Supplementary Tables and Supplementary Sequences

Supplementary Table 1.sgRNA sequences (M. musculus)

All sequences are listed in the 5'-3' direction. Spacers are listed by distance from the transcriptional start site (TSS) tothe base immediately prior to the PAM sequence. Green lines denote the sgRNAs used in Fig. 1f, h, red line denote the sgRNA used in Supplementary Fig. 3c, orange dash lines denote the sgRNAs used in sgRNA arrays. 2-6 sgRNAs were used in Supplementary Fig. 6.

Gene	Location	Sequence (5'-3')
miniCMV	-85	GTCCCCTCCACCCCACAGTG
Ascl1	-83	GCAGCCGCTCGCTGCAGCAG
Ascl1	-122	AGCTGAGGAGGTGGGGGAAG
Ascl1	-177	GAGTTTGCAAGGAGCGGGCG
Ascl1	-265	GGACTCCCGGCTGAATAAAC
Ascl1	-320	GGGGGTGGCTCTAGAAATGG
Ascl1	-387	TGCCTAGGTGGAAAGTCTGG
Ascl1	-445	GAAAATTCAGGGAAGGGTTT
Ascl1	-771	TGGGCACAACTCGCTAAGGG
Ascl1	-887	TGGTGTGGGGAAGTGTATGC
Ascl1	-921	AGGAGTGGCGGCTGTTATAG
Ascl1	-20	TGGGTGTCCCATTGAAAAGG
Ascl1	-581	GTTTGCCATTAGGTTTAGGA
Ascl1	-479	GCAAAGGGAACTCTTGGAAG
Ascl1	-234	GTTGTTGCAGTGCGTGCGCC
Ascl1	-611	GGAGAGCGTTTGCACACTAG
Ascl1	-694	GCAACCCCATATGGCTGCAG
Ascl1	-825	GACAGTTCCCTAAGAAGCTG
Ascl1	-974	GCTAGACGCTATGGGAAAGG
Ascl1	-1042	TGTGTGGAATAAAGAGTGAC
Ascl1	-1071	TGAGACAGGGAGGGACAAGG
Ascl1	-1152	GCGTGTGCCTGGCGGACCGG
Neurog2	-65	GAAAACAATCAGATCTGCCC
Neurog2	-108	CGGGGGACCAGGACAGGCGG
Neurog2	-208	AGGATGGATGGCCAGGCCAG
Neurog2	-309	CGGTAGCTTGGGCTGCAGCC
Neurog2	-405	TGTGATTGGTGGCTCGCGCT
Neurog2	-457	AGGAGGTCGCGAGGCGCAGC
Neurog2	-509	TGCTGAAAGGGAGCGGGCTC
Neurog2	-565	AGTGCTGGGGGCCCATGGCG
Neurog2	-135	TGAAAAGAATAAGCTGGGGA

Neurog2	-237	GGACGGAGGGGCGGGGGTGA
Neurog2	-76	CGGGGGAAGGGTAGGTGAGG
Neurog2	-609	GACGGGCGGGACGCGTATGG
Neurog2	-693	GAGAGTCAGAATCCCGGAGA
Neurog2	-821	GTCACGTACGTGTGCCAGAC
Neurog2	-911	CGACCAATTTCCCCTTCTAG
Neurog2	-1013	GTGAAGCCTCACTGTGTCTC
Neurog2	-1069	GGGGGCTTCTGGTGCGGAAG
Acta1	-55	ACCCAAATATGGCTTGGGAA
Acta1	-98	CCAGGCTGAGAACCAGCCGA
Acta1	-137	TCTCCTTCTTTGGTCAGTGC
Acta1	-188	TCTCCATATACGGCCTGGTC
Dkk1	-27	GCAGCCAGAGGTGGCGGTGG
Dkk1	-233	GTCCAGCTCACCTTAGAGTG
Dkk1	-345	TGAGCTTGAGTGTTCTGCTG
Dkk1	-522	GGTTTTGTGAAAAGCCCAGG
Dkk1	-124	TGGGATTTCAAAGCTTTGGG
Dkk1	-428	GAAAGCGAGGGTACTCATA
Neurod1	-59	GCTGATGCTGAGCGCGGGCG
Neurod1	-96	TGGACGCGTGCGCGATTGCG
Neurod1	-147	GCGGGAGGAAAGTTCTGGGG
Neurod1	-211	TGCCGGGGAGGAAGGAGCAG
Neurod1	-256	CGTGGTTCCCGGCTCTTGGC
Neurod1	-324	GCTCCATTCCGGCCCCTTTG
Neurod1	-368	GTCGCCAGTTAGAGACTCCG
Bcl2	-56	CGGAGAATGAAGTAAGAGGC
Bcl2	-87	TGACGTACGTACAGGAAACC
Bcl2	-186	CGCGGCGCCTTTAACCCGGG
Bcl2	-335	TGGCTCAGTGGGCGTGTGAG
Bcl2	-259	GGCCCAGCGTAGCCCGCGGG
Hbb	-108	AGAGAGTCTGGGCAAGACAG
Prdm16	-84	AGCCCCCCAATCCCGCGCCG
Prdm16	-155	CGAGCTGCGCTGAAAAGGGG
Prdm16	-221	AGTGTCCAGGGTGCGGGCCC
Prdm16	-353	AGTCGCGCAGAAACCCGCTG
Znrf3	-82	CGCCTACCCGCTCCCCTCGG
Znrf3	-152	GGGACTCAGTCGATTGGGCG
Znrf3	-199	TGGGCGGAGCAAGGGTGGAG
Rnf43	-48	TGGATTACTTTTTCGGGCTT
Rnf43	-94	GAGGACAGTAGCTCTCGTCT
Rnf43	-184	GATATTCCGTACAGAGGCGG
Rnf43	-399	GGAAACCTGTGGTTTGTAAT
Slc6a4	-46	TGCCGCCCTCCCACCGGACA
Slc6a4	-85	GCCCTGGCTGCTGTATGTGC

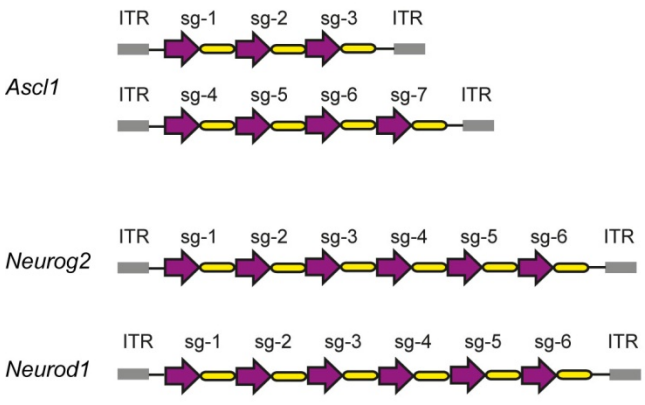
Slc6a4	-222	GCAGGACCTTAACGTAATTT
Slc6a4	-256	GTCAAGAAAGAATGCTCTTA
Miat	-35	CGTTGCTATGGCAGCGCCGC
Miat	-103	GTGCTTCTCGCTTAGGCGCC
Miat	-148	GAGAGCCAAGCACGGATACC
Miat	-241	GAGACCTCTGCCACAGACTT
Lncpint	-44	TGTTGCTGCTGCAGTCACGT
Lncpint	-109	GAGGGGCTCCTGGTGGGTGG
Fendrr	-51	GCGGCAGGCCGAGCCCATA
Fendrr	-75	AGTAGAGAAGCCCGCGGGCG
Halgr	-34	AGTCGGGACCGGCCAGTGCG
Halgr	-75	GTGGCTTCATATACCGGCGG
Slc7a11	-161	GTAGTTTGTAGGTTCACAGA
Slc7a11	-28	GAAAAATATGTCAAGGCCAC
Slc7a11	-245	AGATATGATTAGAAAGTGGT
Il10	-74	GGCAAAGGTTTTTGTTATTC
Il10	-178	GTAAGCGCTAAAGAACTGGT
Il10	-303	GACAGCTGTTCTATGTACAG
Grm2	-55	GGAGTCCGGAGGAACGGAGG
Grm2	-170	GATCTGCTGGAAGCTGCTGG
Grm2	-227	GGGGATTCAGCACCACACTG
Glut4	-50	GCGTGGCCTTTTGGGGTGTG
Glut4	-172	AGTCCAAGATTTTGGATGGC
Glut4	-234	GTGCAGCTGGTCCCCCTGAA
Glut4	-292	GGGTACGGGGTAACTCCAGC
TGFβ1	-71	AGCCCCAGGGGGAGGGCATG
TGFβ1	-152	GGGGTCCCTTCAGCCCTGCG
TGFβ1	-249	GACCAACCAAAGCGCCCCGG
Ins2	-203	GTTAAGACTCTAATTACCCT
Ins2	-300	TGTGGAAAAATGCTCAGCCA
Ins2	-351	GTCCAAGGGACAAAGATACT
Control(LacZ)		TGCGAATACGCCCACGCGAT

Supplementary Table 2: qPCR Primers (M. musculus)

Target	Forward primer (5'-3')	Reverse primer (5'-3')
Ascl1	GGAACAAGAGCTGCTGGACT	GTTTTTCTGCCTCCCCATTT
Neurog2	AACTCCACGTCCCCATACAG	GAGGCGCATAACGATGCTTCT
Acta1	CGAGGTATCCTGACCCTGAA	GAAGGAATAGCCACGCTCAG
Dkk1	TCCGTCTGCCTCCGATCATC	GCCTTTCCGTTTGTGCTTGG
Neurod1	ATGACCAAATCATACAGCGAGAG	TCTGCCTCGTGTTCCTCGT
Bcl2	ATGCCTTTGTGGAACTATATGGC	GGTATGCACCCAGAGTGATGC
Hbb-bh1	CACTTGAGATCATCTCCAAGC	TAACCCCCAAGCCCAAGGATG

Prdm16	AGATGAACCAGGCATCCACTCGAA	ACTTCCCGGCTAAGCTGTCATCAT
Znrf3	GGCGACTATACCACCCACAC	CTTCACCACTCCTACCCAGC
Rnf43	TCCGAAAGATCAGCAGAACAGA	GGACTGCATTAGCTTCCCTTC
Slc6a4	TATCCAATGGGTACTCCGCAG	CCGTTCCCCTTGGTGAATCT
Miat	GAGTGGAGAGATTTGGGAAAGGTCACG	ATCCTGAGTGGAGGAACCCTGAGGAG
Glut4	GTGACTGGAACACTGGTCCTA	CCAGCCACGTTGCATTGTAG
Lncpint	CAGGAGGGTGTTTGCCTTATAG	GTCTACCCAGCCCAGAAATAAA
Fendrr	GGCCCTGTAGTGAGGATTTATG	CACACAGAAGAGAGGCTGTATC
Halgr	GTGTAGAGAGCCGGGAAATAAA	CTGGAAAGTTTGTCCGTGTAAAG
Slc7a11	AGGGCATACTCCAGAACACG	GGACCAAAGACCTCCAGAATG
IL10	CTTACTGACTGGCATGAGGATCA	GCAGCTCTAGGAGCATGTGG
TGFβ1	CCACCTGCAAGACCATCGAC	CTGGCGAGCCTTAGTTTGGAC
Ins2	GGCTTCTTCTACACACCCAT	CCAAGGTCTGAAGGTCACCT
Grm2	CTTTGTGCGTGCCTCACTCA	TCATAACGGGACTTGTCGCTC
Gapdh	CATGGCCTTCCGTGTTCCTA	GCGGCACGTCAGATCCA

Supplementary Table3: sgRNAs target ANN factors



Ascl1

sg-1	GCAGCCGCTCGCTGCAGCAG
sg-2	AGCTGAGGAGGTGGGGGAAG
sg-3	GAGTTTGCAAGGAGCGGGCG
sg-4	GGACTCCCGGCTGAATAAAC
sg-5	GGGGGTGGCTCTAGAAATGG
sg-6	TGCCTAGGTGGAAAGTCTGG
sg-7	GAAAATTCAGGGAAGGGTTT

Neurog2

sg-1	TGTGATTGGTGGCTCGCGCT
sg-2	AGGAGGTCGCGAGGCGCAGC
sg-3	GAAAACAATCAGATCTGCCC
sg-4	CGGGGGACCAGGACAGGCGG
sg-5	AGGATGGATGGCCAGGCCAG
sg-6	CGGTAGCTTGGGCTGCAGCC

Neurod1

sg-1	CGTGGTTCCCGGCTCTTGGC
sg-2	GCTCCATTCCGGCCCCTTTG
sg-3	GCTGATGCTGAGCGCGGGCG
sg-4	TGGACGCGTGCGCGATTGCG
sg-5	GCGGGAGGAAAGTTCTGGGG
sg-6	TGCCGGGGAGGAAGGAGCAG

Supplementary Table 4: PCR primers used to evaluate the recombination possibility of sgRNA arrays

12-sgRNA-array

Target	Forward primer (5'-3')	Reverse primer (5'-3')
Grm2	GGTACCAATTCAAAAAAGCACCGACT	TAGCCATATGTTAATTAAACGCGTTTTGGTT
Ins2	CCAAACTCTAGACTTTCAAGACCTAGCT	GATCTGCTGGAAGCTGCTGG
Neurog2 *Slc6a4*	CTTCCCCCACCTCCTCAGCT	AGCTAGGTCTTGAAAGTCTAGAGTTTG
Neurod1	CTTCCCCCACCTCCTCAGCT	GCGTACTAGTGGATCCTTTTGGTTA
Ascl1	CCAAACTCTAGACTTTCAAGACCTAGCT	GCTGATGCTGAGCGCGGGCG
Il10	TCTGTGAACCTACAAACTAC	AGCTAGGTCTTGAAAGTCTAGAGTTTG
Slc7a11	GAATTCTAGGATCCTTCAAGACCTAGCT	GACAGCTGTTCTATGTACAG
Hbb-bh1	CCCAAAGCTTTGAAATCCCA	AGGATCCTAGAATTCATCGATTTTGGTTA
Dkk1	CCAAACTCTAGACTTTCAAGACCTAGCT	AGAGAGTCTGGGCAAGACAG
Neurog2 *Slc6a4*	CGATCGCATCGATTTTCAAGACCTAG	TGGGATTTCAAAGCTTTGGG

10-sgRNA-array

Target	Forward primer (5'-3')	Reverse primer (5'-3')
MiatLncpint	GTACCTTAATTAACCAAAAGGATCCACT	TAGCCATATGTTAATTAAACGCGTTTTGGTT
Neurod1	CTTCCCCCACCTCCTCAGCT	GCGTACTAGTGGATCCTTTTGGTTA
Ascl1	CCAAACTCTAGACTTTCAAGACCTAGCT	GCTGATGCTGAGCGCGGGCG
Il10	TCTGTGAACCTACAAACTAC	AGCTAGGTCTTGAAAGTCTAGAGTTTG
Slc7a11	GAATTCTAGGATCCTTCAAGACCTAGCT	GACAGCTGTTCTATGTACAG
Hbb-bh1	CCCAAAGCTTTGAAATCCCA	AGGATCCTAGAATTCATCGATTTTGGTTA
Dkk1	CCAAACTCTAGACTTTCAAGACCTAGCT	AGAGAGTCTGGGCAAGACAG
Neurog2 *Slc6a4*	CGATCGCATCGATTTTCAAGACCTAG	TGGGATTTCAAAGCTTTGGG

Supplementary Table 5, Probes for in situ Hybridization

Dkk1

ATGATGGTTGTGTGTGCAGCGGCAGCTGTCCGGTTCTTGGCCGTGTTTACAATGATGGCTCTCTGCAGCCTCCCTCTGCTAGGAGCCAGTG
CCACCTTGAACTCAGTTCTCATCAATTCCAACGCGATCAAGAACCTGCCCCCACCGCTGGGTGGTGCTGGGGGGCAGCCGGGCTCTGCTG
TCAGTGTGGCGCCGGGAGTTCTCTATGAGGGCGGGAACAAGTACCAGACTCTTGACAACTACCAGCCCTACCCTTGCGCTGAAGATGAGG
AGTGCGGCTCTGACGAGTACTGCTCCAGCCCCAGCCGCGGGGCAGCCGGCGTCGGAGGTGTACAGATCTGTCTGGCTTGCCGAAAGCGC
AGGAAGCGCTGCATGAGGCACGCTATGTGCTGCCCCGGGAACTACTGCAAAAATGGGAATATGCATGCCCTCTGACCACAGCCATTTTCCT
CGAGGGGAAATTGAGGAAAGCATCATTGAAAACCTTGGTAATGACCACAACGCCGCCGCGGGGGATGGATATCCCAGAAGAACCACACTG
ACTTCAAAAATATATCACACCAAAGGGACAAGAAGGCTCCGTCTGCCTCCGATCATCAGACTGTGCCGCAGGGCTGTGTTGTGCAAGACAC
TTCTGGTCCAAGATCTGTAAACCTGTCCTTAAAGAAGGTCAGGTGTGCACCAAGCACAAACGGAAAGGCTCCCACGGGCTGGAGATATTCC
AGCGCTGTTACTGCGGGGAAGGCCTGGCTTGCAGGATACAGAAAGATCACCATCAAGCCAGCAATTCTTCTAGGCTCCACACCTGCCAGAG
ACACTAAA

Hbb

TTCACAGCTGAGGAGAAGGCAGCTATCACAAGCATCTGGGATAAAGTGGACTTGGAAAAAGTTGGAGGAGAAACTCTGGGAAGGCTCCTGA
TTGTTTACCCATGGACTCAGAGATTCTTTGACAAGTTTGGAAACCTCTCTTCTGCCCTGGCCATCATGGGAAACCCCCGGATTAGAGCCCAT
GGCAAGAAAGTGCTGACATCCTTGGGCTTGGGGGTTAAGAACATGGACAACCTCAAGGAGACCTTTGCTCATCTCAGTGAGCTGCACTGTG
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GAGGTGCAGGCTGCCTGGCAGAAGCTGGTGATTGGAGTGGCCAATGCTCTGTCCCACAAGTACCATTAAACTCCATTCCAGTACACTGGCA

ATCCCATGTGTCTATGATGCCCTCTTTGAGTCCATGGGGACTGCA

Supplementary Sequences:

CAG-LoxpStopLoxp-NLS-dCas9-HA-NLS-NLS-10xGCN4-NLS-P2A-scFv-NLS-P65-HSF1-Flag-T2A-EGFP-WPRE-PolyA(Fig 2a, Vector used to generate SPH transgenic mice)

ACATAACTTACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGC

CAATAGGGACTTTCCATTGACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG

CCCCCTATTGACGTCAATGACGGTAAATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTATGGGACTTTCCTACTTGGCAGTACATCTA

CGTATTAGTCATCGCTATTACCATGGTCGAGGTGAGCCCCACGTTCTGCTTCACTCTCCCCATCTCCCCCCCCTCCCCACCCCCAATTTTGT

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CGCGCCGCCCGCCCCGGCTCTGACTGACCGCGTTACTCCCACAGGTGAGCGGGCGGGACGGCCCTTCTCCTCCGGGCTGTAATTAGCGC

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GAAGGGTTCCGGCTCAGGAGAGGAACTGCTCTCGAAGAACTATCATCTTGAAAATGAGGTCGCTCGATTAAAAAAGGGATCGGGCAGTGGT
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GGACCTGCACCAGGAAGTATGAGCGAGCTGATTAAGGAGAACATGCACATGAAGCTGTACATGGGCCCCGACATCGTGATGACCCAGAGC
CCCAGCAGCCTGAGCGCCAGCGTGGGCGACCGCGTGACCATCACCTGCCGCAGCAGCACCGGCGCCGTGACCACCAGCAACTACGCCA
GCTGGGTGCAGGAGAAGCCCGGCAAGCTGTTCAAGGGCCTGATCGGCGGCACCAACAACCGCGCCCCCGGCGTGCCCAGCCGCTTCAG
CGGCAGCCTGATCGGCGACAAGGCCACCCTGACCATCAGCAGCCTGCAGCCCGAGGACTTCGCCACCTACTTCTGCGCCCTGTGGTACAG
CAACCACTGGGTGTTCGGCCAGGGCACCAAGGTGGAGCTGAAGCGCGGCGGCGGCGGCAGCGGCGGCGGCGGCAGCGGCGGCGGCG
GCAGCAGCGGCGGCGGCAGCGAGGTGAAGCTGCTGGAGAGCGGCGGCGGCCTGGTGCAGCCCGGCGGCAGCCTGAAGCTGAGCTGCG
CCGTGAGCGGCTTCAGCCTGACCGACTACGGCGTGAACTGGGTGCGCCAGGCCCCCGGCCGCGGCCTGGAGTGGATCGGCGTGATCTG
GGGCGACGGCATCACCGACTACAACAGCGCCCTGAAGGACCGCTTCATCATCAGCAAGGACAACGGCAAGAACACCGTGTACCTGCAGAT
GAGCAAGGTGCGCAGCGACGACACCGCCCTGTACTACTGCGTGACCGGCCTGTTCGACTACTGGGGCCAGGGCACCCTGGTGACCGTGA
GCAGCTACCCATACGATGTTCCAGATTACGCTGGTGGAGGCGGAGGTTCTGGGGGAGGAGGTAGTGGCGGTGGTGGTTCAGGAGGCGGC
GGAAGCCCTAAGAAAAAGAGGAAGGTGGCGGCCGCTGGATCCCCTTCAGGGCAGATCAGCAACCAGGCCCTGGCTCTGGCCCCTAGCTC
CGCTCCAGTGCTGGCCCAGACTATGGTGCCCTCTAGTGCTATGGTGCCTCTGGCCCAGCCACCTGCTCCAGCCCCTGTGCTGACCCCAGG
ACCACCCCAGTCACTGAGCGCTCCAGTGCCCAAGTCTACACAGGCCGGCGAGGGGACTCTGAGTGAAGCTCTGCTGCACCTGCAGTTCGA
CGCTGATGAGGACCTGGGAGCTCTGCTGGGGAACAGCACCGATCCCGGAGTGTTCACAGATCTGGCCTCCGTGGACAACTCTGAGTTTCA
GCAGCTGCTGAATCAGGGCGTGTCCATGTCTCATAGTACAGCCGAACCAATGCTGATGGAGTACCCCGAAGCCATTACCCGGCTGGTGAC
CGGCAGCCAGCGGCCCCCCGACCCCGCTCCAACTCCCCTGGGAACCAGCGGCCTGCCTAATGGGCTGTCCGGAGATGAAGACTTCTCAA
GCATCGCTGATATGGACTTTAGTGCCCTGCTGTCACAGATTTCCTCTAGTGGGCAGGGAGGAGGTGGAAGCGGCTTCAGCGTGGACACCA
GTGCCCTGCTGGACCTGTTCAGCCCCTCGGTGACCGTGCCCGACATGAGCCTGCCTGACCTTGACAGCAGCCTGGCCAGTATCCAAGAGC
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CCGCTGTTCCTGCTGGACCCCGGCTCCGTGGACACCGGGAGCAACGACCTGCCGGTGCTGTTTGAGCTGGGAGAGGGCTCCTACTTCTC
CGAAGGGGACGGCTTCGCCGAGGACCCCACCATCTCCCTGCTGACAGGCTCGGAGCCTCCCAAAGCCAAGGACCCCACTGTCTCCGCTA
GCGAGGGCAGAGGAAGTCTGCTAACATGCGATTACAAAGACGATGACGATAAGGGATCCAGTGGAGAGGGCAGAGGAAGTCTGCTAACAT
GCGGTGACGTCGAGGAGAATCCTGGCCCAGTGAGCAAGGGCGAGGAGCTGTTCACCGGGGTGGTGCCCATCCTGGTCGAGCTGGACGG
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CCGGCAAGCTGCCCGTGCCCTGGCCCACCCTCGTGACCACCCTGACCTACGGCGTGCAGTGCTTCAGCCGCTACCCCGACCACATGAAG
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CTACCTGAGCACCCAGTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCCTGCTGGAGTTCGTGACCGCCGCCGGGAT
CACTCTCGGCATGGACGAGCTGTACAAGTAAATCGGCGCGACCCGGGTACGCGTATCAAGCTTATCGATAATCAACCTCTGGATTACAAAA
TTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTC
CCGTATGGCTTTCATTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGG
TGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCC
TATTGCCACGGCGGAACTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTC
GGGGAAATCATCGTCCTTTCCTTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTC
AATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCC

CTTTGGGCCGCCTCCCCGCATCGATACCGTCGATCCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCCCTCCCCCGTGCCTTCCTTG
ACCCTGGAAGGTGCCACTCCCACTGTCCTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGG
TGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGGCTCTATGG

U6-sgRNA-EF1α-NLS-CRE-P2A-mCherry-WPRE(Letiviral vector used to infect primary cells)

GATCCGACGCGCCATCTCTAGGCCCGCGCCGGCCCCCTCGCACGGACTTGTGGGAGAAGCTCGGCTACTCCCCTGCCCCGGTTAATTTGC
ATATAATATTTCCTAGTAACTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTTAATACTAGCTACATTTTACATGATAGGCT
TGGATTTCTATAACTTCGTATAGCATACATTATACGAAGTTATAAACAGCACAAAAGGAAACTCACCCTAACTGTAAAGTAATTGTGTGTTTTG
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TAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTTTCTCGGAATTCAAGGATCTGCGATCGCTCCGGTGC
CCGTCAGTGGGCAGAGCGCACATCGCCCACAGTCCCCGAGAAGTTGGGGGGAGGGGTCGGCAATTGAACGGGTGCCTAGAGAAGGTGG
CGCGGGGTAAACTGGGAAAGTGATGTCGTGTACTGGCTCCGCCTTTTTCCCGAGGGTGGGGGAGAACCGTATATAAGTGCAGTAGTCGCC
GTGAACGTTCTTTTTCGCAACGGGTTTGCCGCCAGAACACAGCTGAAGCTTCGAGGGGCTCGCATCTCTCCTTCACGCGCCCGCCGCCCTA
CCTGAGGCCGCCATCCACGCCGGTTGAGTCGCGTTCTGCCGCCTCCCGCCTGTGGTGCCTCCTGAACTGCGTCCGCCGTCTAGGTAAGTT
TAAAGCTCAGGTCGAGACCGGGCCTTTGTCCGGCGCTCCCTTGGAGCCTACCTAGACTCAGCCGGCTCTCCACGCTTTGCCTGACCCTGC
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AAGCTGAACAATCGCAAATGGTTCCCCGCCGAGCCGGAGGACGTGCGCGATTACCTGCTGTATCTCCAGGCAAGAGGGCTGGCTGTCAAG
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TGGCGTTGAAAAGGCCTTGTCCCTGGGCGTAACGAAGCTGGTGGAAAGATGGATCTCAGTGTCCGGCGTGGCTGACGACCCTAATAATTAC
TTGTTCTGTCGAGTGAGAAAAAACGGAGTCGCCGCGCCCTCTGCCACCAGCCAATTGAGTACACGGGCCCTTGAAGGGATCTTTGAGGCAA
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GGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCCTACG
AGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCTCAGTTCATGTACGGCT
CCAAGGCCTACGTGAAGCACCCCGCCGACATCCCCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAACT
TCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTGCGCGGCACCAAC
TTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCCTGAA
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AGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAACAGTACGAACGCGCCG
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GCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTCGGGGAAATCATCGTCCTTTCCTTGG
CTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCG
GCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCCTCCCCGC

U6-sgRNA-CMV-Puro-T2A-mCherry-WPRE(sgRNA vector for VP64, SunTag, VPR and SPH)

GATCCGACGCGCCATCTCTAGGCCCGCGCCGGCCCCCTCGCACGGACTTGTGGGAGAAGCTCGGCTACTCCCCTGCCCCGGTTAATTTGC
ATATAATATTTCCTAGTAACTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTTAATACTAGCTACATTTTACATGATAGGCT
TGGATTTCTATAACTTCGTATAGCATACATTATACGAAGTTATAAACAGCACAAAAGGAAACTCACCCTAACTGTAAAGTAATTGTGTGTTTTG
AGACTATAAGTATCCCTTGGAGAACCACCTTGTTGGCAGGCGTGAGCCACCGCGCCGTTTAAGAGCTATGCTGGAAATGCTGTAGCAAGTT
TAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTTTCTCGAGTACTAGGATCCATTAGGCGGCCGCGTGG
ATAACCGTATTACCGCCATGCATTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGGTGATGCGGT
TTTGGCAGTACATCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGG
CACCAAAATCAACGGGACTTTCCAAAATGTCGTAACAACTCCGCCCCATTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATA
TAAGCAGAGCTGGTTTAGTGAACCGTCAGATCCGCTAGCCCACCATGACCGAGTACAAGCCCACGGTGCGCCTCGCCACCCGCGACGACG
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GTCTGGACCACGCCGGAGAGCGTCGAAGCGGGGGCGGTGTTCGCCGAGATCGGCCCGCGCATGGCCGAGTTGAGCGGTTCCCGGCTGG
CCGCGCAGCAACAGATGGAAGGCCTCCTGGCGCCGCACCGGCCCAAGGAGCCCGCGTGGTTCCTGGCCACCGTCGGCGTCTCGCCCGA
CCACCAGGGCAAGGGTCTGGGCAGCGCCGTCGTGCTCCCCGGAGTGGAGGCGGCCGAGCGCGCCGGGGTGCCCGCCTTCCTGGAGAC
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GTCGCCACCATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTG
AACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTG
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CCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTGCGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGG
GCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGG
CCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACAT
CACCTCCCACAACGAGGACTACACCATCGTGGAACAGTACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACGAGCTGTACA
AGTAAGAATTCGTCGAGGGACCTAATAACTTCGTATAGCATACATTATACGAAGTTATACATGTTTAAGGGTTCCGGTTCCACTAGGTACAAT
TCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTATG
TGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTT
TATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACC
ACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAG
GGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTCGGGGAAATCATCGTCCTTTCCTTGGCTGCTCGCCTGTGTTGCCACCTGGAT
TCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCT
TCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCCTCCCCGC

sgRNA target sequence-MiniCMV-mCherry-BGH polyA(Fig. 1b-e)

GTCCCCTCCACCCCACAGTGGGGCGAGGTAGGCGTGTACGGTGGGAGGCCTATATAAGCAGAGCTCGTTTAGTGAACCGTCAGATCGCCT
GGAACGCGTGCCACCATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGG
CTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACC
AAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCTCAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCCGACATC
CCCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCA
GGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTGCGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAA
GACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAG
GACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAA

GTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAACAGTACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACG
AGCTGTACAAGTAAACCGGTTAGGGGCCCGTTTAAACCCGCTGATCAGCCTCGACTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCC
CTCCCCCGTGCCTTCCTTGACCCTGGAAGGTGCCACTCCCACTGTCCTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGT
GTCATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGG
CTCTATGG

U6-sgminiCMV-CMV-Puro-T2A-EGFP-WPRE(Fig. 1b-e)

GATCCGACGCGCCATCTCTAGGCCCGCGCCGGCCCCCTCGCACGGACTTGTGGGAGAAGCTCGGCTACTCCCCTGCCCCGGTTAATTTGC
ATATAATATTTCCTAGTAACTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTTAATACTAGCTACATTTTACATGATAGGCT
TGGATTTCTATAACTTCGTATAGCATACATTATACGAAGTTATAAACAGCACAAAAGGAAACTCACCCTAACTGTAAAGTAATTGTGTGTTTTG
AGACTATAAGTATCCCTTGGAGAACCACCTTGTTGGCAGGCGTGAGCCACCGCGCCGTTTAAGAGCTATGCTGGAAATGCTGTAGCAAGTT
TAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTTTCTCGAGTACTAGGATCCATTAGGCGGCCGCGTGG
ATAACCGTATTACCGCCATGCATTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGGTGATGCGGT
TTTGGCAGTACATCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGG
CACCAAAATCAACGGGACTTTCCAAAATGTCGTAACAACTCCGCCCCATTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATA
TAAGCAGAGCTGGTTTAGTGAACCGTCAGATCCGCTAGCCCACCATGACCGAGTACAAGCCCACGGTGCGCCTCGCCACCCGCGACGACG
TCCCCCGGGCCGTACGCACCCTCGCCGCCGCGTTCGCCGACTACCCCGCCACGCGCCACACCGTCGACCCGGACCGCCACATCGAGCG
GGTCACCGAGCTGCAAGAACTCTTCCTCACGCGCGTCGGGCTCGACATCGGCAAGGTGTGGGTCGCGGACGACGGCGCCGCGGTGGCG
GTCTGGACCACGCCGGAGAGCGTCGAAGCGGGGGCGGTGTTCGCCGAGATCGGCCCGCGCATGGCCGAGTTGAGCGGTTCCCGGCTGG
CCGCGCAGCAACAGATGGAAGGCCTCCTGGCGCCGCACCGGCCCAAGGAGCCCGCGTGGTTCCTGGCCACCGTCGGCGTCTCGCCCGA
CCACCAGGGCAAGGGTCTGGGCAGCGCCGTCGTGCTCCCCGGAGTGGAGGCGGCCGAGCGCGCCGGGGTGCCCGCCTTCCTGGAGAC
CTCCGCGCCCCGCAACCTCCCCTTCTACGAGCGGCTCGGCTTCACCGTCACCGCCGACGTCGAGGTGCCCGAAGGACCGCGCACCTGGT
GCATGACCCGCAAGCCCGGTGCCGGATCGGGAGAGGGCAGAGGAAGTCTGCTAACATGCGGTGACGTCGAGGAGAATCCTGGCCCACCG
GTCGCCACCATGGTGAGCAAGGGCGAGGAGCTGTTCACCGGGGTGGTGCCCATCCTGGTCGAGCTGGACGGCGACGTAAACGGCCACAA
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CCTGGCCCACCCTCGTGACCACCCTGACCTACGGCGTGCAGTGCTTCAGCCGCTACCCCGACCACATGAAGCAGCACGACTTCTTCAAGT
CCGCCATGCCCGAAGGCTACGTCCAGGAGCGCACCATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAG
GGCGACACCCTGGTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGAGTACAACTAC
AACAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAACGGCATCAAGGTGAACTTCAAGATCCGCCACAACATCGAGGACGGCAGC
GTGCAGCTCGCCGACCACTACCAGCAGAACACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCGACAACCACTACCTGAGCACCCAGTC
CGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCCTGCTGGAGTTCGTGACCGCCGCCGGGATCACTCTCGGCATGGACG
AGCTGTACAAGTAAGAATTCGTCGAGGGACCTAATAACTTCGTATAGCATACATTATACGAAGTTATACATGTTTAAGGGTTCCGGTTCCACT
AGGTACAATTCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTT
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CTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTGGGGC
ATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACTCATCGCCGCCTGCCTTGCCCGCT
GCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTCGGGGAAATCATCGTCCTTTCCTTGGCTGCTCGCCTGTGTTG
CCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTC
TGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCCTCCCCGC

dSV40-NLS-dCas9-HA-NLS-NLS-10xGCN4 (Fig. 1)

AGGCAGGCAGAAGTATGCAAAGCATGCATCTCAATTAGTCAGCAACCATAGTCCCGCCCCTAACTCCGCCCATCCCGCCCCTAACTCCGCC
CAGTTCCGCCCATTCTCCGCCCCATGGCTGACTAATTTTTTTTATTTATGCAGAGGCCGAGGCCGCCTCTGCCTCTGAGCTATTCCAGAAGT
AGTGAGGAGGCTTTTTTGGAGGCCTAGGCTACGCGCGCCACCATGCCCAAGAAGAAGCGCAAGGTGGGACGCGTCTGCAGGATATCAAGC
TTGCGGTACCGCGGGCCCGGGATCGCCACCATGGACAAGAAGTACAGCATCGGCCTGGCCATCGGCACCAACTCTGTGGGCTGGGCCGT

GATCACCGACGAGTACAAGGTGCCCAGCAAGAAATTCAAGGTGCTGGGCAACACCGACCGGCACAGCATCAAGAAGAACCTGATCGGCGC

CCTGCTGTTCGACAGCGGAGAAACAGCCGAGGCCACCCGGCTGAAGAGAACCGCCAGAAGAAGATACACCAGACGGAAGAACCGGATCT

GCTATCTGCAAGAGATCTTCAGCAACGAGATGGCCAAGGTGGACGACAGCTTCTTCCACAGACTGGAAGAGTCCTTCCTGGTGGAAGAGGA

TAAGAAGCACGAGCGGCACCCCATCTTCGGCAACATCGTGGACGAGGTGGCCTACCACGAGAAGTACCCCACCATCTACCACCTGAGAAA

GAAACTGGTGGACAGCACCGACAAGGCCGACCTGCGGCTGATCTATCTGGCCCTGGCCCACATGATCAAGTTCCGGGGCCACTTCCTGAT

CGAGGGCGACCTGAACCCCGACAACAGCGACGTGGACAAGCTGTTCATCCAGCTGGTGCAGACCTACAACCAGCTGTTCGAGGAAAACCC

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CTATGATCAAGAGATACGACGAGCACCACCAGGACCTGACCCTGCTGAAAGCTCTCGTGCGGCAGCAGCTGCCTGAGAAGTACAAAGAGA

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AGGAAACCATCACCCCCTGGAACTTCGAGGAAGTGGTGGACAAGGGCGCCAGCGCCCAGAGCTTCATCGAGCGGATGACCAACTTCGATA

AGAACCTGCCCAACGAGAAGGTGCTGCCCAAGCACAGCCTGCTGTACGAGTACTTCACCGTGTACAACGAGCTGACCAAAGTGAAATACGT

GACCGAGGGAATGAGAAAGCCCGCCTTCCTGAGCGGCGAGCAGAAAAAAGCCATCGTGGACCTGCTGTTCAAGACCAACCGGAAAGTGAC

CGTGAAGCAGCTGAAAGAGGACTACTTCAAGAAAATCGAGTGCTTCGACTCCGTGGAAATCTCCGGCGTGGAAGATCGGTTCAACGCCTCC

CTGGGCACATACCACGATCTGCTGAAAATTATCAAGGACAAGGACTTCCTGGACAATGAGGAAAACGAGGACATTCTGGAAGATATCGTGC

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EF1α-scFv-p65-HSF1-T2A-EGFP-WPRE-PolyA (Fig. 1)

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EF1α-MS2-NLS-P65-HSF1-T2A-EGFP-WPRE (SAM)

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EF1α-HA-NLS-dCas9-NLS-VP64-WPRE(VP64)

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AAGTGCTGAGCATGCCCCAAGTGAATATCGTGAAAAAGACCGAGGTGCAGACAGGCGGCTTCAGCAAAGAGTCTATCCTGCCCAAGAGGA

ACAGCGATAAGCTGATCGCCAGAAAGAAGGACTGGGACCCTAAGAAGTACGGCGGCTTCGACAGCCCCACCGTGGCCTATTCTGTGCTGG

TGGTGGCCAAAGTGGAAAAGGGCAAGTCCAAGAAACTGAAGAGTGTGAAAGAGCTGCTGGGGATCACCATCATGGAAAGAAGCAGCTTCG

AGAAGAATCCCATCGACTTTCTGGAAGCCAAGGGCTACAAAGAAGTGAAAAAGGACCTGATCATCAAGCTGCCTAAGTACTCCCTGTTCGA

GCTGGAAAACGGCCGGAAGAGAATGCTGGCCTCTGCCGGCGAACTGCAGAAGGGAAACGAACTGGCCCTGCCCTCCAAATATGTGAACTT

CCTGTACCTGGCCAGCCACTATGAGAAGCTGAAGGGCTCCCCCGAGGATAATGAGCAGAAACAGCTGTTTGTGGAACAGCACAAGCACTA

CCTGGACGAGATCATCGAGCAGATCAGCGAGTTCTCCAAGAGAGTGATCCTGGCCGACGCTAATCTGGACAAAGTGCTGTCCGCCTACAAC

AAGCACCGGGATAAGCCCATCAGAGAGCAGGCCGAGAATATCATCCACCTGTTTACCCTGACCAATCTGGGAGCCCCTGCCGCCTTCAAGT

ACTTTGACACCACCATCGACCGGAAGAGGTACACCAGCACCAAAGAGGTGCTGGACGCCACCCTGATCCACCAGAGCATCACCGGCCTGT

ACGAGACACGGATCGACCTGTCTCAGCTGGGAGGCGACAGCCCCAAGAAGAAGAGAAAGGTGGAGGCCAGCGGGCCGGCCGGATCCGG

GCGCGCCGACGCGCTGGACGATTTCGATCTCGACATGCTGGGTTCTGATGCCCTCGATGACTTTGACCTGGATATGTTGGGAAGCGACGC

ATTGGATGACTTTGATCTGGACATGCTCGGCTCCGATGCTCTGGACGATTTCGATCTCGATATGTTATATATCGATTGATTAATTAAGAATTC

GGTACAAGTAAAGCGGCCGCGTCGACAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTA

CGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATTTTCTCCTCCTTGTATAAATCCTGGTTGCT

GTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTGGGGCATT

GCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACTCATCGCCGCCTGCCTTGCCCGCTGCT

GGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTCGGGGAAGCTGACGTCCTTTCCATGGCTGCTCGCCTGTGTTGCCA

CCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGC

GGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCCTCCCCGC

U6-sgRNA2.0(sgRNA vector for SAM)

GAGGGCCTATTTCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTGGAATTAATTTGACTGTAAACACAAAG

ATATTAGTACAAAATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAAATTATGTTTTAAAATGGACTATCATATGCTTAC

CGTAACTTGAAAGTATTTCGATTTCTTGGCTTTATATATCTTGTGGAAAGGACGAAACACCGGTCCCCTCCACCCCACAGTGGTTTTAGAGCT

AGGCCAACATGAGGATCACCCATGTCTGCAGGGCCTAGCAAGTTAAAATAAGGCTAGTCCGTTATCAACTTGGCCAACATGAGGATCACCC

ATGTCTGCAGGGCCAAGTGGCACCGAGTCGGTGCTTTTT

Long GFAP-mCherry-WPRE-SV40 PolyA (Fig. 3)

TAATCCCACCTCCCTCTCTGTGCTGGGACTCACAGAGGGAGACCTCAGGAGGCAGTCTGTCCATCACATGTCCAAATGCAG

AGCATACCCTGGGCTGGGCGCAGTGGCGCACAACTGTAATTCCAGCACTTTGGGAGGCTGATGTGGAAGGATCACTTGAG

CCCAGAAGTTCTAGACCAGCCTGGGCAACATGGCAAGACCCTATCTCTACAAAAAAAGTTAAAAAATCAGCCACGTGTGG

TGACACACACCTGTAGTCCCAGCTATTCAGGAGGCTGAGGTGAGGGGATCACTTAAGGCTGGGAGGTTGAGGCTGCAGTG

AGTCGTGGTTGCGCCACTGCACTCCAGCCTGGGCAACAGTGAGACCCTGTCTCAAAAGACAAAAAAAAAAAAAAAAAAA

AAAGAACATATCCTGGTGTGGAGTAGGGGACGCTGCTCTGACAGAGGCTCGGGGGCCTGAGCTGGCTCTGTGAGCTGGGG

AGGAGGCAGACAGCCAGGCCTTGTCTGCAAGCAGACCTGGCAGCATTGGGCTGGCCGCCCCCCAGGGCCTCCTCTTCATG

CCCAGTGAATGACTCACCTTGGCACAGACACAATGTTCGGGGTGGGCACAGTGCCTGCTTCCCGCCGCACCCCAGCCCCCC

TCAAATGCCTTCCGAGAAGCCCATTGAGCAGGGGGCTTGCATTGCACCCCAGCCTGACAGCCTGGCATCTTGGGATAAAA

GCAGCACAGCCCCCTAGGGGCTGCCCTTGCTGTGTGGCGCCACCGGCGGTGGAGAACAAGGCTCTATTCAGCCTGTGCCC

AGGAAAGGGGATCAGGGGATGCCCAGGCATGGACAGTGGGTGGCAGGGGGGGAGAGGAGGGCTGTCTGCTTCCCAGAAG

TCCAAGGACACAAATGGGTGAGGGGACTGGGCAGGGTTCTGACCCTGTGGGACCAGAGTGGAGGGCGTAGATGGACCTG

AAGTCTCCAGGGACAACAGGGCCCAGGTCTCAGGCTCCTAGTTGGGCCCAGTGGCTCCAGCGTTTCCAAACCCATCCATCC

CCAGAGGTTCTTCCCATCTCTCCAGGCTGATGTGTGGGAACTCGAGGAAATAAATCTCCAGTGGGAGACGGAGGGGTGGC

CAGGGAAACGGGGCGCTGCAGGAATAAAGACGAGCCAGCACAGCCAGCTCATGTGTAACGGCTTTGTGGAGCTGTCAAG

GCCTGGTCTCTGGGAGAGAGGCACAGGGAGGCCAGACAAGGAAGGGGTGACCTGGAGGGACAGATCCAGGGGCTAAAGT

CCTGATAAGGCAAGAGAGTGCCGGCCCCCTCTTGCCCTATCAGGACCTCCACTGCCACATAGAGGCCATGATTGACCCTTA

GACAAAGGGCTGGTGTCCAATCCCAGCCCCCAGCCCCAGAACTCCAGGGAATGAATGGGCAGAGAGCAGGAATGTGGGA

CATCTGTGTTCAAGGGAAGGACTCCAGGAGTCTGCTGGGAATGAGGCCTAGTAGGAAATGAGGTGGCCCTTGAGGGTACA

GAACAGGTTCATTCTTCGCCAAATTCCCAGCACCTTGCAGGCACTTACAGCTGAGTGAGATAATGCCTGGGTTATGAAATC

AAAAAGTTGGAAAGCAGGTCAGAGGTCATCTGGTACAGCCCTTCCTTCCCTTTTTTTTTTTTTTTTGTGAGACAAGGTCT

CTCTCTGTTGCCCAGGCTGGAGTGGCGCAAACACAGCTCACTGCAGCCTCAACCTACTGGGCTCAAGCAATCCTCCAGCCT

CAGCCTCCCAAAGTGCTGGGATTACAAGCATGAGCCACCCCACTCAGCCCTTTCCTTCCTTTTTAATTGATGCATAATAATT

GTAAGTATTCATCATGGTCCAACCAACCCTTTCTTGACCCACCTTCCTAGAGAGAGGGTCCTCTTGCTTCAGCGGTCAGGG

CCCCAGACCCATGGTCTGGCTCCAGGTACCACCTGCCTCATGCAGGAGTTGGCGTGCCCAGGAAGCTCTGCCTCTGGGCAC

AGTGACCTCAGTGGGGTGAGGGGAGCTCTCCCCATAGCTGGGCTGCGGCCCAACCCCACCCCCTCAGGCTATGCCAGGGG

GTGTTGCCAGGGGCACCCGGGCATCGCCAGTCTAGCCCACTCCTTCATAAAGCCCTCGCATCCCAGGAGCGAGCAGAGCC
AGAGCAGGTTGGAGAGGAGACGCATCACCTCCGCTGCTCGCGGGGATCCATGGCCATCATCAAGGAGTTCATGCGCTTCA
AGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCCTACGAGGGCAC
CCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCTCAGTTCATGTACGG
CTCCAAGGCCTACGTGAAGCACCCCGCCGACATCCCCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCG
CGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGG
TGAAGCTGCGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAG
CGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACG
CTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATC
ACCTCCCACAACGAGGACTACACCATCGTGGAACAGTACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACG
AGCTGTACAAGTAAGAATTCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTA
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TTCATTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGG
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CCCCCTCCCTATTGCCACGGCGGAACTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGA
CAATTCCGTGGTGTTGTCGGGGAAATCATCGTCCTTTCCTTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACG
TCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGC
GTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCCTCCCCGCATCGATACCGTCGACCCGGGCGGCCGC
TTCGAGCAGACATGATAAGATACATTGATGAGTTTGGACAAACCACAACTAGAATGCAGTGAAAAAAATGCTTTATTTGT
GAAATTTGTGATGCTATTGCTTTATTTGTAACCATTATAAGCTGCAATAAACAAGTT

U6-sgMiat-U6-sgLncpint-U6-sgNeurod1-U6-sgAscl1-U6-sgIl10-U6-sgSlc7a11-U6-sHbb-U6-sgDkk1-U6-sgScl6a4-U6-sgNeurog2-EF1a-NLS-Cre-P2A-mCherry-WPRE(Supplementary Fig.8)

GAGGGCCTATTTCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGA
TATTAGTACAAAATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAAATTATGTTTTAAAATGGACTATCATATGCTTACC
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GAAATAGCAAGTTAAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTTGAATTGGTACCGAGGGCCTATT
TCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAA
AATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAAATTATGTTTTAAAATGGACTATCATATGCTTACCGTAACTTGAAA
GTATTTCGATTTCTTGGCTTTATATATCTTGTGGAAAGGACGAAACACCGGAGGGGCTCCTGGTGGGTGGGTTTTAGAGCTAGAAATAGCAA
GTTAAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTTGAATTCGCTAGCTAGGTCTTGAAACGCGTACTA
GTGGATCCTTTTGGTTAATTAAGGTACCGAGGGCCTATTTCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAAT
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GTTTTAAAATGGACTATCATATGCTTACCGTAACTTGAAAGTATTTCGATTTCTTGGCTTTATATATCTTGTGGAAAGGACGAAACACCGGCTG
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GAGATAATTAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAAAATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTT
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TATTAGTACAAAATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAAATTATGTTTTAAAATGGACTATCATATGCTTACC
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CGCCCGCCGCCCTACCTGAGGCCGCCATCCACGCCGGTTGAGTCGCGTTCTGCCGCCTCCCGCCTGTGGTGCCTCCTGAACTGCGTCCG
CCGTCTAGGTAAGTTTAAAGCTCAGGTCGAGACCGGGCCTTTGTCCGGCGCTCCCTTGGAGCCTACCTAGACTCAGCCGGCTCTCCACGC
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GTGCCACCATGCCCAAGAAGAAGAGGAAGGTGTCCAATCTCCTGACTGTTCACCAGAACCTCCCTGCGCTGCCAGTAGATGCCACTAGCGA
TGAGGTCAGGAAAAATCTCATGGATATGTTTAGGGATAGACAGGCGTTTTCTGAACACACCTGGAAAATGCTGCTTAGCGTGTGCCGATCCT
GGGCAGCCTGGTGTAAGCTGAACAATCGCAAATGGTTCCCCGCCGAGCCGGAGGACGTGCGCGATTACCTGCTGTATCTCCAGGCAAGAG
GGCTGGCTGTCAAGACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGCAGCGGGCTCCCCCGGCCTAGCGATTCAAACG
CAGTCTCCCTTGTTATGAGGAGAATTAGAAAGGAAAACGTAGATGCGGGTGAGAGGGCTAAGCAGGCTCTCGCTTTTGAGCGGACTGATTT
CGACCAGGTCAGATCCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTTCTGGGAATTGCATATAACACACTTCTG
CGCATAGCTGAGATCGCCCGGATCAGAGTGAAAGACATCAGTCGAACGGACGGCGGCCGGATGCTTATTCATATTGGACGCACAAAGACA
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GACCCTAATAATTACTTGTTCTGTCGAGTGAGAAAAAACGGAGTCGCCGCGCCCTCTGCCACCAGCCAATTGAGTACACGGGCCCTTGAAG
GGATCTTTGAGGCAACCCACCGACTCATATACGGAGCCAAGGATGACAGTGGCCAGAGGTATCTCGCCTGGTCAGGTCATTCTGCTAGGGT
GGGGGCCGCACGAGACATGGCGCGGGCAGGAGTCTCCATACCAGAGATTATGCAAGCTGGAGGTTGGACAAATGTGAACATCGTTATGAA
CTATATCCGCAATCTTGACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACAAGGCCGGCCAGGCAAAAAAGAAAAAGGG
AAGCGGAGCCACTAACTTCTCCCTGTTGAAACAAGCAGGGGATGTCGAAGAGAATCCCGGGCCAATGGTGAGCAAGGGCGAGGAGGATAA
CATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCG
AGGGCCGCCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCT
CAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCCGACATCCCCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGG
GAGCGCGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAA
GCTGCGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCG
AGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAG

GCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAA
CAGTACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACGAGCTGTACAAGTAAAATCAACCTCTGGATTACAAAATTTGTGAAA
GATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGC
TTTCATTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTG
TGTTTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCAC
GGCGGAACTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTCGGGGAAAT
CATCGTCCTTTCCTTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGC
GGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGC
CGCCTCCCCGC

AAV-U6-sgDkk1-U6-sgHbb(Fig.4)

GAGGGCCTATTTCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGA
TATTAGTACAAAATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAAATTATGTTTTAAAATGGACTATCATATGCTTACC
GTAACTTGAAAGTATTTCGATTTCTTGGCTTTATATATCTTGTGGAAAGGACGAAACACCGTGGGATTTCAAAGCTTTGGGGTTTTAGAGCTA
GAAATAGCAAGTTAAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTTGAATTGGTACCGAGGGCCTATT
TCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAA
AATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAAATTATGTTTTAAAATGGACTATCATATGCTTACCGTAACTTGAAA
GTATTTCGATTTCTTGGCTTTATATATCTTGTGGAAAGGACGAAACACCGAGAGAGTCTGGGCAAGACAGGTTTTAGAGCTAGAAATAGCAA
GTTAAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGC

AAV-hSyn-mCherry-P2A-CRE-WPRE(Fig.4)

CTGCAGAGGGCCCTGCGTATGAGTGCAAGTGGGTTTTAGGACCAGGATGAGGCGGGGTGGGGGTGCCTACCTGACGACCGACCCCGACC
CACTGGACAAGCACCCAACCCCCATTCCCCAAATTGCGCATCCCCTATCAGAGAGGGGGAGGGGAAACAGGATGCGGCGAGGCGCGTGC
GCACTGCCAGCTTCAGCACCGCGGACAGTGCCTTCGCCCCCGCCTGGCGGCGCGCGCCACCGCCGCCTCAGCACTGAAGGCGCGCTGA
CGTCACTCGCCGGTCCCCCGCAAACTCCCCTTCCCGGCCACCTTGGTCGCGTCCGCGCCGCCGCCGGCCCAGCCGGACCGCACCACGC
GAGGCGCGAGATAGGGGGGCACGGGCGCGACCATCTGCGCTGCGGCGCCGGCGACTCAGCGCTGCCTCAGTCTGCGGTGGGCAGCGG
AGGAGTCGTGTCGTGCCTGAGAGCGCAGTCGAGAAATCACCTCCGCTGCTCGCGCCACCATGGTGAGCAAGGGCGAGGAGGATAACATG
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GCGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTG
CGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGA
CGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCA
AGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAACAGT
ACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACGAGCTGTACAAGGCTAGCGGAAGCGGAGCCACTAACTTCTCCCTGTTG
AAACAAGCAGGGGATGTCGAAGAGAATCCCGGGCCACCCAAGAAGAAGAGGAAGGTGTCCAATCTCCTGACTGTTCACCAGAACCTCCCT
GCGCTGCCAGTAGATGCCACTAGCGATGAGGTCAGGAAAAATCTCATGGATATGTTTAGGGATAGACAGGCGTTTTCTGAACACACCTGGA
AAATGCTGCTTAGCGTGTGCCGATCCTGGGCAGCCTGGTGTAAGCTGAACAATCGCAAATGGTTCCCCGCCGAGCCGGAGGACGTGCGCG
ATTACCTGCTGTATCTCCAGGCAAGAGGGCTGGCTGTCAAGACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGCAGCGG
GCTCCCCCGGCCTAGCGATTCAAACGCAGTCTCCCTTGTTATGAGGAGAATTAGAAAGGAAAACGTAGATGCGGGTGAGAGGGCTAAGCA
GGCTCTCGCTTTTGAGCGGACTGATTTCGACCAGGTCAGATCCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTT
CTGGGAATTGCATATAACACACTTCTGCGCATAGCTGAGATCGCCCGGATCAGAGTGAAAGACATCAGTCGAACGGACGGCGGCCGGATG
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GGATCTCAGTGTCCGGCGTGGCTGACGACCCTAATAATTACTTGTTCTGTCGAGTGAGAAAAAACGGAGTCGCCGCGCCCTCTGCCACCAG

CCAATTGAGTACACGGGCCCTTGAAGGGATCTTTGAGGCAACCCACCGACTCATATACGGAGCCAAGGATGACAGTGGCCAGAGGTATCTC
GCCTGGTCAGGTCATTCTGCTAGGGTGGGGGCCGCACGAGACATGGCGCGGGCAGGAGTCTCCATACCAGAGATTATGCAAGCTGGAGG
TTGGACAAATGTGAACATCGTTATGAACTATATCCGCAATCTTGACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACTACC
CATACGATGTTCCAGATTACGCTTAAGAATTCGATATCAAGCTTATCGATAAGTAAAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGAC
TGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATT
TTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGC
TGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAA
CTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTCGGGGAAGCTGACGTCC
TTTCCATGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTC
CTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTCCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGCCGCCTCCCC
GC

AAV-aCamkII-mCherry-P2A-Cre-WPRE-BGH-polyA(Fig. 4)

TTAACATTATGGCCTTAGGTCACTTCATCTCCATGGGGTTCTTCTTCTGATTTTCTAGAAAATGAGATGGGGGTGCAGAGAGCTTCCTCAGTG
ACCTGCCCAGGGTCACATCAGAAATGTCAGAGCTAGAACTTGAACTCAGATTACTAATCTTAAATTCCATGCCTTGGGGGCATGCAAGTACG
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TGGCCCCTAGTTCTGGGGGCAGCGCTCGTAATCACCTCCGCTGCTCGCGCCACCATGGTGAGCAAGGGCGAGGAGGATAACATGGCCAT
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AACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACTCATC
GCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTTGTCGGGGAAGCTGACGTCCTTTCCA
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CGGTTAGGGGCCCGTTTAAACCCGCTGATCAGCCTCGACTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCCCTCCCCCGTGCCTTCC
TTGACCCTGGAAGGTGCCACTCCCACTGTCCTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGG
GGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGGCTCTATGGC

AAV-ALB-Cre-WPRE-BGH polyA(Supplementary Fig. 9)

CTAGCTTCCTTAGCATGACGTTCCACTTTTTTCTAAGGTGGAGCTTACTTCTTTGATTTGATCTTTTGTGAAACTTTTGGAAATTACCCATCTTC
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CACTGTCCTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGC
AAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGGCTCTATGGC

EF1α-dCas9-VP64-WPRE-PolyA-WPRE-mCherry-EF1α(SAM, Supplementary Fig. 3)

GGCTCCGGTGCCCGTCAGTGGGCAGAGCGCACATCGCCCACAGTCCCCGAGAAGTTGGGGGGAGGGGTCGGCAATTGAACCGGTGCCTA
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U6-sgRNA(*Hbb*)-EF1α-MS2-P65-HSF1-T2A-EGFP-WPRE(SAM, Supplementary Fig. 3)

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PolyA- EGFP- CMV-CMV-dCas9- VP64-P65-RTA-PolyA(VPR, Supplementary Fig. 3)

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U6-sgRNA (*Hbb*)-EF1α-CRE-P2A-mCherry-WPRE(VPR, Supplementary Fig. 3)

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EF1α -dCas9-HA -10xGCN4(SPH, Supplementary Fig. 3)

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U6-sgRNA(*Hbb*)-EF-α-scFv-p65-HSF1-T2A-EGFP-WPRE-PolyA (SPH, Supplementary Fig. 3)

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