



Supplemental Material to:

**Maria Ana Gomez-Ferreria, Mikhail Bashkurov,
Michael Mullin, Anne-Claude Gingras and
Laurence Pelletier**

**CEP192 interacts physically and functionally with the K63-
deubiquitinase CYLD to promote mitotic spindle assembly**

2012; 11(19)

<http://dx.doi.org/10.4161/cc.21574>

<http://www.landesbioscience.com/journals/cc/article/21574>

SUPPLEMENTARY FIGURE LEGENDS

Fig S1. CEP192 interactome. FLAG-CEP192 expressed in HEK293 cells was immunoprecipitated and the purified proteins were identified by mass spectrometry. As a negative control, we transfected FLAG-HAUS4 or FLAG alone (data not shown). List of protein interactions found in at least 2 out of 3 biological replicates and filtered for: maximum frequency across the database = 5% (database contains ~2000 experiments), minimum number of unique peptides in at least one of the experiments = 2. None of the hits was detected in the control samples. The numbers listed in the columns represent the total peptide number (spectral counts) for each hit across the 3 experiments (E1, E2, E3).

Fig S2. CYLD co-depletion rescues bipolar spindle assembly in CEP192-deficient cells. **A.** Quantification of the spindle phenotypes observed in HeLa cells transfected with the indicated siRNA. We show the average and s.d. of at least 3 experiments. **B.** Quantification of CEP192 centrosomal levels in cells transfected with the indicated siRNA. Each dot represents a cell where CEP192 signal and spindle morphology were scored. The horizontal lines in the graph mark the range of comparable depleted levels of CEP192 that we consider for the quantifications in Fig S2C. We show one representative experiment out of five. **C.** Quantification of the spindle phenotypes observed in cells with comparable CEP192 depleted levels (measured as in Fig 2D for the esiRNAs and Fig S2B for the siRNAs). We show the average and s.d. of 5 independent experiments. **D.** Possible model explaining the antagonism between CEP192 and CYLD in mitosis. I, CYLD promotes microtubule polymerization/stabilization in interphase. II, at the onset of mitosis, CYLD is inhibited by CEP192 to achieve a complete de-polymerization of the interphase array of microtubules and/or preserve ubiquitination of CYLD substrates. III,

additionally, CEP192 regulates centrosome maturation and possibly microtubule nucleation by activating NEDD1.

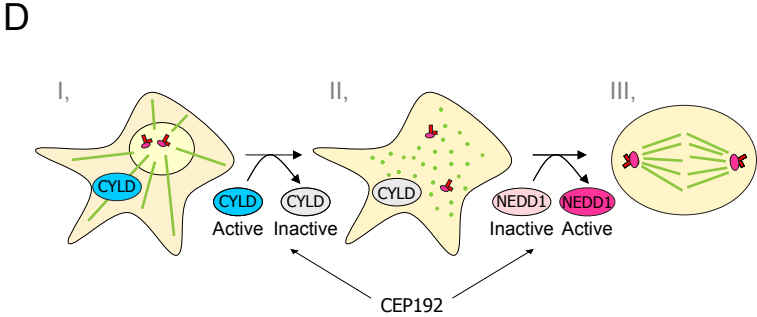
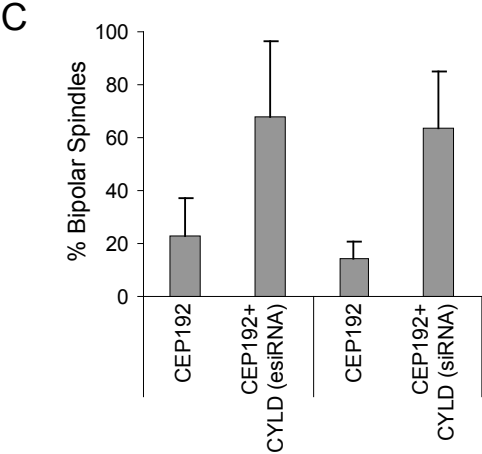
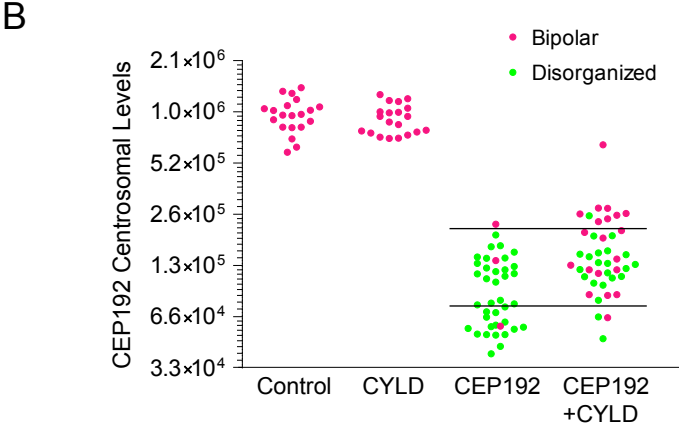
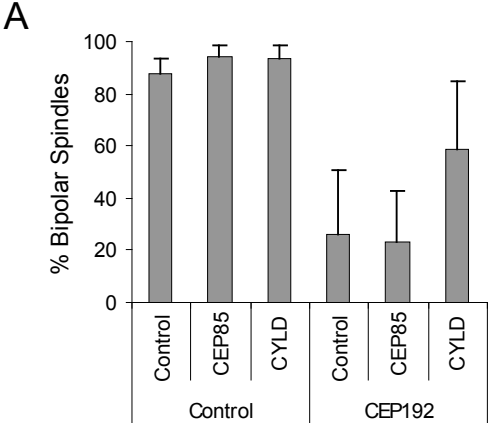
SUPPLEMENTARY TABLE

Table S1: CEP192 interactome. List of CEP192 interacting proteins identified by Mass Spectrometry. Interactions were filtered to enable a maximum frequency across the database of 5%.

Figure S1

	E1	E2	E3
CEP192	536	244	786
RBM12B	15	13	32
PJA2	14	2	9
CYLD	16	1	3
NEDD1	9	3	2
CEP85	6	3	5
BNIP3L	4	2	6
SDCCAG8	3	5	3
ALMS1	4	2	-
ZBTB10	1	-	3

Figure S2



Bait Gene Name: CEP192

Bait Gene ID: 55125

Filter: Project Frequency > 5

Yellow background marks the hits selected in Fig 1A and S1

Additional filters: Shared frequency < 67

Unique peptide < 2 in all experiments

Experiment	Hit Gene Name	Hit Gene ID	Hit Protein ID	Hit Score	Peptide Number	Unique Peptide Number	Coverage	Frequency (in database)	Shared Frequency
Exp 1	CEP192	55125	255003833	5041	536	93	38.7	3.5	100
Exp 2	CEP192	55125	255003833	3045	244	57	26.4	3.5	100
Exp 3	CEP192	55125	255003833	6287	786	115	40.4	3.5	100
Exp 1	56160532	56160532	56160532	428	20	8	19.8		100
Exp 2	56160532	56160532	56160532	191	7	4	10.5		100
Exp 3	56160532	56160532	56160532	579	47	10	23.6		100
Exp 1	RBM12B	389677	118722349	422	15	11	11.2	4.1	100
Exp 2	RBM12B	389677	118722349	334	13	8	7.8	4.1	100
Exp 3	RBM12B	389677	118722349	668	32	17	18	4.1	100
Exp 1	PJA2	9867	157412255	399	14	6	11.9	2.5	100
Exp 2	PJA2	9867	157412255	59	2	1	1.6	2.5	100
Exp 3	PJA2	9867	157412255	254	9	5	8.8	2.5	100
Exp 1	CYLD	1540	14165258	356	16	7	9.3	1.9	100
Exp 2	CYLD	1540	14165258	39	1	1	1.3	1.9	100
Exp 3	CYLD	1540	14165258	158	3	3	4	1.9	100
Exp 1	NEDD1	121441	206597470	335	9	5	9.8	2.5	100
Exp 2	NEDD1	121441	206597470	103	3	2	3.7	2.5	100
Exp 3	NEDD1	121441	206597470	41	2	1	2.1	2.5	100
Exp 1	CEP85	64793	40538794	193	6	5	9.3	1.9	100
Exp 2	CEP85	64793	40538794	95	3	2	3	1.9	100
Exp 3	CEP85	64793	40538794	232	5	4	5.5	1.9	100
Exp 1	SDCCAG8	10806	28269672	130	3	3	5.6	1.6	100
Exp 2	SDCCAG8	10806	28269672	139	5	4	4.6	1.6	100
Exp 3	SDCCAG8	10806	28269672	67	3	1	1.1	1.6	100
Exp 1	BNIP3L	665	4757860	73	4	1	6.8	0.6	100
Exp 2	BNIP3L	665	4757860	46	2	1	6.8	0.6	100
Exp 3	BNIP3L	665	4757860	122	6	2	15.1	0.6	100
Exp 1	FOXO3	2309	4503739	36	3	1	1.2	2.2	100
Exp 2	FOXO3	2309	4503739	32	1	1	1.2	2.2	100
Exp 3	FOXO3	2309	4503739	32	1	1	1.2	2.2	100
Exp 1	ALMS1	7840	110349786	92	4	3	0.9	3.8	67

Exp 2	ALMS1	7840	110349786	48	2	2	0.5	3.8	67
Exp 1	SPATA2L	124044	31377585	92	2	1	3.5	0.3	67
Exp 3	SPATA2L	124044	31377585	46	1	1	1.9	0.3	67
Exp 1	LATS2	26524	126507091	33	1	1	0.9	1.3	67
Exp 3	LATS2	26524	126507091	33	2	1	0.9	1.3	67
Exp 1	UTP23	84294	223468687	32	1	1	5.6		67
Exp 2	UTP23	84294	223468687	29	1	1	5.6		67
Exp 1	PRDM1	639	172072684	31	4	1	1	0.6	67
Exp 3	PRDM1	639	172072684	35	3	1	1	0.6	67
Exp 1	ZBTB10	65986	157694497	31	1	1	2.4	1.9	67
Exp 3	ZBTB10	65986	157694497	120	3	2	6.5	1.9	67
Exp 1	CCDC160	347475	157427195	31	2	1	3.1	0.6	67
Exp 3	CCDC160	347475	157427195	35	6	1	3.1	0.6	67
Exp 1	MDM1	56890	9910418	31	4	1	3.2	0.6	67
Exp 3	MDM1	56890	9910418	44	19	1	3.2	0.6	67
Exp 1	SMYD5	10322	154689858	30	2	1	1.9	1.6	67
Exp 3	SMYD5	10322	154689858	33	2	1	1.9	1.6	67
Exp 1	NBAS	51594	41393547	29	1	1	0.4	2.8	67
Exp 3	NBAS	51594	41393547	44	4	1	0.5	2.8	67
Exp 1	CHD1L	9557	373432615	29	1	1	1	3.1	67
Exp 3	CHD1L	9557	373432617	37	1	1	1.8	3.1	67
Exp 1	TNRC6A	27327	116805348	29	2	1	0.5	4.4	67
Exp 3	TNRC6A	27327	116805348	82	5	1	1.4	4.4	67
Exp 1	KLHL8	57563	34101268	29	1	1	1.6	0.3	67
Exp 3	KLHL8	57563	34101268	29	1	1	1.6	0.3	67
Exp 1	SLC1A1	6505	66773030	28	2	1	2.5		67
Exp 2	SLC1A1	6505	66773030	28	1	1	2.5		67
Exp 1	ZNF845	91664	210031219	27	1	1	0.8	0.6	67
Exp 2	ZNF845	91664	210031219	26	1	1	0.9	0.6	67
Exp 1	MTUS2	23281	140161498	25	1	1	0.6	1.3	67
Exp 2	MTUS2	23281	140161498	28	1	1	0.7	1.3	67
Exp 2	UBN2	254048	236459851	38	2	1	0.7	2.5	67
Exp 3	UBN2	254048	236459851	38	4	1	0.7	2.5	67
Exp 2	C4orf19	55286	157388979	33	1	1	4.1		67
Exp 3	C4orf19	55286	157388979	29	1	1	4.1		67
Exp 1	ITGA11	22801	52485853	91	3	1	2.2	0.9	33
Exp 1	TMEM106C	79022	219802797	73	2	2	7.4	0.9	33
Exp 1	IKBKB	3551	299758411	71	6	1	2.9	1.3	33
Exp 1	SERPINA3	12	50659080	69	2	1	2.6	0.6	33
Exp 1	TSGA10	80705	13376858	68	5	1	1.9	3.8	33
Exp 1	INTS2	57508	24308211	68	2	1	1.7	3.8	33

Exp 1	RAB5A	5868	19923262	65	2	2	4.7	2.5	33
Exp 1	KBTBD8	84541	227497736	61	3	2	2	0.3	33
Exp 1	OR56A4	120793	94967016	60	3	1	4.4		33
Exp 1	SLFN5	162394	145580600	58	2	1	2.4	0.6	33
Exp 1	JAKMIP2	9832	45237195	56	2	2	2.6	4.1	33
Exp 1	ITGAM	3684	88501734	56	2	1	1.4	1.3	33
Exp 1	DOCK5	80005	117553586	56	2	1	1.1	1.9	33
Exp 1	MPHOSPH10	10199	31317305	56	2	1	2.3	3.1	33
Exp 1	COL5A1	1289	89276751	54	2	2	1.1	3.5	33
Exp 1	GHITM	27069	118200356	45	1	1	2	1.3	33
Exp 1	LRTM2	654429	84781739	43	2	1	1.9	1.3	33
Exp 1	ATF4	468	33469974	42	1	1	1.7	0.6	33
Exp 1	ADCY3	109	148536830	42	1	1	0.7	1.3	33
Exp 1	FAM19A3	284467	33300649	41	1	1	7.5	0.3	33
Exp 1	MS4A10	341116	167466260	40	1	1	3		33
Exp 1	LYRM1	57149	10092683	40	3	1	6.6	0.3	33
Exp 1	PTPRZ1	5803	332205943	40	1	1	0.9	0.6	33
Exp 1	SCGB3A1	92304	50363226	40	1	1	6.7		33
Exp 1	FAM158A	51016	31542298	40	3	1	3.4	0.3	33
Exp 1	FCRL4	83417	14550416	38	3	1	1.4	0.6	33
Exp 1	CLEC2B	9976	37577107	37	1	1	5.4		33
Exp 1	FAM161A	84140	187936946	37	1	1	1.5	0.6	33
Exp 1	FRMPD2	143162	372326076	37	1	1	4.1	1.3	33
Exp 1	BBS12	166379	40217788	37	1	1	1	0.6	33
Exp 1	XPA	7507	4507937	36	1	1	4.8	0.9	33
Exp 1	DIO3	1735	255958313	36	1	1	3	0.3	33
Exp 1	FAM131B	9715	164519061	35	1	1	3.3	0.3	33
Exp 1	NPEPL1	79716	325652114	35	1	1	2.2		33
Exp 1	TFEC	22797	347360943	35	1	1	2.9	1.3	33
Exp 1	FITM2	128486	122937337	35	1	1	4.2		33
Exp 1	FAM162A	26355	49355721	35	1	1	5.2	0.9	33
Exp 1	INTS7	25896	7661566	35	1	1	0.7	4.1	33
Exp 1	SULT1A1	6817	29540531	35	1	1	3.1	2.2	33
Exp 1	ANKRD52	283373	157743284	34	1	1	0.8	0.9	33
Exp 1	ALLC	55821	144953901	34	1	1	2	2.2	33
Exp 1	NME7	29922	37574614	34	2	1	2.4	0.6	33
Exp 1	TMEM56	148534	22749023	34	1	1	3	0.3	33
Exp 1	TRPM1	4308	94538366	34	1	1	0.6	2.5	33
Exp 1	C15orf56	644809	90017700	33	1	1	5.6	0.6	33
Exp 1	TRADD	8717	13378137	33	1	1	5.1	0.6	33
Exp 1	TSPAN12	23554	6912528	33	1	1	4.6		33

Exp 1	CX3CL1	6376	4506857	33	1	1	1.8		33
Exp 1	CLDN9	9080	11141861	33	1	1	5.5		33
Exp 1	NBL1	4681	323276673	33	1	1	4.4	0.3	33
Exp 1	CARD8	22900	296531357	33	1	1	2.2		33
Exp 1	OR5M1	390168	52317124	33	1	1	3.5		33
Exp 1	C9orf133	548324	341914811	33	1	1	5.6		33
Exp 1	ZNF7	7553	4508035	33	1	1	1.6	0.9	33
Exp 1	F2RL1	2150	34577052	33	1	1	2	0.3	33
Exp 1	TTC39B	158219	270265883	33	1	1	1.3	1.9	33
Exp 1	CREB3L4	148327	364023829	33	1	1	1.9	0.6	33
Exp 1	C8orf73	642475	154937380	33	1	1	1.8	1.3	33
Exp 1	SLC25A40	55972	46094065	33	1	1	2.1		33
Exp 1	SERTM1	400120	155969691	33	1	1	8.4		33
Exp 1	ZNF519	162655	289666793	33	1	1	1.7		33
Exp 1	RCAN3	11123	354623074	33	1	1	5.8	0.3	33
Exp 1	SPATA25	128497	18129630	32	2	1	2.6		33
Exp 1	ZNF689	115509	34147544	32	1	1	2		33
Exp 1	WDR62	284403	145580608	32	1	1	0.5	2.8	33
Exp 1	NAE1	8883	66363686	32	1	1	1.3	2.8	33
Exp 1	TPPP	11076	5902018	32	1	1	5.9	0.3	33
Exp 1	CYB5R1	51706	49574502	32	1	1	2.3		33
Exp 1	PARD3B	117583	119120897	32	1	1	1.2	2.8	33
Exp 1	OLFML2A	169611	116014339	32	1	1	1.2	0.6	33
Exp 1	CTBS	1486	4758092	32	1	1	1.8	0.3	33
Exp 1	FAM196B	100131897	193788653	32	1	1	2.2	0.6	33
Exp 1	ANKLE2	23141	148664230	32	1	1	0.7	4.1	33
Exp 1	SCAF1	58506	226509740	32	1	1	1.2	3.5	33
Exp 1	ABI3BP	25890	33667044	32	1	1	1	2.5	33
Exp 1	GPR108	56927	122937301	32	1	1	2.6	0.3	33
Exp 1	AIFM3	150209	21389617	32	1	1	1.5	2.8	33
Exp 1	CCDC28A	25901	27414491	32	1	1	4	0.6	33
Exp 1	WDR5B	54554	23199987	32	1	1	2.4	0.6	33
Exp 1	SPIC	121599	22748707	32	1	1	2.8		33
Exp 1	MRGPRX4	117196	239582753	32	1	1	1.9	1.6	33
Exp 1	CES5A	221223	298231153	31	1	1	1.8	0.3	33
Exp 1	CERS1	10715	38176296	31	1	1	3	0.3	33
Exp 1	FABP9	646480	122937490	31	1	1	7.6	0.3	33
Exp 1	TRHDE	29953	7019561	31	1	1	1.1	0.3	33
Exp 1	REV1	51455	7706681	31	1	1	1.1	1.3	33
Exp 1	DCLK3	85443	149589021	31	1	1	1.7	0.3	33
Exp 1	TMCC2	9911	339275845	31	2	1	1.3	2.2	33

Exp 1	HDGFRP3	50810	7705320	31	1	1	4.9	1.3	33
Exp 1	SMAD7	4092	299890807	31	1	1	3.8	0.9	33
Exp 1	ZNF648	127665	58000461	31	1	1	1.2		33
Exp 1	PNPLA8	50640	365192579	31	2	1	1.6	1.6	33
Exp 1	SIGLEC10	89790	283837888	31	1	1	1.8	1.6	33
Exp 1	TMEM120B	144404	212720630	31	2	1	3.5		33
Exp 1	AADAT	51166	7705897	31	1	1	3.1	0.6	33
Exp 1	APLP1	333	4885065	31	1	1	1.1	2.5	33
Exp 1	SPAG16	79582	70887780	31	1	1	4.4	0.9	33
Exp 1	WWC3	55841	38570149	30	2	1	1	2.5	33
Exp 1	5-Sep	5413	9945439	30	1	1	1.9	0.6	33
Exp 1	CRH	1392	4503041	30	1	1	6.1		33
Exp 1	SLC39A4	55630	115430255	30	1	1	1.1	0.6	33
Exp 1	LRRC2	79442	190014581	30	1	1	1.9		33
Exp 1	UBA6	55236	150417996	30	1	1	1.1	1.9	33
Exp 1	DBF4	10926	5729734	30	1	1	1	1.9	33
Exp 1	FOXM1	2305	42544161	30	1	1	1.1	0.3	33
Exp 1	WRAP53	55135	221136854	30	1	1	1.8		33
Exp 1	MOSPD3	64598	13122608	30	1	1	3.4	0.9	33
Exp 1	PICK1	9463	7110697	30	1	1	1.7	0.9	33
Exp 1	CFLAR	8837	187608585	30	1	1	5	0.6	33
Exp 1	KCNB2	9312	27436974	30	1	1	0.8	2.2	33
Exp 1	ZNF615	284370	313569854	30	1	1	2.4	0.9	33
Exp 1	CCDC111	201973	22749373	30	1	1	1.8		33
Exp 1	CCDC93	54520	82775371	29	1	1	1.9	2.2	33
Exp 1	PTCHD1	139411	148271104	29	1	1	0.8	4.4	33
Exp 1	CLSTN2	64084	209364544	29	1	1	1		33
Exp 1	EPB41L4A	64097	87042275	29	1	1	1.6	1.9	33
Exp 1	WDR16	146845	124028510	29	1	1	1.4	1.6	33
Exp 1	ENOX1	55068	189027046	29	1	1	1.7	0.6	33
Exp 1	EHHADH	1962	261878539	29	1	1	1.1	2.2	33
Exp 1	TRIL	9865	76880480	29	1	1	1	0.9	33
Exp 1	MB21D2	151963	197333817	29	1	1	1.4		33
Exp 1	EIF5	1983	21361337	29	1	1	3	4.7	33
Exp 1	GPRASP1	9737	103472136	29	1	1	0.7	2.5	33
Exp 1	CDKN2AIP	55602	8923040	29	1	1	2.1	1.6	33
Exp 1	THOP1	7064	4507491	29	1	1	1	2.2	33
Exp 1	ZNF296	162979	21687252	29	1	1	1.9	0.3	33
Exp 1	KIF25	3834	154124879	29	1	1	2.9	1.6	33
Exp 1	PDE11A	50940	116536083	29	1	1	2	0.9	33
Exp 1	AASDH	132949	45580730	29	1	1	0.8	1.6	33

Exp 1	HSPA12A	259217	119874213	28	1	1	1.8	2.5	33
Exp 1	BBS10	79738	100816407	28	1	1	1.5		33
Exp 1	GPR158	57512	93204867	28	1	1	1.2	3.1	33
Exp 1	CDCA2	157313	44681484	28	1	1	1.1	3.8	33
Exp 1	PI4K2A	55361	13559514	28	1	1	2.1	1.9	33
Exp 1	POMT2	29954	32455271	28	1	1	1.1	0.9	33
Exp 1	NFE2L3	9603	225735557	28	1	1	1.2	0.9	33
Exp 1	ARMCX4	100131755	371877632	28	1	1	0.4	2.8	33
Exp 1	GAS2L1	10634	19923777	28	1	1	1.8	1.3	33
Exp 1	SYNPO2	171024	193083185	28	1	1	0.9	0.6	33
Exp 1	SEMA4D	10507	214010220	28	2	1	1.1	0.3	33
Exp 1	FAM194A	131831	87298939	28	1	1	1.4	1.6	33
Exp 1	ZNF729	100287226	336455120	28	2	1	0.9		33
Exp 1	CNGB3	54714	116642889	28	1	1	1	1.3	33
Exp 1	BIRC3	330	4502139	28	1	1	1.3	1.3	33
Exp 1	PDE9A	5152	48762728	28	1	1	2.3	1.6	33
Exp 1	COL5A2	1290	89363017	28	1	1	0.5	3.5	33
Exp 1	MAP4K1	11184	6005810	27	1	1	0.8	0.6	33
Exp 1	DICER1	23405	307133775	27	1	1	0.5	2.5	33
Exp 1	ZNF251	90987	153792407	27	1	1	1.5	1.3	33
Exp 1	FNDC3A	22862	118918395	27	1	1	0.7	1.3	33
Exp 1	HERC5	51191	110825982	27	1	1	0.9	0.9	33
Exp 1	CRY2	1408	18853Exp 13	27	1	1	1.9	0.3	33
Exp 1	DPY19L2	283417	93277105	27	1	1	1.3	2.8	33
Exp 1	TUBGCP6	85378	56788364	27	1	1	0.4	3.8	33
Exp 1	ADCY1	107	31083193	27	1	1	0.6	2.5	33
Exp 1	NBEAL2	23218	149944548	27	1	1	0.4		33
Exp 1	TUBGCP2	10844	375298717	27	1	1	0.9	3.5	33
Exp 1	ZNRF3	84133	150378447	27	1	1	0.8		33
Exp 1	PAK1	5058	42794769	27	1	1	1.5	0.3	33
Exp 1	SLFN13	146857	56119108	26	1	1	1.7	0.6	33
Exp 1	RP1	Exp 11	5454016	26	1	1	0.5	3.8	33
Exp 1	KIF13B	23303	46852172	26	1	1	0.7	4.7	33
Exp 1	PIWIL4	143689	221316711	26	1	1	1.2	0.3	33
Exp 1	HMMR	3161	217272804	26	1	1	1.4	4.4	33
Exp 1	PTPRQ	374462	222537743	26	1	1	0.3	4.4	33
Exp 1	PTPDC1	138639	30089952	26	1	1	0.9	2.2	33
Exp 1	PLCE1	51196	260166694	25	1	1	0.4	3.8	33
Exp 1	DUSP27	92235	122937243	25	1	1	0.9	2.2	33
Exp 1	MAGI2	9863	27436957	25	1	1	0.8	2.8	33
Exp 1	MAP3K14	9020	115298645	25	1	1	2.1	1.9	33

Exp 1	AKNA	80709	151301137	25	1	1	1	1.9	33
Exp 1	KIAA0753	9851	154689847	25	1	1	1	3.1	33
Exp 1	DNAH6	1768	194353966	24	1	1	0.3	4.4	33
Exp 1	SETX	23064	113722133	24	1	1	0.3	4.7	33
Exp 1	FRAS1	80144	256000767	23	2	1	0.2	3.1	33
Exp 2	CHD9	80205	95147342	63	2	2	0.8	4.4	33
Exp 2	LOC100288562	100288562	239743602	61	2	1	3.1		33
Exp 2	KIFC1	3833	167555110	58	2	2	2.2	2.2	33
Exp 2	BRSK1	84446	24308326	57	2	1	1.8	3.1	33
Exp 2	KRT85	3891	4504935	56	2	1	3.7	4.1	33
Exp 2	DIXDC1	85458	83816971	54	2	1	3.5	1.6	33
Exp 2	CSPP1	79848	116174778	53	2	1	1	3.8	33
Exp 2	MICB	4277	167857788	53	1	1	2.9	1.3	33
Exp 2	HLA-DPA1	3113	24797074	51	2	1	2.7		33
Exp 2	VEZT	55591	155030244	49	1	1	1	0.3	33
Exp 2	GABRD	2563	34734071	48	1	1	2.2	0.3	33
Exp 2	OR51M1	390059	284005410	46	1	1	1.8	0.3	33
Exp 2	CTBP1	1487	4557497	42	1	1	1.8	1.9	33
Exp 2	GET4	51608	38570062	40	2	1	3.7	2.8	33
Exp 2	KRT222	125113	22748757	40	1	1	2.4	4.7	33
Exp 2	S100A8	6279	21614544	40	1	1	22.6	4.4	33
Exp 2	KLK11	11012	5803199	40	1	1	6	0.3	33
Exp 2	FAM167A	83648	170784820	38	1	1	3.3	0.9	33
Exp 2	GHSR	2693	38455410	38	2	1	1.9	0.3	33
Exp 2	MED4	29079	7661788	38	2	1	3	0.9	33
Exp 2	ADARB1	104	4501919	37	1	1	1	1.9	33
Exp 2	AKR1B10	57016	223468663	37	1	1	4.1		33
Exp 2	ZFYVE9	9372	6552337	37	1	1	1.2	1.6	33
Exp 2	GALNT13	114805	145309313	37	1	1	2.7	2.5	33
Exp 2	MINPP1	9562	296010986	36	1	1	2.2	0.6	33
Exp 2	INSL6	11172	38569396	35	1	1	5.2	0.6	33
Exp 2	FLJ27352	145788	311771669	35	1	1	5.8		33
Exp 2	CREG2	200407	24475869	35	4	1	2.8		33
Exp 2	FMO4	2329	4503Exp 3	35	1	1	2.3	0.3	33
Exp 2	ZNF488	118738	23308499	35	1	1	3.8	0.3	33
Exp 2	FAM90A1	55138	144953905	35	4	1	1.7	0.3	33
Exp 2	UGDH	7358	296040438	35	3	1	2.3	2.5	33
Exp 2	C1orf110	339512	148806888	35	1	1	2.6	0.3	33
Exp 2	CYP20A1	57404	29171730	34	1	1	1.7		33
Exp 2	LIPC	3990	194097335	34	1	1	1.8	0.9	33
Exp 2	TRMT112	51504	7705477	34	1	1	8	4.1	33

Exp 2	ZNF37A	7587	55769566	34	1	1	2	0.3	33
Exp 2	HIVEP2	3097	110347463	34	1	1	0.4	3.5	33
Exp 2	C6orf52	347744	222537721	34	1	1	5.9		33
Exp 2	FBXO45	200933	157743247	34	1	1	2.4	1.9	33
Exp 2	LRRC37B	114659	53829385	33	1	1	0.7	0.6	33
Exp 2	SLC35C1	55343	223671917	32	1	1	5.7	0.6	33
Exp 2	NISCH	11188	66472382	32	3	1	0.6	2.2	33
Exp 2	STRA6	64220	217330578	32	1	1	1.6	1.6	33
Exp 2	SLC4A5	57835	19743827	32	1	1	0.7	2.5	33
Exp 2	MFN1	55669	45269137	32	2	1	1.1		33
Exp 2	GOLM1	51280	29550838	32	1	1	1.7	0.3	33
Exp 2	FUT7	2529	4758406	32	1	1	2.6	0.3	33
Exp 2	TRPV3	162514	21735483	32	1	1	1.5	0.3	33
Exp 2	GNG2	54331	54114974	32	1	1	15.5	1.9	33
Exp 2	FAM22G	441457	113865921	32	1	1	2.2	0.6	33
Exp 2	BLNK	29760	386268028	32	1	1	2	1.6	33
Exp 2	EDN2	1907	4503463	32	1	1	4.5		33
Exp 2	LRP4	4038	157384998	32	2	1	0.5	2.2	33
Exp 2	LOC729626	729626	113428298	32	1	1	10.9		33
Exp 2	DNPEP	23549	156416028	32	1	1	2.5	0.9	33
Exp 2	SLIT1	6585	188528675	31	1	1	0.5	0.6	33
Exp 2	CEPT1	10390	5174415	31	1	1	1.7	1.9	33
Exp 2	C19orf35	374872	38348368	31	1	1	1.7	0.3	33
Exp 2	PNISR	25957	154146193	31	1	1	1.6	4.1	33
Exp 2	CHST3	9469	19923281	31	1	1	2.1	1.6	33
Exp 2	PLXDC2	84898	40255005	31	1	1	1.9	0.6	33
Exp 2	KIAA1383	54627	149192843	31	1	1	1.1	1.6	33
Exp 2	LRRC3B	116135	16418445	31	1	1	3.5		33
Exp 2	SYNM	23336	112382237	31	1	1	0.7	4.7	33
Exp 2	CCDC159	126075	209969682	31	1	1	3.4		33
Exp 2	SERP1	27230	7657552	31	1	1	10.6		33
Exp 2	DMBT1	1755	341913704	31	1	1	1	1.3	33
Exp 2	SORBS2	8470	224586855	30	1	1	1.4	1.3	33
Exp 2	LRRC8C	84230	19923729	30	1	1	1.2	2.5	33
Exp 2	MPEG1	219972	133505169	30	1	1	1.3	3.5	33
Exp 2	VASH1	22846	7662454	30	1	1	2.7	0.9	33
Exp 2	TSEN2	80746	223972638	30	1	1	2.2		33
Exp 2	OTUD7A	161725	18702331	30	1	1	1.4	1.3	33
Exp 2	TBX22	50945	18375603	30	1	1	2.1	0.3	33
Exp 2	GUCY1A3	2982	194595478	30	1	1	1.8	1.6	33
Exp 2	FAM187B	148109	22749005	30	1	1	1.6		33

Exp 2	PTCH2	8643	52145305	30	1	1	0.7	0.6	33
Exp 2	HEATR5A	25938	327365361	30	1	1	0.5	0.9	33
Exp 2	RANBP6	26953	342349354	29	1	1	1.5	1.9	33
Exp 2	ZNF783	100289678	30464Exp 35	29	1	1	3.1		33
Exp 2	ABCA10	10349	153792144	29	1	1	0.5	2.2	33
Exp 2	CEP112	201134	82880654	29	1	1	5.2	2.8	33
Exp 2	RLIM	51132	34452684	29	1	1	1.6	2.2	33
Exp 2	LAMA5	3911	21264602	29	1	1	0.3	4.1	33
Exp 2	SP100	6672	122939208	29	1	1	1.2	1.6	33
Exp 2	IFI44	10561	166706911	29	1	1	2.3	1.6	33
Exp 2	IL16	3603	27262655	29	1	1	1	3.5	33
Exp 2	ADNP	23394	12229217	29	1	1	0.8	0.9	33
Exp 2	DDR1	780	321400059	29	1	1	1.6	0.6	33
Exp 2	KCNK3	3777	4504849	29	1	1	3.3		33
Exp 2	APTX	54840	305410835	28	1	1	2.7	0.6	33
Exp 2	EZH1	2145	19923202	28	1	1	1.5	1.3	33
Exp 2	SLITRK2	84631	33504581	28	1	1	1.4	0.3	33
Exp 2	KDM2B	84678	54112382	28	1	1	0.7	4.1	33
Exp 2	ATP8B3	148229	295821170	28	2	1	0.5	1.9	33
Exp 2	PTPRC	5788	18641347	28	1	1	0.5	1.9	33
Exp 2	CHST9	83539	116235458	28	1	1	2.3	0.3	33
Exp 2	ITGAV	3685	223468597	28	1	1	0.8	0.6	33
Exp 2	SHB	6461	106879210	27	1	1	1.4	1.6	33
Exp 2	INSR	3643	119395736	27	1	1	0.7	1.9	33
Exp 2	MCF2L2	23101	31742505	27	1	1	1.2	1.9	33
Exp 2	ZFH3	463	258613987	27	1	1	0.4	2.8	33
Exp 2	GPRASP2	114928	19923967	27	1	1	0.8	2.2	33
Exp 2	MAP3K10	4294	21735550	27	1	1	1.2	0.9	33
Exp 2	GPATCH8	23131	50962882	27	1	1	0.5	4.7	33
Exp 2	NRXN2	9379	14211536	27	1	1	0.6	1.9	33
Exp 2	PPP1R7	5510	4506013	27	2	1	1.9	3.5	33
Exp 2	SHPRH	257218	27436873	26	3	1	0.4	3.1	33
Exp 2	HEATR7B2	133558	154240671	26	1	1	0.4	2.8	33
Exp 2	C7orf63	79846	236463164	26	1	1	3.6	1.3	33
Exp 2	BRD1	23774	11321642	26	1	1	1.1	2.2	33
Exp 2	ARID4A	5926	115334673	26	1	1	0.8	3.5	33
Exp 2	AGAP10	728127	239744064	26	1	1	1.6	0.6	33
Exp 2	CUL9	23113	24307991	25	1	1	0.3	4.4	33
Exp 2	DOCK3	1795	31415870	25	1	1	0.4	1.9	33
Exp 2	DENND3	22898	50345870	25	1	1	1.3	1.9	33
Exp 2	COBL	23242	31581524	25	1	1	0.9	3.1	33

Exp 2	GRIN2B	2904	167003331	25	1	1	0.6	2.2	33
Exp 2	ZZEF1	23140	73747881	24	1	1	0.3	3.1	33
Exp 3	TRIM27	5987	5730009	103	3	3	7.2	3.8	33
Exp 3	PDCD1LG2	80380	190014605	75	6	2	7.3		33
Exp 3	KLHL24	54800	40018614	73	3	1	2.8	4.4	33
Exp 3	GAL3ST4	79690	31542835	66	2	1	4.3	2.5	33
Exp 3	CCDC164	92749	217416374	64	5	1	2.3		33
Exp 3	BLM	641	4557365	63	3	2	1.6	4.1	33
Exp 3	ZNF318	24149	120587019	63	2	1	0.6	4.7	33
Exp 3	PKHD1L1	93035	126116589	60	3	1	0.4	2.5	33
Exp 3	CC2D2A	57545	197209974	56	2	1	1	3.5	33
Exp 3	PRKCQ	5588	334848126	55	2	1	1.1	0.3	33
Exp 3	GPR98	84059	113722120	55	2	1	0.3	3.8	33
Exp 3	CEP164	22897	115648142	54	2	1	1	4.4	33
Exp 3	CCDC132	55Exp 1	384229074	52	3	1	1.7	1.9	33
Exp 3	SYNRG	11276	254587994	52	1	1	1.9	2.5	33
Exp 3	TRIM37	4591	15147333	51	2	1	3.9	3.1	33
Exp 3	WDR19	57728	55743151	48	1	1	0.8	1.6	33
Exp 3	HCAR3	8843	157738694	44	5	1	2.8	0.3	33
Exp 3	SNTG2	54221	259155293	43	1	1	1.5	1.3	33
Exp 3	SDCCAG3	10807	89353278	42	1	1	2.7	3.8	33
Exp 3	C8orf58	541565	311771787	42	2	1	3	0.9	33
Exp 3	TMEM86B	255043	281427107	42	4	1	4.9		33
Exp 3	SH3RF2	153769	222446607	41	1	1	1	3.5	33
Exp 3	GRIK5	2901	29029597	40	1	1	4.7	0.6	33
Exp 3	ZNF669	79862	217035140	40	2	1	1.9	0.3	33
Exp 3	ANO5	203859	47106048	40	2	1	1	0.6	33
Exp 3	TFEB	7942	24307933	38	1	1	1.5	0.9	33
Exp 3	PLD4	122618	94681038	38	1	1	1.6	0.6	33
Exp 3	KIAA1377	57562	115387118	38	1	1	0.8	1.3	33
Exp 3	LOC100288814	100288814	304307742	38	1	1	4.7		33
Exp 3	TOR3A	64222	115647957	37	1	1	2	0.3	33
Exp 3	DDAH1	23576	197313763	37	1	1	3.8	2.8	33
Exp 3	LOC100507588	100507588	305410860	36	1	1	2.5		33
Exp 3	GRIN2A	2903	197313638	36	1	1	1.1	2.2	33
Exp 3	RSG1	79363	241666479	36	1	1	3.5	0.3	33
Exp 3	ZNF187	7741	161353481	36	1	1	2.3	0.3	33
Exp 3	KRT23	25984	27894339	36	1	1	1.9	1.9	33
Exp 3	OVOS	408186	341914879	36	1	1	2.5	0.3	33
Exp 3	GCGR	2642	4503947	36	1	1	1.7	0.6	33
Exp 3	KCNJ1	3758	24497467	36	2	1	3.2	0.3	33

Exp 3	OR4M2	390538	284005443	36	1	1	3.8		33
Exp 3	MLC1	23209	14589896	35	1	1	3.4	0.6	33
Exp 3	TRMT2A	27037	384229064	35	1	1	1.2	1.3	33
Exp 3	KNDC1	85442	116268127	35	1	1	0.4	4.4	33
Exp 3	BST1	683	168229159	35	2	1	4.7	0.6	33
Exp 3	FGF16	8823	4503691	35	1	1	3.4		33
Exp 3	KIR2DS2	100132285	341916324	35	1	1	6.8		33
Exp 3	PCIF1	63935	18034767	35	1	1	1	1.9	33
Exp 3	C5orf25	375484	196259796	35	1	1	1.5	0.3	33
Exp 3	POP7	10248	153791431	35	1	1	8.6	1.6	33
Exp 3	USP43	124739	148612811	35	1	1	1.3	1.9	33
Exp 3	ARSG	22901	45430057	35	1	1	3	0.3	33
Exp 3	TPSAB1	7177	13775595	35	3	1	2.9	0.3	33
Exp 3	HDAC11	79885	209862883	34	1	1	2.4	0.6	33
Exp 3	SLC35F2	54733	31542943	34	1	1	2.9		33
Exp 3	OR2T35	403244	49226830	34	1	1	2.5	2.8	33
Exp 3	ZNF497	162968	333033771	34	1	1	1.8	0.3	33
Exp 3	VAV1	7409	384551646	34	1	1	0.9		33
Exp 3	CASP6	839	14916485	34	1	1	2.9		33
Exp 3	MPV17L2	84769	116235468	33	4	1	3.9	0.3	33
Exp 3	ZNF407	55628	226246537	33	1	1	0.5	1.9	33
Exp 3	FAM186B	84070	14149789	33	2	1	1	1.6	33
Exp 3	MAGEC1	9947	58530876	33	1	1	0.6	0.3	33
Exp 3	CCDC48	79825	228008351	33	1	1	1.7	1.3	33
Exp 3	CDK4	1019	4502735	33	1	1	4.3	4.7	33
Exp 3	ZBED5	58486	49574210	32	1	1	1.3	1.6	33
Exp 3	CYP11B1	1584	71067343	32	2	1	1.8	0.3	33
Exp 3	ZMYM3	9203	4827067	32	1	1	0.9	3.1	33
Exp 3	OSCP1	127700	268370167	32	1	1	2.4	0.6	33
Exp 3	GPR124	25960	300934750	32	1	1	0.8	1.3	33
Exp 3	SALL3	27164	154146199	32	1	1	0.9	0.9	33
Exp 3	TNFRSF8	943	68348711	32	1	1	1.8	0.3	33
Exp 3	ANKRD34B	340120	257467559	32	1	1	2.1		33
Exp 3	SOWAHB	345079	71274172	32	1	1	0.9	1.6	33
Exp 3	EXPH5	23086	221316747	32	2	1	0.5	2.5	33
Exp 3	VIPR1	7433	353523865	32	1	1	5.7		33
Exp 3	PAH	5053	4557819	32	1	1	4		33
Exp 3	RALGAPA2	57186	118600961	32	5	1	0.5	2.8	33
Exp 3	FAM83H	286077	157311635	32	2	1	0.8	1.3	33
Exp 3	AZU1	566	11342670	32	1	1	4		33
Exp 3	BUB1	699	4757878	32	1	1	0.6	1.3	33

Exp 3	KIF2C	11004	166795250	32	1	1	5.4	1.3	33
Exp 3	DIP2B	57609	55749758	32	1	1	0.5	2.5	33
Exp 3	TYSND1	219743	94400921	32	1	1	1.9	0.6	33
Exp 3	TTC17	55761	21361787	32	1	1	0.7	4.1	33
Exp 3	RFPL4A	342931	222446629	32	2	1	2.8	0.6	33
Exp 3	C18orf21	83608	319918864	32	1	1	6.2		33
Exp 3	PITX2	5308	24234708	32	1	1	4.7	0.6	33
Exp 3	ZNF644	84146	41152093	31	1	1	0.8	1.9	33
Exp 3	GP2	2813	119220572	31	1	1	3.1	1.3	33
Exp 3	LRP6	4040	148727288	31	1	1	0.6	2.2	33
Exp 3	ALAS2	212	83977440	31	1	1	1.8	2.2	33
Exp 3	ADAMTS17	170691	110611170	31	1	1	0.6	1.3	33
Exp 3	TMEM165	55858	32189371	31	1	1	2.8	3.8	33
Exp 3	POTED	317754	153792284	31	1	1	1.7	0.6	33
Exp 3	PRKD2	25865	120659787	31	1	1	1.5	1.3	33
Exp 3	WIPF2	147179	18959210	31	1	1	2.3	1.6	33
Exp 3	LPCAT4	254531	87116681	31	1	1	8.2	1.9	33
Exp 3	ZFPL1	7542	33300635	31	1	1	3.5	0.3	33
Exp 3	PRDM9	56979	147905620	31	1	1	1.1	0.3	33
Exp 3	HLA-DMB	3109	301129275	31	1	1	2.7		33
Exp 3	GOLGA8H	728498	239745132	31	1	1	1.7	1.9	33
Exp 3	CCDC84	338657	38348292	31	1	1	2.7	0.3	33
Exp 3	C12orf70	341346	222446616	30	1	1	2	0.9	33
Exp 3	IFITM2	10581	151101191	30	1	1	6.1		33
Exp 3	AMIGO1	57463	153791466	30	1	1	1.8	1.6	33
Exp 3	FAM75A7	26165	153791826	30	1	1	0.8	0.3	33
Exp 3	RRP7A	27341	25092725	30	1	1	4.6	1.6	33
Exp 3	WNT5A	7474	40806205	30	1	1	2.9	0.3	33
Exp 3	STAT6	6778	296010868	30	1	1	1.1	4.1	33
Exp 3	VPS26A	9559	17978519	30	1	1	2.4	2.5	33
Exp 3	DLEU7	220107	148747397	30	1	1	7.5	0.3	33
Exp 3	HTR3B	9177	5174469	30	1	1	2.9		33
Exp 3	SH2D3A	10045	208609985	30	1	1	1.9	1.6	33
Exp 3	LRP10	26020	32490559	30	2	1	1.8	2.5	33
Exp 3	KRIT1	889	31581522	30	1	1	1.2	3.8	33
Exp 3	SLC25A22	79751	133Exp 383	30	1	1	2.5	3.5	33
Exp 3	RAB3C	115827	19923985	30	1	1	6.2	2.2	33
Exp 3	ATOH8	84913	226498192	30	1	1	2.5	2.5	33
Exp 3	KLHL15	80311	226442729	29	1	1	1.8	3.1	33
Exp 3	C1orf135	79000	13128990	29	1	1	2.8	0.3	33
Exp 3	FRMD4B	23150	150010540	29	1	1	1.7	1.9	33

Exp 3	ANKRD5	63926	38569426	29	1	1	1.3	2.5	33
Exp 3	NEK4	6787	302058308	29	1	1	1.3	0.9	33
Exp 3	ENTPD7	57089	9966821	29	1	1	1.7	0.3	33
Exp 3	IMPDH1	3614	34328928	29	1	1	1.2	3.1	33
Exp 3	PIAS2	9063	27532984	29	1	1	1.6	1.6	33
Exp 3	VSIG10	54621	40254891	29	1	1	3.5	0.9	33
Exp 3	PIGQ	9091	22538450	29	1	1	2.2	0.6	33
Exp 3	STK36	27148	217330634	29	1	1	0.8		33
Exp 3	MYC	4609	71774083	29	1	1	2.2		33
Exp 3	PARP2	10038	110825961	29	1	1	1.2	3.8	33
Exp 3	TMEM67	91147	214830753	29	1	1	1.4	2.2	33
Exp 3	C1orf65	164127	224593756	29	1	1	3	0.9	33
Exp 3	GDF10	2662	4826740	29	1	1	1.5	0.6	33
Exp 3	C6orf132	647024	256574805	29	1	1	1	2.2	33
Exp 3	DCC	1630	110431348	28	1	1	0.5	1.3	33
Exp 3	RAG1	5896	4557841	28	1	1	1.1	0.6	33
Exp 3	CACNA1C	775	193788528	28	2	1	0.4	1.3	33
Exp 3	POLR3E	55718	384475541	28	1	1	1.1	0.6	33
Exp 3	FGD6	55785	154240686	28	1	1	0.9	2.2	33
Exp 3	CNGA3	1261	4502917	28	2	1	1.7	1.3	33
Exp 3	DLG5	9231	95089461	28	1	1	0.4	2.2	33
Exp 3	NOS3	4846	40254422	28	1	1	0.7	1.3	33
Exp 3	PHLDB3	653583	157266264	28	1	1	1.2	1.3	33
Exp 3	NOD2	64127	11545912	28	1	1	1	1.9	33
Exp 3	MAPK1	5594	20986531	28	1	1	2.5	3.1	33
Exp 3	ABCB5	340273	255708477	28	1	1	1	2.8	33
Exp 3	SEC14L3	266629	27923592	28	1	1	2.2	0.3	33
Exp 3	SLC30A9	10463	57164948	28	1	1	1.9	1.6	33
Exp 3	IRF5	3663	334883190	28	1	1	2.2	0.3	33
Exp 3	OSMR	9180	4557040	28	1	1	1.5	0.6	33
Exp 3	ARHGEF18	23370	41327769	28	1	1	1.1	2.8	33
Exp 3	BMPER	168667	37693519	28	1	1	1.2	1.6	33
Exp 3	FAM178A	55719	150456436	28	1	1	0.8	4.1	33
Exp 3	PCDH17	27253	94538350	27	1	1	1.1	2.2	33
Exp 3	EIF2AK3	9451	134304838	27	1	1	1.2	2.5	33
Exp 3	MAP3K9	4293	52421790	27	2	1	0.7	2.2	33
Exp 3	PRSS23	11098	6005882	27	1	1	3.4		33
Exp 3	PPP1R26	9858	45387958	27	1	1	0.6	2.8	33
Exp 3	ADAMTS7	11173	38683827	27	2	1	0.5	1.6	33
Exp 3	SLC4A4	8671	4507025	27	1	1	1.7	1.9	33
Exp 3	PPP1R3A	5506	167614502	27	2	1	1.1	1.6	33

Exp 3	FRMPD4	9758	211971072	27	1	1	0.9	2.8	33
Exp 3	EBF4	5Exp 33	160333411	27	1	1	3.7		33
Exp 3	ATP10D	57205	222352161	27	1	1	0.9	2.2	33
Exp 3	RBM15B	29890	54607124	27	1	1	0.8	4.4	33
Exp 3	SMC1B	27127	71565160	27	1	1	0.5	3.1	33
Exp 3	PRDM8	56978	150378439	27	1	1	1.5	0.3	33
Exp 3	TUFT1	7286	9910596	27	1	1	3.3	0.6	33
Exp 3	PIK3R1	5295	32455248	27	1	1	4.4	1.3	33
Exp 3	MORC4	79710	145553971	27	1	1	1	0.9	33
Exp 3	ZFP106	64397	11968023	27	1	1	0.3	4.4	33
Exp 3	WRN	7486	110735439	26	1	1	0.9	4.7	33
Exp 3	C1orf87	127795	22748811	26	1	1	1.5	3.1	33
Exp 3	HEATR5B	54497	55749742	26	1	1	0.8	4.7	33
Exp 3	FCGBP	8857	154146262	26	1	1	0.1	1.6	33
Exp 3	PLCH1	23007	57863298	26	1	1	0.6	1.6	33
Exp 3	LRBA	987	345498499	26	1	1	0.4	3.8	33
Exp 3	APC2	10297	5031587	25	2	1	0.4	4.7	33
Exp 3	ANKRD20A1	84210	15Exp 14901	25	1	1	1.3	0.3	33
Exp 3	MUC5B	727897	301172750	25	1	1	0.2	1.6	33
Exp 3	RAPGEF2	9693	7657261	25	1	1	0.9	2.2	33
Exp 3	HTT	3064	90903231	25	1	1	1.2	2.2	33
Exp 3	MED12L	116931	93277088	24	1	1	0.3	3.1	33