

**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	<b>V<sub>L</sub>-linker-V<sub>H</sub></b>			
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 <sup>2+</sup> 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 <sup>+</sup> 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<sub>H</sub>-linker-V<sub>L</sub> 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.