



Supplementary Figure 1. cDNA synthesis and PCR amplification overview. Schematic shows location of nested chain-specific primers used for cDNA synthesis (outer) and PCR amplification (inner). Also shown is the location of the template switching oligonucleotide. Schematic depicts the synthesis and amplification of VH domain cDNA, analogous steps are used for VL domains. FR: framework regions; CDR: complementarity determining regions; CR: constant region.

Supplementary Table 1. List of primers and barcodes.

Oligonucleotide	Vendor	Cat #	Sequence
RT Chain Specific Outer Primer mix			
RT-mIGK	IDT	271038654	TTGTCGTTCACTGCCATCAAT*C
RT-mIGHG	IDT	271038655	AGCTGGGAAGGTGTGCACA*C
RT-mIGL	IDT	271038656	GGGGTACCATCTACCTTCCA*C
RT-mIGHG3-NEW	IDT	271038657	GTACAGATGAGACTGTGCGCACA*C
TSO-short	IDT	408473058	/5Biosg/AAGCAGTGGTATCAACGCAGAGTACA TrGrGrG
PCR Chain Specific Reverse Inner Primer Mix			
10for-mIgh3	IDT	270929982	GGATAGACAGATGGGGCTGTTGTTGTAG*C
PCR-R-mIGL	IDT	270929983	ATCGTACACACCAGTGTGG*C
6-REV-LC	IDT	270929984	GGATACAGTTGGTGCAGCAT*C
10-REV-HC1	IDT	270929985	ATAGACAGATGGGGGTGTCGTTTTGG*C

F Primer, ISPCR (Barcoded) PCR-SMART indices	Sequence
01-SMARTindex	CAGCGTCAGTGGTATCAACGCAGAGTACA
02-SMARTindex	GATCACCAGTGGTATCAACGCAGAGTACA
03-SMARTindex	ACCAGTCAGTGGTATCAACGCAGAGTACA
04-SMARTindex	TGCACGCAGTGGTATCAACGCAGAGTACA
05-SMARTindex	ACATTACAGTGGTATCAACGCAGAGTACA
06-SMARTindex	GTGTAGCAGTGGTATCAACGCAGAGTACA
07-SMARTindex	CTAGTCCAGTGGTATCAACGCAGAGTACA
08-SMARTindex	TGTGCACAGTGGTATCAACGCAGAGTACA
09-SMARTindex	TCAGGAACAGTGGTATCAACGCAGAGTACA
10-SMARTindex	CGGTAAACAGTGGTATCAACGCAGAGTACA
11-SMARTindex	TTAACTACAGTGGTATCAACGCAGAGTACA
12-SMARTindex	ATGAACACAGTGGTATCAACGCAGAGTACA
13-SMARTindex	CCTAAGACAGTGGTATCAACGCAGAGTACA
14-SMARTindex	AATCCGACAGTGGTATCAACGCAGAGTACA
15-SMARTindex	GGCTGCACAGTGGTATCAACGCAGAGTACA
16-SMARTindex	TACCTTACAGTGGTATCAACGCAGAGTACA
17-SMARTindex	TCTTAATCAGTGGTATCAACGCAGAGTACA
18-SMARTindex	GTCAGGTCAGTGGTATCAACGCAGAGTACA
19-SMARTindex	ATACTGTCAGTGGTATCAACGCAGAGTACA
20-SMARTindex	TATGTCTCAGTGGTATCAACGCAGAGTACA
21-SMARTindex	GAGTCCTCAGTGGTATCAACGCAGAGTACA
22-SMARTindex	GGAGGTTCAAGTGGTATCAACGCAGAGTACA
23-SMARTindex	CACACTTCAGTGGTATCAACGCAGAGTACA
24-SMARTindex	CCGCAATCAGTGGTATCAACGCAGAGTACA
25-SMARTindex	TTTATGCAGTGGTATCAACGCAGAGTACA
26-SMARTindex	AACGCCACAGTGGTATCAACGCAGAGTACA
27-SMARTindex	CAAGCACAGTGGTATCAACGCAGAGTACA
28-SMARTindex	GCTCGACAGTGGTATCAACGCAGAGTACA
29-SMARTindex	GCGAATCAGTGGTATCAACGCAGAGTACA
30-SMARTindex	TGGATTCAAGTGGTATCAACGCAGAGTACA
31-SMARTindex	ACCTACCAGTGGTATCAACGCAGAGTACA
32-SMARTindex	CGAAGGCAGTGGTATCAACGCAGAGTACA
33-SMARTindex	AGATAGAACAGTGGTATCAACGCAGAGTACA
34-SMARTindex	TTGGTAAACAGTGGTATCAACGCAGAGTACA

35-SMARTindex	GTTACCAACAGTGGTATCAACGCAGAGTACA
36-SMARTindex	CGCAACAACAGTGGTATCAACGCAGAGTACA
37-SMARTindex	TGGCGAAACAGTGGTATCAACGCAGAGTACA
38-SMARTindex	ACCGTGAACAGTGGTATCAACGCAGAGTACA
39-SMARTindex	CAACAGAACAGTGGTATCAACGCAGAGTACA
40-SMARTindex	GATTGTAACAGTGGTATCAACGCAGAGTACA
41-SMARTindex	CTCTCGATCAGTGGTATCAACGCAGAGTACA
42-SMARTindex	TGACACATCAGTGGTATCAACGCAGAGTACA
43-SMARTindex	AAGACAATCAGTGGTATCAACGCAGAGTACA
44-SMARTindex	ACAGATATCAGTGGTATCAACGCAGAGTACA
45-SMARTindex	TAGGCTATCAGTGGTATCAACGCAGAGTACA
46-SMARTindex	CTCCATATCAGTGGTATCAACGCAGAGTACA
47-SMARTindex	GCATGGATCAGTGGTATCAACGCAGAGTACA
48-SMARTindex	AATAGCATCAGTGGTATCAACGCAGAGTACA
49-SMARTindex	GTGCCATACAGTGGTATCAACGCAGAGTACA
50-SMARTindex	TCGAGGTACAGTGGTATCAACGCAGAGTACA
51-SMARTindex	CACTAATACAGTGGTATCAACGCAGAGTACA
52-SMARTindex	GGTATATACAGTGGTATCAACGCAGAGTACA
53-SMARTindex	CGCCTGTACAGTGGTATCAACGCAGAGTACA
54-SMARTindex	AATGAATACAGTGGTATCAACGCAGAGTACA
55-SMARTindex	ACAACGTACAGTGGTATCAACGCAGAGTACA
56-SMARTindex	ATATCCTACAGTGGTATCAACGCAGAGTACA
57-SMARTindex	AGTACTCAGTGGTATCAACGCAGAGTACA
58-SMARTindex	ATAAGACAGTGGTATCAACGCAGAGTACA
59-SMARTindex	GGTGAGCAGTGGTATCAACGCAGAGTACA
60-SMARTindex	TTCCGCCAGTGGTATCAACGCAGAGTACA
61-SMARTindex	GAAGTGCAGTGGTATCAACGCAGAGTACA
62-SMARTindex	CAATGCCAGTGGTATCAACGCAGAGTACA
63-SMARTindex	ACGTCTCAGTGGTATCAACGCAGAGTACA
64-SMARTindex	CAGGACCAGTGGTATCAACGCAGAGTACA
65-SMARTindex	AAGCTCCAGTGGTATCAACGCAGAGTACA
66-SMARTindex	GACGATCAGTGGTATCAACGCAGAGTACA
67-SMARTindex	TCGTTCCAGTGGTATCAACGCAGAGTACA
68-SMARTindex	CCAATTCAGTGGTATCAACGCAGAGTACA
69-SMARTindex	AGTTGACAGTGGTATCAACGCAGAGTACA
70-SMARTindex	AACCGACAGTGGTATCAACGCAGAGTACA
71-SMARTindex	CAGATGCAGTGGTATCAACGCAGAGTACA
72-SMARTindex	GTAGAACAGTGGTATCAACGCAGAGTACA
73-SMARTindex	GACATCACAGTGGTATCAACGCAGAGTACA
74-SMARTindex	CGATCTACAGTGGTATCAACGCAGAGTACA
75-SMARTindex	CGTCGCACAGTGGTATCAACGCAGAGTACA
76-SMARTindex	ATGGCGACAGTGGTATCAACGCAGAGTACA
77-SMARTindex	ATTGGTACAGTGGTATCAACGCAGAGTACA
78-SMARTindex	GCCACAACAGTGGTATCAACGCAGAGTACA
79-SMARTindex	CATCTAACAGTGGTATCAACGCAGAGTACA
80-SMARTindex	AACAAGACAGTGGTATCAACGCAGAGTACA
81-SMARTindex	GCAGCCTCAGTGGTATCAACGCAGAGTACA
82-SMARTindex	ACTCTTTCAGTGGTATCAACGCAGAGTACA
83-SMARTindex	TGCTATTCAGTGGTATCAACGCAGAGTACA
84-SMARTindex	AAGTGGTCAGTGGTATCAACGCAGAGTACA
85-SMARTindex	CTCATATCAGTGGTATCAACGCAGAGTACA
86-SMARTindex	CCGACCTCAGTGGTATCAACGCAGAGTACA
87-SMARTindex	GGCCAATCAGTGGTATCAACGCAGAGTACA

88-SMARTindex	AGACCATCAGTGGTATCAACGCAGAGTACA
89-SMARTindex	CGCGGACAGTGGTATCAACGCAGAGTACA
90-SMARTindex	CCTGCTCAGTGGTATCAACGCAGAGTACA
91-SMARTindex	GCGCTGCAGTGGTATCAACGCAGAGTACA
92-SMARTindex	GAACCTCAGTGGTATCAACGCAGAGTACA
93-SMARTindex	TTCGAGCAGTGGTATCAACGCAGAGTACA
94-SMARTindex	AGAATCCAGTGGTATCAACGCAGAGTACA
95-SMARTindex	AGGCATCAGTGGTATCAACGCAGAGTACA
96-SMARTindex	ACACGCCAGTGGTATCAACGCAGAGTACA

Supplementary Table 1. Top table. Sequences of oligonucleotides used for priming cDNA synthesis and for amplification of V_L and V_H domains. Bottom table. Sequences of oligonucleotides used to barcode samples.

Supplementary Table 2. List of R-mAbs successfully cloned via sequence-based cloning.

R-mAb	Target	R-mAb	Target	R-mAb	Target	R-mAb	Target
1D8	LRRK2/Dardarin-pSer910	L114/3	Parvalbumin	N133/35	RGS14	N358/68	5-formylcytidine
1F1	TrpC1	L114/38	Parvalbumin	N134/12	Nav1.8 Na ⁺ channel	N360A/24	ATF4
62-3G1	GABA(A)R, Beta2/3	L114/81	Parvalbumin	N138/6	LRRK2/Dardarin, N-terminus	N363/71	Kir6.2 K ⁺ channel
8G10	LRRK2/Dardarin, N-terminus	L115/13	NPY Neuropeptide Y	N140A/12	SALM5/LRFN5	N364/10	Bral1
A12/18	Pan-Neurofascin (extracellular)	L117/1	IRSp53/BAIAP2	N141/21	HCN3	N364/42	Bral1
D4/11	Kv2.1 K ⁺ channel	L117/52	IRSp53/BAIAP2	N141/28	HCN3	N366/60	Kir6.1 K ⁺ channel
D4/154	Kv2.1 K ⁺ channel	L118/14	VGAT	N142/28	GRK6A/B	N367/51	Shank1 and Shank3
D4/40	Kv2.1 K ⁺ channel	L118/80	VGAT	N143/36	CDY1/2/L1/L2	N367/62	Shank3
K14/39	Kv1.2 K ⁺ channel	L118/135	VGAT	N143/38	CDY1/2	N372A/1	Kv2.2 K ⁺ channel
K19/46	Kv1.6 K ⁺ channel	L119/106	NPY2R Neuropeptide Y receptor type 2	N144/14	6xHis	N372B/1	Kv2.2 K ⁺ channel
K28/25	PSD-95 + PSD-93	L119/134*	NPY2R Neuropeptide Y receptor type 2	N144/17	Gamma-protocadherin-A3	N372B/60	Kv2.2 K ⁺ channel
K28/27	PSD-95	L120/12	Collybistin	N144/32	Pan-Gamma-protocadherin-A	N372C/51	Kv2.2 K ⁺ channel
K28/38	PSD-95	L120/30	Collybistin	N145/20	Pan-GRK	N374/48	TASK1 K ⁺ channel
K28/42	PSD-95 + PSD-93	L121/25	nNOS/NOS1	N148/30	Gamma-protocadherin-B2	N375/67	Kv3.3 K ⁺ channel
K28/58	PSD-95	L121/42	nNOS/NOS1	N152B/23	VDAC1	N377/20	MAP3K12
K28/74	PSD-95	L121/133	nNOS/NOS1	N154/32	JMJD2A	N377/83	MAP3K12
K28/86	Pan-MAGUK	L121/136	nNOS/NOS1	N155/9	Uncx	N37A/10	Kv7.1/KCNQ1 K ⁺ channel
K28/94	PSD-95	L122/6	Calretinin	N158/28	Histone H3.3	N380/87	CLN3
K40/17	Pan-Kvbeta K ⁺ channel	L122/68	Calretinin	N159/5	Pan-Gamma-protocadherin-Constant	N382/14	MFF
K47/9	Kvbeta1.2/KCNA B1 K ⁺ channel	L122/144	Calretinin	N160/21	SynDIG3/Tmem91	N382/69	MFF (exon 1)
K47/42	Kvbeta1.2/KCNA B1 K ⁺ channel	L123/46	GABA(A)R, Theta	N161/20	NKCC1	N384/63	Miro2
K55/7*	KChIP1 K ⁺ channel	L124/59	Bassoon	N165/38	LAR/PTPRF	N385/21	Beta1-spectrin
K55/29	KChIP1 K ⁺ channel	L125/121	Synapsin-3	N165/43	Pan-PTPR	N388A/27	Ankyrin-R/G
K55/82	Pan-KChIP K ⁺ channel	L125/129	Pan-Synapsin	N166A/26	OCRL/INPP5b	N389/9	TRAK1
K56A/50	CASK	L125/76	SAPAP3	N170A/26	Neurexin-1-Beta	N390/43	TRAK2
K56A/57	CASK	L126/93	SAPAP3	N173B/13	Tafazzin	N391/68	WNK1
K57/27	Kv4.2 K ⁺ channel (external)	L127/8	GAD67	N180/41	EAAC1	N393/2	Beta4-spectrin
K57/41	Kv4.2 K ⁺ channel (external)	L127/12	GAD65/67	N183/15	QKI-7	N393/76	Beta4-spectrin
K60/73	KChIP2b K ⁺ channel	L130/1	Tiam1	N185/7	NALCN	N395/68	Navbeta2 Na ⁺ channel
K60/87**	KChIP2b K ⁺ channel	L131/17	SPHKAP	N186/29	Dopamine D2 receptor	N396/29	Navbeta3 Na ⁺ channel
K65/35	CASPR/Neurexin IV	L131/20	SPHKAP	N191/7	Fratxin	N397/19	Nav1.5 Na ⁺ channel
K65A/2	CASPR/Neurexin IV	L131/27	SPHKAP	N192/12	Gs protein, alpha subunit	N398A/34	GABA(A)R, Alpha4
K66/27	KChIP3 K ⁺ channel	L132/18	Cav1.2 Ca ²⁺ channel pS1928	N194/11	QKI-7b	N399/19	GABA(A)R, Alpha2
K66/59	KChIP3 K ⁺ channel	L132/37	Cav1.2 Ca ²⁺ channel pS1928	N202/7	Fig4/Sac3	N400/24	CLN6
K67/11	CASPR2	N1/12	KCC2	N206A/8	GFAP	N402/13	Thyroid hormone receptor beta1

K67/25	CASPR2	N4/15	PINK1	N207/27	LRP4 (extracellular)	N402/46	Thyroid hormone receptor beta1
K69/3*	Nav1.2 Na+ channel	N4/49	PINK1	N209C/35	LRRTM2	N403/63	Pan-Thyroid hormone receptor
K69/33	Nav1.2 Na+ channel	N6/38	VACHT	N210/5	PhyH/PAHX	N405/74	Navbeta1 Na+ channel
K73/20	Contactin/F3	N10/7	Cavbeta4 Ca2+ channel	N212/7	TRIP8b (constant)	N406/47	Cln5
K74/53	Nav1.1 Na+ channel	N15/4	TrpV3	N212A/34	TRIP8b (exon 1b)	N408/79	Npas4
K75/18	Kv4.3 K+ channel	N15/39	TrpV3	N219/5	RBM17/SPF45	N410/17	Kv3.2 K+ channel
K75/30	Kv4.3 K+ channel	N18/28	PSD-93/Chapsyn-110	N221/12	TrpV1	N411/51	Arx
K78/29	SK2 K+ channel	N18/30	PSD-93/Chapsyn-110	N221/17	TrpV1	N414/25	NCKX4
K87A/10	Nav1.6 Na+ channel	N19/2	SAP102	N225A/10	FGF13/FHF2, B isoform	N416/57	GluN3A/NR3A glutamate receptor
K89/41	Kv2.1 K+ channel	N22/21	Shank1	N227/21	MECP2	N420/24	EAAC1
K96/7	Pancortin	N23B/6	Shank2	N228A/16	Lhx6.1	N421A/85	ANO5/TMEM16E
L6/48	Slo1/BKAlpha maxi-K+ channel	N25/35	Kir2.3 K+ channel	N229A/32	GABA(A)R, Alpha6	N422/18	GluN2C/NR2C glutamate receptor
L6/60	Slo1/BKAlpha maxi-K+ channel	N26A/23	Kv7.2/KCNQ2 K+ channel	N231B/34	LRRK2/Dardarin, N3 (non-mouse-reactive)	N423/75	KChIP4 K+ channel
L21/32	GluA2/GluR2 glutamate receptor	N38/8	Cav1.3 Ca2+ channel	N232/9	PEX7	N424/45	Glycine receptor Alpha3
L23/27	Kv1.3 K+ channel	N39B/8	GIT1	N233/8	PEX6	N424/48*	Glycine receptor Alpha3L
L24/1	IP3 receptor, type 1	N43/6	Kv7.4/KCNQ4 K+ channel	N238/29	SAPAP1	N425/45	VACHT
L24/11	IP3 receptor, type 1	N46/30	ADAM22 (cytoplasmic)	N238/30	SAPAP1	N428/12	WRN
L24/18	IP3 receptor, type 1	N49A/21	NGL-1/LRRC4C	N238/31	SAPAP1/2	N429/19	ANO6/TMEM16F
L24/19	IP3 receptor, type 1	N50/36	NGL-2/LRRC4	N241A/34	LRRK2/Dardarin, C-terminus	N431/64	GABA(A)R, Pi
L24/21	IP3 receptor, type 1	N52B/27	SALM2/LRFN1	N241A/72	LRRK2/Dardarin, C-terminus	N432/21	VSP
L28/36	Kv4.2 K+ channel	N53/32	BKbeta2 K+ channel	N245/1	TARPGamma2/Stargazin	N432/63	VSP
L45/30	SynCAM1	N55/10	Cav3.2 Ca2+ channel	N245/36	TARPGamma2/4/8	N440/21	VMAT1
L48A/9	Cav1.3 Ca2+ channel	N56/9	S-tag	N245/44	Thioredoxin	N440/61	VMAT1
L48A/29	Cav1.3 Ca2+ channel	N56/21	FGF14/FHF4	N250/21	DNAH7	N441/35	ADAM11
L48A/31	Cav1.3 Ca2+ channel	N57/2	ADAM22 (extracellular)	N251/14	DNAH1	N442/28	Alg13
L57/23	Cav1.2/1.3 Ca2+ channel	N59/20	GluN2B/NR2B glutamate receptor	N253/32	Notch1	N444/63	AGPS neo-epitope
L57/46	Cav1.2/1.3 Ca2+ channel	N64A/36	TrpC7	N255/38	Nav1.4 Na+ channel	N445/27	TRAAK K+ channel
L57/47	Cav1.2/1.3 Ca2+ channel	N67/15	TrpC5	N263/31	Cav1.2 Ca2+ channel	N446/80	CELF4/BRUNO L4
L58A/6	Kv2.1 K+ channel	N68/6	Nav1.7 Na+ channel	N270/47	Synaptotagmin-6	N447/24	Kv11.3 K+ channel
L61C/30	Kv2.1 K+ channel	N71/37	HCN2	N271/44	ASIC1	N448/88	Kv8.2 K+ channel
L62/29	Copper ATPase 2 (Wilson's disease protein)	N72/16	Kv3.4 K+ channel	N274/8	Synaptotagmin-5	N449/73	VMAT2
L64/32	Kv1.2 K+ channel	N74/25	TrpM7	N275/14	Synaptotagmin-7	N450/53*	BDNF
L71/5	Kv1.4 K+ channel (extracellular)	N75/3	mGluR1/5 (Group I) glutamate receptor	N276A/15	Synaptotagmin-9	N451/73	ICK
L71/22	Kv1.4 K+ channel (extracellular)	N75/33	mGluR1/5 (Group I) glutamate receptor	N283/7	Lgi1	N452/30	GABA(A)R, Gamma2L/S
L76/36	Kv1.2 K+ channel	N77/15	TrpC4	N286/74	Zebrafish PSD Marker	N452/69	GABA(A)R, Gamma2L

L80/21	Kv2.1 K+ channel	N81/2	GABA(B)R2	N290B/25	ARHGAP4	N452/73	GABA(A)R, Gamma2L/S
L83/11	Kv2.1 K+ channel	N86/20	GFP	N294A/10	Brevican	N452/81	GABA(A)R, Gamma2L/S
L83/81	Kv2.1 K+ channel	N86/44	GFP	N294A/6	Brevican	N454/91	ANO3/TMEM16C
L86/2	AMIGO-1	N86/8	GFP	N295B/54	Arl13b	N455/15	Kir3.3 K+ channel
L86/14	AMIGO-1	N87/25	GABA(A)R, Beta3	N302/10	BBS3/Arl6	N456/39	Proser1
L86/33*	AMIGO-1	N92/14	FGF11/FHF3	N304B/115	BBS5	N458/10	Kv6.4 K+ channel
L86/36	AMIGO-1	N95/35	GABA(A)R, Alpha1	N307/12	Histone H3-acetyl-Lys56	N459/84	SAPAP2
L100/1	Kv2.1 K+ channel pS586	N98/47	Neuroigin-4	N308/48	GluN1/NR1 glutamate receptor	N460/19	Kv9.2 K+ channel
L102/45	SynDIG4/Prnt1	N100/13	GST	N309A/21	Histone H4-dimethyl-Arg3	N461/19	Kv9.1 K+ channel
L106/4	Gephyrin	N104/37	SNAT1	N312/10	NSD1	N463/52*	DEPDC5
L106/22	Gephyrin	N105/13	Ankyrin-B	N319A/14	SUR2A	N465/11	Kir2.4 K+ channel
L106/23	Gephyrin	N105/17	Ankyrin-B	N323A/31	SUR1 and SUR2B	N467/1	TRESK potassium channel
L106/83	Gephyrin	N106/20	Ankyrin-G	N324/2	Rem2	N468/37	THIK-2 potassium channel
L107/39	Neuroigin-2	N106/36*	Ankyrin-G	N325B/65	THAP1	N470/22	TRPM6
L107/90*	Neuroigin-2	N106/65	Ankyrin-G (staining)	N326D/2	REEP2	N471/27	Kv1.7 K+ channel
L107/93	Neuroigin-2	N112/16	Kir2.1 K+ channel	N326D/13	REEP	N472/88	MIRP4 K+ channel
L107/95	Neuroigin-2	N112B/14	Kir2.1 K+ channel	N327/95	GluN2A/NR2A glutamate receptor	N473/36	Cavbeta3 Ca2+ channel
L109/39	Calbindin	N112B/29	Kir2.1 K+ channel	N327A/38	GluN2A/NR2A glutamate receptor	N476/9	ZIP3
L109/57	Calbindin	N119/44	MPP8	N330A/80	Alpha-2C adrenergic receptor	N479/107	VAPA/B
L109/62	Calbindin	N121A/1	Pannexin-2	N332B/15	BAF53b	N479/12	VAPA
L113/13	Homer1L	N123/19	Histone H3-pThr11	N336B/83	BAF53a	N479/22	VAPA
L113/26	Homer1L	N123/48	Histone H3-pThr11	N341/12	LRRK1	N483/26	Rufy3
L113/27	Homer1L	N125/10	Thorase/Atad1	N343/26	NrCAM	N483/84	Rufy3
L113/28	Homer1L	N126B/31	Neuregulin-CRD (Cysteine-rich domain, Type III)	N345/51	REEP1	N483/126	Rufy3
L113/29	Homer1L	N128A/2	Haspin/GSG2	N347/42	ATAT1	N485/22	Prnt2
L113/44	Homer1L	N128A/4	Maltose binding protein (MBP)	N349/96	Foxi2	N486/25	c-Fos
L113/62	Homer1L/S	N129/15	Mad3 (human)	N356/9	SVOP	N486/32	c-Fos
L113/130	Homer1L/S	N132A/12	KLH	N357/6*	PINK1	N486/76	c-Fos

Supplementary Table 2. List of R-mAbs and their targets that were successfully cloned into the IgG2a mammalian expression plasmid using the sequence-based Gibson Assembly cloning method. * cloned from hybridomas with more than two V_L sequences. ** cloned from a hybridoma with two V_L and two V_H sequences.

Supplementary Table 3. List of R-mAbs successfully transferred to IgG subclass-switched expression plasmids.

Transferred to IgG2b Expression Plasmid				Transferred to IgG1 Expression Plasmid	
R-mAb	Target	R-mAb	Target	R-mAb	Target
A12/18	Pan-Neurofascin (extracellular)	N59/20	GluN2B/NR2B glutamate receptor	A12/18	Pan-Neurofascin (extracellular)
K7/45	Kv1.5 K+ channel	N59/36	GluN2B/NR2B glutamate receptor	K20/78	Kv1.1 K+ channel
K13/31	Kv1.4 K+ channel	N68/6	Nav1.7 Na+ channel	K28/43	PSD-95
K14/16	Kv1.2 K+ channel	N69/46	Shank3	K57/1	Kv4.2 K+ channel (external)
K17/70	Kvbeta2 K+ channel	N70/28	HCN1	K65/35	CASPR/Neurexin IV
K20/78	Kv1.1 K+ channel	N76/8	Ataxin-1, 11NQ	K75/41	Kv4.3 K+ channel
K28/43	PSD-95	N86/38	GFP	L108/92	VIP
K39/25	Kv2.1 K+ channel (external)	N86/8	GFP	L109/39	Calbindin
K57/1	Kv4.2 K+ channel (external)	N97A/31	Neuroigin-1	L113/130	Homer1L/S
K64/15	SAP97	N106/36	Ankyrin-G	L113/27	Homer1L
K65/35	CASPR/Neurexin IV	N110/29	Neuroigin-3	L118/80	VGAT
K66/38	KChIP3 K+ channel	N112B/14	Kir2.1 K+ channel	L122/6	Calretinin
K74/71	Nav1.1 Na+ channel	N114/10	HCN4	L122/68	Calretinin
K75/41	Kv4.3 K+ channel	N133/21	RGS14	L127/12	GAD65 + GAD67
K89/34	Kv2.1 K+ channel	N133/35	RGS14	L21/32	GluA2/GluR2 glutamate receptor
L6/60	Slo1/BKAlpha maxi-K+ channel	N134/12	Nav1.8 Na+ channel	L6/60	Slo1/BKAlpha maxi-K+ channel
L21/32	GluA2/GluR2 glutamate receptor	N149/25	Olig1	L86/33	AMIGO-1
L28/4	Kv4.2 K+ channel	N151/3	GABA(A)R, Delta	N1/12	KCC2
L57/46	Cav1.2/1.3 Ca2+ channel	N168/6	Navbeta4 Na+ channel	N86/8	Nav1.7 Na+ channel
L60/4	Copper ATPase 1 (Menke's disease protein)	N170A/1	Neurexin-1-Beta	N106/36	Ankyrin-G
L86/33	AMIGO-1	N178A/9	Cav3.1 Ca2+ channel	N112B/14	Kir2.1 K+ channel
L86/36	AMIGO-1	N182/17	QKI-6	N133/21	RGS14
L106/83	Gephyrin	N196/16	PARIS/ZNF746	N134/12	Nav1.8 Na+ channel
L107/39	Neuroigin-2	N201/35	Iduna/RNF146	N149/25	Olig1
L108/92	VIP	N206A/8	GFAP	N170A/1	Neurexin-1-Beta
L109/39	Calbindin	N212/17	TRIP8b (constant)	N206A/8	GFAP
L113/27	Homer1L	N241A/34	LRRK2/Dardarin, C-terminus	N241A/34	LRRK2/Dardarin, C-terminus
L113/130	Homer1L/S	N244/5	SynCAM4	N263/31	Cav1.2 Ca2+ channel
L114/3	Parvalbumin	N263/31	Cav1.2 Ca2+ channel	N28/9	VGluT1
L115/13	NPY/Neuropeptide Y	N289/16	SUR1	N29/29	VGluT2
L118/80	VGAT	N295B/66	Arl13b	N295B/66	Arl13b
L122/6	Calretinin	N308/48	GluN1/NR1 glutamate receptor	N308/48	GluN1/NR1 glutamate receptor
L122/68	Calretinin	N327/95	GluN2A/NR2A glutamate receptor	N327/95	GluN2A/NR2A glutamate receptor
L127/8	GAD67	N355/1	GluA1/GluR1 glutamate receptor	N355/1	GluA1/GluR1 glutamate receptor
L127/12	GAD65/67	N410/17	Kv3.2 K+ channel	N410/17	Kv3.2 K+ channel
N1/12	KCC2	N425/45	VACHT	N425/45	VACHT
N3/26	KCNT1/Slo2.2/Slack K+ channel			N52A/42	Mortalin/GRP75
N6/38	VACHT			N59/20	GluN2B/NR2B glutamate receptor
N7/18	Cavbeta1 Ca2+ channel			N59/36	GluN2B/NR2B glutamate receptor
N11/33	KCNT2/Slo2.1/Slick K+ channel			N6/38	VACHT
N28/9	VGlut1			N68/6	Nav1.7 Na+ channel
N29/29	VGluT2			N70/28	HCN1
N52A/42	Mortalin/GRP75			N86/38	GFP

Supplementary Table 3. List of R-mAbs and their targets that were successfully transferred from the IgG2a mammalian expression plasmid into either an IgG2b and/or IgG1 mammalian expression plasmid using restriction digest/ligation-based cloning.

Supplementary Table 4. List of scFvs successfully cloned via sequence-based cloning.

scFv	Target	Plasmid	Tags	scFv	Target	Plasmid	Tags
1D8	LRRK2/Dardarin-pSer910	pcDNA3.4	HA sortase His	N67/15	TrpC5	pcDNA3.4	HA sortase His
A12/18	Pan-Neurofascin (extracellular)	pcDNA3.1	sortase His	N68/6	Nav1.7 Na channel	pcDNA3.1	sortase His
A12/18	Pan-Neurofascin (extracellular)	pcDNA3.1	HA sortase His	N69/46	Shank3	pcDNA3.4	HA sortase His
K7/45	Kv1.5 K channel	pcDNA3.4	HA sortase His	N86/20	GFP	pcDNA3.4	HA sortase His
K14/16	Kv1.2 K channel	pcDNA3.1	HA His	N86/38	GFP	pcDNA3.1	HA His
K17/70	Kvbeta2/KCNAB2 K channel	pcDNA3.4	HA sortase His	N86/44	GFP	pcDNA3.4	HA sortase His
K20/78	Kv1.1 K channel	pcDNA3.1	sortase His	N93A/49	GABA(B)R1	pcDNA3.4	HA sortase His
K20/78	Kv1.1 K channel	pcDNA3.1	HA sortase His	N100/13	GST	pcDNA3.4	HA sortase His
K28/38	PSD-95	pcDNA3.4	HA sortase His	N103/31	Aldh1L1	pcDNA3.1	sortase His
K28/42	PSD-95 PSD-93	pcDNA3.4	HA sortase His	N103/31	Aldh1L1	pcDNA3.1	HA sortase His
K28/43	PSD-95	pcDNA3.4	HA His	N105/13	Ankyrin-B	pcDNA3.4	HA sortase His
K28/43	PSD-95	pcDNA3.1	HA Flag sortase	N105/17	Ankyrin-B	pcDNA3.4	HA sortase His
K28/74	PSD-95	pcDNA3.4	HA sortase His	N106/20	Ankyrin-G	pcDNA3.4	HA sortase His
K39/25	Kv1.2 K channel (extracellular)	pcDNA3.4	HA His	N114/10	HCN4	pcDNA3.1	HA sortase His
K56A/50	CASK	pcDNA3.4	HA sortase His	N125/10	Thorase/Atad1	pcDNA3.4	HA sortase His
K56A/57	CASK	pcDNA3.4	HA sortase His	N126B/31	Neuregulin-CRD (Cysteine-rich domain, Type III)	pcDNA3.4	HA sortase His
K60/73	KChIP2b K channel	pcDNA3.4	HA sortase His	N129/15	Mad3 (human)	pcDNA3.4	HA sortase His
K65/35	CASPR/Neurexin IV	pcDNA3.1	sortase His	N133/21	RGS14	pcDNA3.1	sortase His
K66/27	KChIP3 K channel	pcDNA3.4	HA sortase His	N133/35	RGS14	pcDNA3.4	HA sortase His
K66/38	KChIP3 K channel	pcDNA3.4	HA sortase His	N134/12	Nav1.8 Na channel	pcDNA3.1	sortase His
K66/59	KChIP3 K channel	pcDNA3.4	HA sortase His	N134/12	Nav1.8 Na channel	pcDNA3.1	HA sortase His
K89/34	Kv2.1 K channel	pcDNA3.4	HA His	N144/17	Gamma- protocadherin-A3	pcDNA3.4	HA sortase His

K89/34	Kv2.1 K channel	pcDNA3.1	HA Flag sortase	N144/32	Pan-Gamma- protocadherin-A	pcDNA3.4	HA sortase His
K89/34 Flag	Kv2.1 K channel	pcDNA3.4	HA His Flag	N149/25	Olig1	pcDNA3.4	HA sortase His
K89/41	Kv2.1 K channel	pcDNA3.4	HA sortase His	N151/3	GABA(A)R, Delta	pcDNA3.4	HA sortase His
K96/7	Pancortin	pcDNA3.4	HA sortase His	N159/5	Pan-Gamma- protocadherin- Constant	pcDNA3.4	HA sortase His
L11A/41	Pan-Neurofascin	pcDNA3.4	HA sortase His	N160/21	SynDIG3/Tmem91	pcDNA3.4	HA sortase His
L23/27	Kv1.3 K channel	pcDNA3.1	HA sortase His	N170A/1	Neurexin-1-Beta	pcDNA3.1	HA sortase His
L24/1	IP3 receptor, type 1	pcDNA3.4	HA sortase His	N170A/26	Neurexin-1-Beta	pcDNA3.4	HA sortase His
L48A/9	Cav1.3 Ca2 channel	pcDNA3.4	HA sortase His	N183/15	QKI-7	pcDNA3.4	HA sortase His
L61C/30	Kv2.1 K channel	pcDNA3.4	HA sortase His	N185/7	NALCN	pcDNA3.4	HA sortase His
L71/5	Kv1.4 K channel (extracellular)	pcDNA3.4	HA sortase His	N196/16	PARIS/ZNF746	pcDNA3.4	HA sortase His
L76/36	Kv1.2 K channel	pcDNA3.4	HA sortase His	N201/35	Iduna/RNF146	pcDNA3.4	HA sortase His
L83/11	Kv2.1 K channel	pcDNA3.4	HA sortase His	N206A/8	GFAP	pcDNA3.1	sortase His
L86/33	AMIGO-1	pcDNA3.4	HA sortase His	N207/27	LRP4 (extracellular)	pcDNA3.4	HA sortase His
L107/39	Neuroigin-2	pcDNA3.1	sortase His	N212/17	TRIP8b (constant)	pcDNA3.4	HA sortase His
L107/90	Neuroigin-2	pcDNA3.4	HA sortase His	N221/17	TRIP8b (constant)	pcDNA3.1	sortase His
L107/95	Neuroigin-2	pcDNA3.4	HA sortase His	N212A/34	TRIP8b (exon 1b)	pcDNA3.4	HA sortase His
L109/57	Calbindin	pcDNA3.4	HA His	N221/17	TrpV1	pcDNA3.4	HA sortase His
L113/13	Homer1L	pcDNA3.1	sortase His	N225A/10	FGF13/FHF2, B isoform	pcDNA3.4	HA sortase His
L113/13	Homer1L	pcDNA3.1	HA sortase His	N241A/34	LRRK2/Dardarin, C- terminus	pcDNA3.1	sortase His
L113/130	Homer1L/S	pcDNA3.1	sortase His	N263/31 LC1	Cav1.2 Ca2 channel	pcDNA3.4	HA His
L113/130	Homer1L/S	pcDNA3.1	HA sortase His	N270/47	Synaptotagmin-6	pcDNA3.4	HA sortase His
L113/27	Homer1L	pcDNA3.1	sortase His	N276A/15	Synaptotagmin-9	pcDNA3.4	HA sortase His
L113/27	Homer1L	pcDNA3.1	HA sortase His	N289/16	SUR1	pcDNA3.4	HA sortase His

L113/28	Homer1L	pcDNA3.4	HA sortase His	N295B/66	Arl13b	pcDNA3.1	HA His
L113/44	Homer1L	pcDNA3.4	HA sortase His	N355/1	GluA1/GluR1 glutamate receptor	pcDNA3.1	sortase His
L114/3	Parvalbumin	pCDNA3.4	HA His	N363/71	Kir6.2 K channel	pcDNA3.4	HA sortase His
L114/3 Flag	Parvalbumin	pcDNA3.4	HA His Flag	N366/60	Kir6.1 K channel	pcDNA3.4	HA sortase His
L114/81	Parvalbumin	pCDNA3.4	HA His	N367/51	Shank1 and Shank3	pcDNA3.4	HA sortase His
L115/13	NPY/Neuropeptide Y	pcDNA3.1	sortase His	N372B/1	Kv2.2 K channel	pcDNA3.4	HA sortase His
L115/13	NPY/Neuropeptide Y	pcDNA3.1	HA sortase His	N372B/60	Kv2.2 K channel	pcDNA3.4	HA sortase His
L117/1	IRSp53/BAIAP2	pcDNA3.1	sortase His	N375/67	Kv3.3 K channel	pcDNA3.4	HA sortase His
L117/1	IRSp53/BAIAP2	pcDNA3.1	HA sortase His	N393/2	Beta4-spectrin	pcDNA3.4	HA sortase His
L118/14	VGAT	pcDNA3.4	HA sortase His	N398A/34	GABA(A)R, Alpha4	pcDNA3.4	HA sortase His
L120/12	Collybistin	pcDNA3.1	sortase His	N399/19	GABA(A)R, Alpha2	pcDNA3.4	HA sortase His
L121/133	nNOS/NOS1	pcDNA3.4	HA sortase His	N402/46	Thyroid hormone receptor beta1	pcDNA3.4	HA sortase His
L121/136	nNOS/NOS1	pcDNA3.4	HA sortase His	N403/63	Pan-Thyroid hormone receptor	pcDNA3.4	HA sortase His
L122/6	Calretinin	pCDNA3.4	HA His	N414/25	NCKX4	pcDNA3.4	HA sortase His
L122/68	Calretinin	pcDNA3.1	sortase His	N422/18	GluN2C/NR2C glutamate receptor	pcDNA3.4	HA sortase His
L124/59	Bassoon	pcDNA3.1	sortase His	N432/21	VSP	pcDNA3.4	HA sortase His
L124/59	Bassoon	pcDNA3.1	HA sortase His	N432/63	VSP	pcDNA3.4	HA sortase His
L125/129	Pan-Synapsin	pcDNA3.1	sortase His	N448/88	Kv8.2 K channel	pcDNA3.4	HA sortase His
L127/8	GAD67	pcDNA3.1	sortase His	N449/73	VMAT2	pcDNA3.4	HA sortase His
L130/1	Tiam1	pcDNA3.4	HA sortase His	N452/73	GABA(A)R, Gamma2L/S	pcDNA3.1	sortase His
L131/17	SPHKAP	pcDNA3.4	HA sortase His	N452/73	GABA(A)R, Gamma2L/S	pcDNA3.1	HA sortase His
L131/20	SPHKAP	pcDNA3.4	HA sortase His	N452/81	GABA(A)R, Gamma2L/S	pcDNA3.1	sortase His
L131/27	SPHKAP	pcDNA3.4	HA sortase His	N452/81	GABA(A)R, Gamma2L/S	pcDNA3.1	HA sortase His

N1/12	KCC2	pcDNA3.1	HA sortase His	N471/27	Kv1.7 K channel	pcDNA3.4	HA sortase His
N16B/8	Kv3.1b K channel	pcDNA3.1	sortase His	N479/107	VAPA/B	pcDNA3.4	HA sortase His
N18/28	PSD-93/Chapsyn-110	pcDNA3.4	HA sortase His	N479/12	VAPA	pcDNA3.4	HA sortase His
N22/21	Shank1	pcDNA3.4	HA sortase His	N483/26	Rufy3	pcDNA3.4	HA sortase His
N23B/6	Shank2	pcDNA3.4	HA sortase His	N483/84	Rufy3	pcDNA3.4	HA sortase His
N23B/49	Pan-Shank	pcDNA3.1	HA sortase His	N483/126	Rufy3	pcDNA3.1	sortase His
N28/9	VGlut1	pcDNA3.1	HA His	N483/126	Rufy3	pcDNA3.1	HA sortase His
N28/9 Flag	VGlut1	pcDNA3.4	HA His Flag	N486/32	c-Fos	pcDNA3.4	HA His
N29/29	VGlut2	pcDNA3.1	HA His	N486/76	c-Fos	pcDNA3.4	HA sortase His
N43/6	Kv7.4/KCNQ4 K channel	pcDNA3.4	HA sortase His	N112B/29	Kir2.1 K+ channel	pcDNA3.4	HA sortase His
N53/32	BKbeta2 K channel	pcDNA3.4	HA sortase His	N140A/12	SALM5/LRFN5	pcDNA3.4	HA sortase His
N52A/42	Mortalin/GRP75	pcDNA3.1	HA His	N155/9	Uncx	pcDNA3.4	HA sortase His
N52B/27	SALM2/LRFN1	pcDNA3.4	HA sortase His	N294A/6	Brevican	pcDNA3.4	HA sortase His
N59/20	GluN2B/NR2B glutamate receptor	pcDNA3.1	sortase His	N312/10	NSD1	pcDNA3.4	HA sortase His
N59/20	GluN2B/NR2B glutamate receptor	pcDNA3.1	HA sortase His	N411/51	Arx	pcDNA3.4	HA sortase His
N59/36	GluN2B/NR2B glutamate receptor	pcDNA3.1	HA sortase His	N416/57	GluN3A/NR3A glutamate receptor	pcDNA3.4	HA sortase His
N59/36	GluN2B/NR2B glutamate receptor	pcDNA3.1	HA His	N424/45	Glycine receptor Alpha3	pcDNA3.4	HA sortase His
D4/154	Kv2.1 K+ channel	pcDNA3.4	HA sortase His	N428/12	WRN	pcDNA3.4	HA sortase His
K57/41	Kv4.2 K+ channel (external)	pcDNA3.4	HA sortase His	N452/30	GABA-A-R-Gamma2L/S, GABRG2	pcDNA3.4	HA sortase His
L24/21	IP3R	pcDNA3.4	HA sortase His	N473/36.3	Cavbeta3 Ca2+ channel	pcDNA3.4	HA sortase His
L86/14	AMIGO-1	pcDNA3.4	HA sortase His	N485/22	Prrt2	pcDNA3.4	HA sortase His
L86/2	AMIGO-1	pcDNA3.4	HA sortase His	V_L-linker-V_H			
L106/23	Gephyrin	pcDNA3.4	HA sortase His	L6/60	Slo1/BKAlpha maxi-K channel	pcDNA3.4	HA sortase His

L114/38	Parvalbumin	pcDNA3.4	HA sortase His	N86/8	GFP	pcDNA3.4	HA sortase His
L122/144	Calretinin	pcDNA3.4	HA sortase His	N95/35	GABA(A)R, Alpha1	pcDNA3.4	HA sortase His
L123/46	GABA(A)R, Theta	pcDNA3.4	HA sortase His	N106/36	Ankyrin-G	pcDNA3.4	HA sortase His
N7/18	Cavbeta1 Ca ²⁺ channel	pcDNA3.4	HA sortase His	N112B/14	Kir2.1 K channel	pcDNA3.4	HA sortase His
N56/21	FGF14a	pcDNA3.4	HA sortase His	N377/20	MAP3K12	pcDNA3.1	HA sortase His
N112/16	Kir2.1 K ⁺ channel	pcDNA3.4	HA sortase His				

Supplementary Table 4. List of scFvs and their targets that were successfully cloned into either pcDNA3.1 or pcDNA3.4 mammalian expression plasmids using the sequence-based Gibson Assembly cloning method. All are in the V_H-linker-V_L format except as noted. Tags indicate the presence of HA or Flag epitope tags, a sortase labelling tag and/or the 6xHis purification tag at the C-terminus of the scFv.