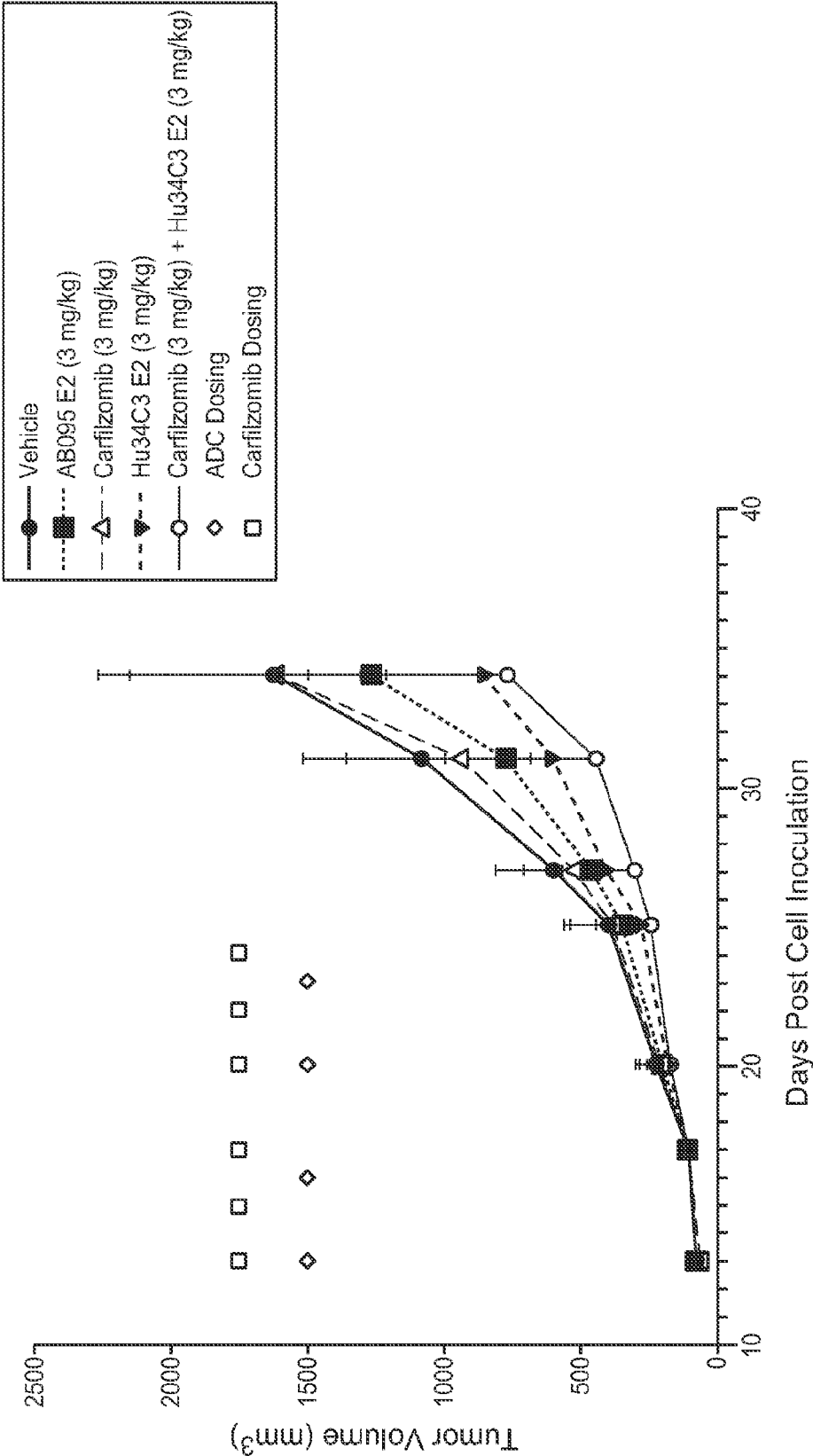


FIG. 26B

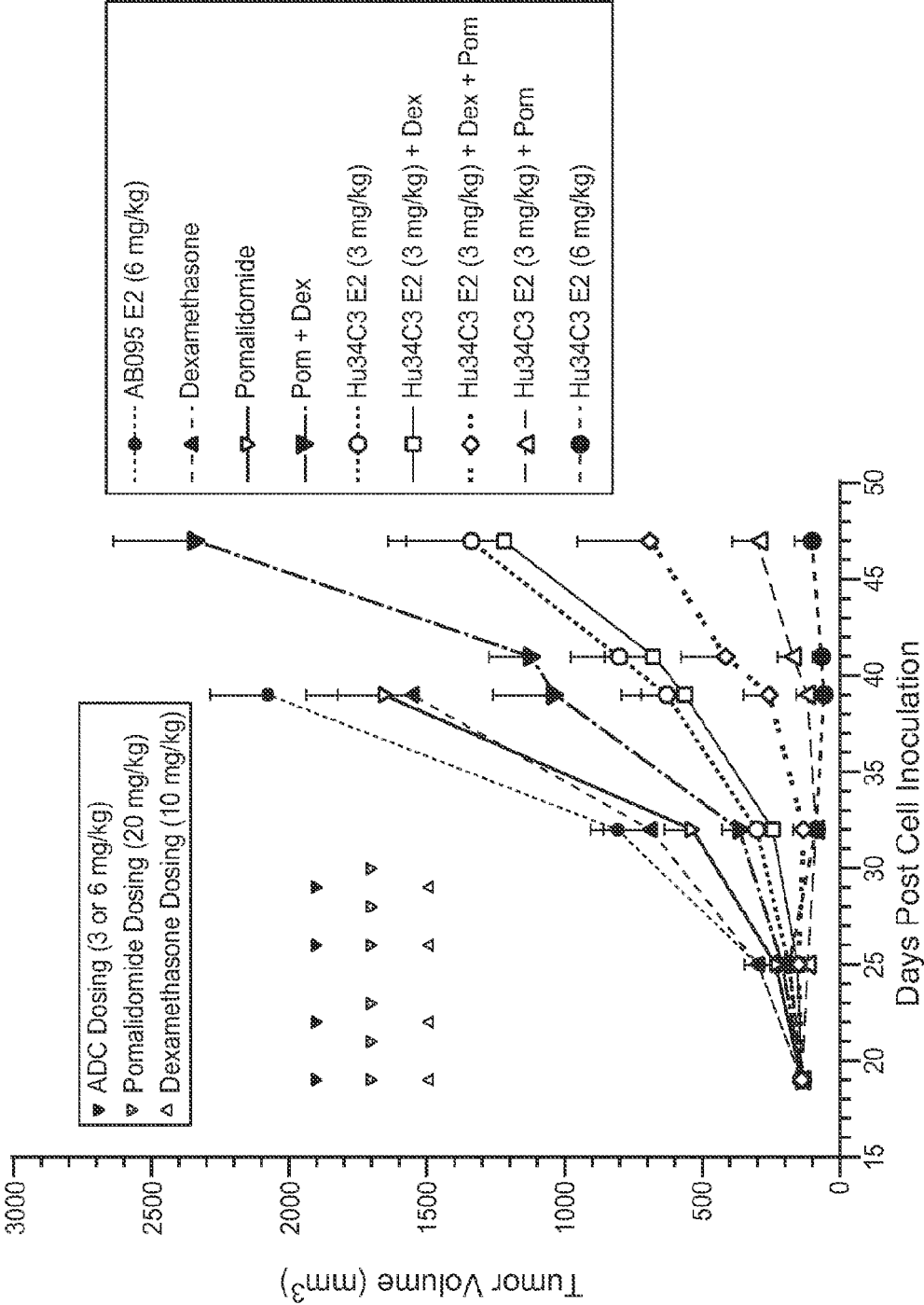


FIG. 27

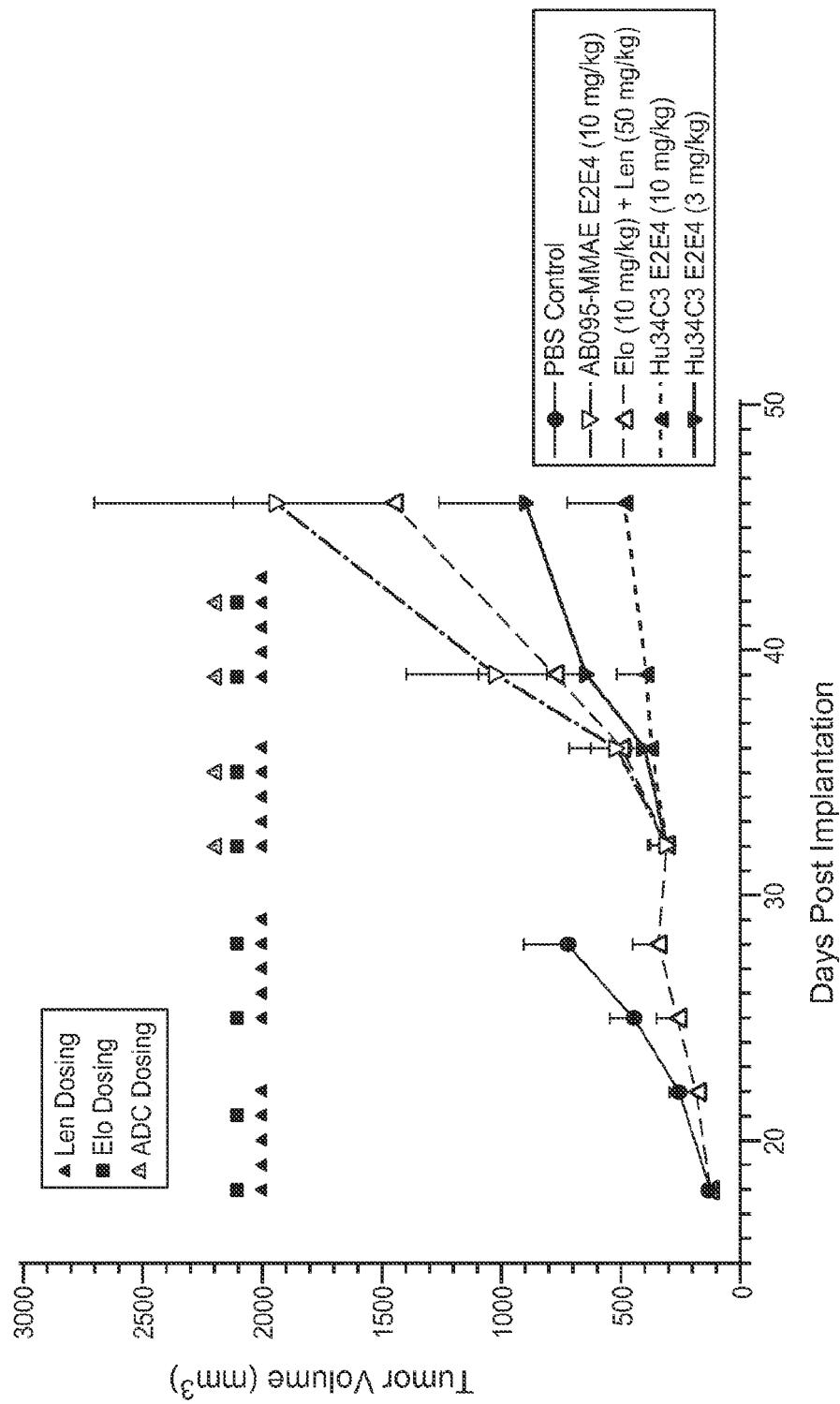


FIG. 28

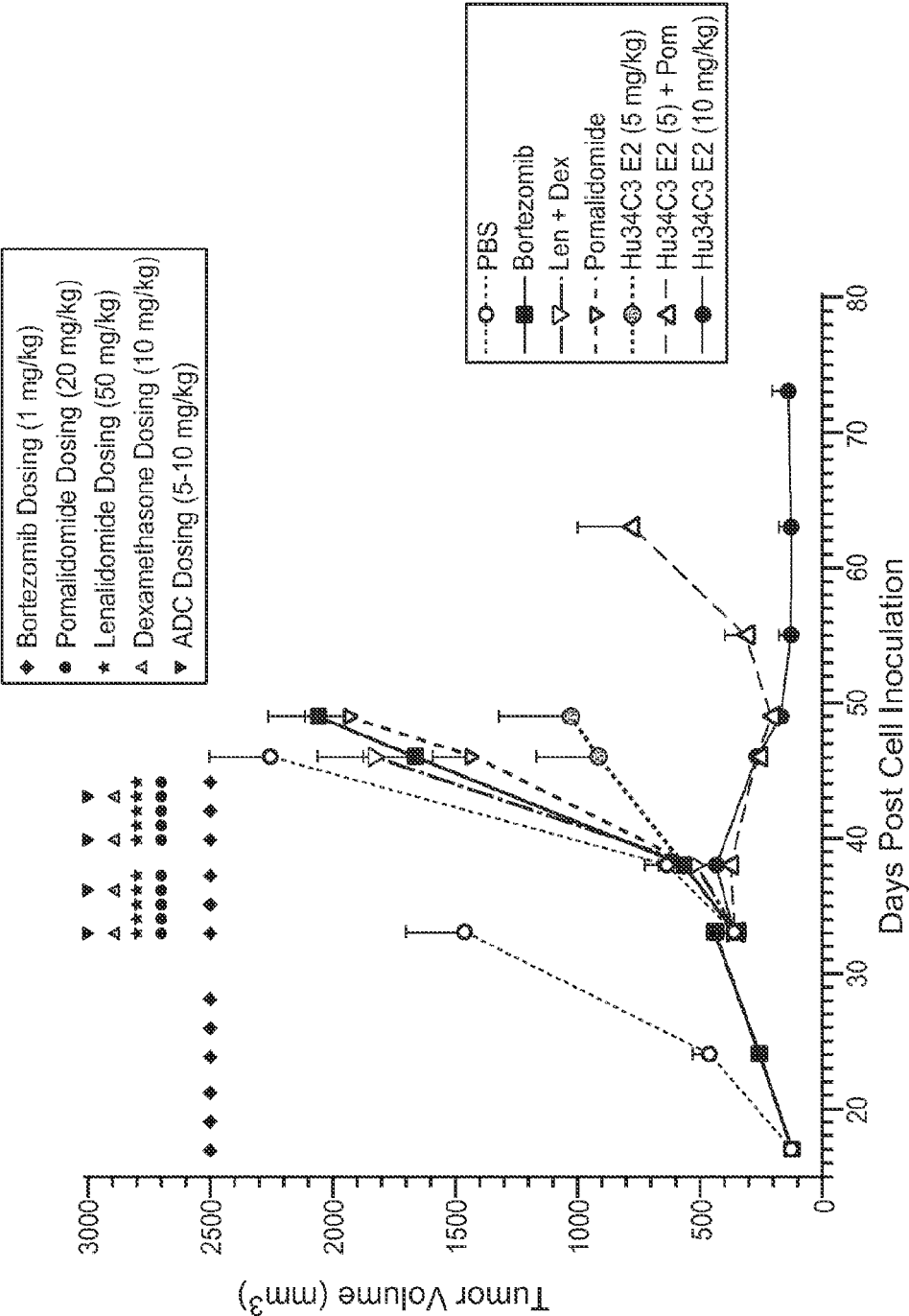


FIG. 29

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PDL241 V_H

QVQLVQSGAEVKKPGASVKVSCKASGYAFSSSSWMNWVRQAPGQGLEWIGRIYPGDGDTKYNGKF
KGKATLTADKSTSTAYMELSSLRSEDTAVYYCARSTMIATGAMDYWGQGLTVTVSS

PDL241 V_L

DIQMTQSPSSLSASVGDRVTITCKASQDVSTAVAWYQQKPGKAPKLLIYSASVRYTGVDPDRFTG
 SGSGTDFTLTISSLQPEDFATYYCQOHYSTPPYTFGGGTKVEIKR

Elo V_H (SEQ ID NO:41 of US Patent No. 7,709,610)

EVQLVESGGGLVQPGGSLRLSCAASGFDFSRYWMSWVRQAPGKGLEWIGEINPDSSTINYAPSL
KDKFTIISRDNAKNSLYLQMNSLRAEDTAVYYCARPDGNYWYFDVWGQGLTVTVSS

Elo V_L (SEQ ID NO:44 of US Patent No. 7,709,610)

DIQMTQSPSSLSASVGDRVTITCKASQDVGIAVAWYQQKPGKVPKLLIYWASTRHTGVDPDRFSG
 SGSGTDFTLTISSLQPEDVATYYCQOYSSYPYTFGGGTKVEIKR

Luc34 V_H (SEQ ID NO:7 of US Patent No.8,455,646)

QVQLQQSGAELARPGASVKLSCKASGYTFTSYWMQWVKORPGQGLEWIGAIYPGDGDTRYTQKF
KGKATLTADKSSSTAYMQLSSLASEDSAVYYCARGGKVYYGSNPFAYWGQGLTVTVSA

Luc34 V_L (SEQ ID NO:8 of US Patent No.8,455,646)

DIQMTQSSSYLSVSLGGRVTITCKASDHINNWLAWYQQKPGNAPRLIISGATSLETGVPSRFSG
 SGSGKDYTLTITSLQTEDVATYYCQOYWSTPWTFGGGGTKLEIKR

FIG. 30