

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) to the 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	GTCCCCTCCACCCACAGTG
<i>Ascl1</i>	-83	GCAGCCGCTCGCTGCAGCAG
<i>Ascl1</i>	-122	AGCTGAGGAGGTGGGGGAAG
<i>Ascl1</i>	-177	GAGTTTGCAAGGAGCGGGCG
<i>Ascl1</i>	-265	GGACTCCCGGCTGAATAAAC
<i>Ascl1</i>	-320	GGGGGTGGCTCTAGAAATGG
<i>Ascl1</i>	-387	TGCCTAGGTGAAAGTCTGG
<i>Ascl1</i>	-445	GAAAATTCAGGGAAGGGTTT
<i>Ascl1</i>	-771	TGGGCACAACCTCGCTAAGGG
<i>Ascl1</i>	-887	TGGTGTGGGGAAGTGTATGC
<i>Ascl1</i>	-921	AGGAGTGGCGCTGTTATAG
<i>Ascl1</i>	-20	TGGGTGTCCCATTGAAAAGG
<i>Ascl1</i>	-581	GTTTGCCATTAGGTTTAGGA
<i>Ascl1</i>	-479	GCAAAGGGAACCTTGGAAG
<i>Ascl1</i>	-234	GTTGTTGCAGTGCCTGCGCC
<i>Ascl1</i>	-611	GGAGAGCGTTTGCACTAG
<i>Ascl1</i>	-694	GCAACCCCATATGGCTGCAG
<i>Ascl1</i>	-825	GACAGTCCCTAAGAAGCTG
<i>Ascl1</i>	-974	GCTAGACGCTATGGGAAAGG
<i>Ascl1</i>	-1042	TGTGTGAATAAAGAGTGAC
<i>Ascl1</i>	-1071	TGAGACAGGGAGGGACAAGG
<i>Ascl1</i>	-1152	GCGTGTGCCTGGCGGACCGG
<i>Neurog2</i>	-65	GAAACAATCAGATCTGCCC
<i>Neurog2</i>	-108	CGGGGGACCAGGACAGGCGG
<i>Neurog2</i>	-208	AGGATGGATGGCCAGGCCAG
<i>Neurog2</i>	-309	CGGTAGCTTGGGCTGCAGCC
<i>Neurog2</i>	-405	TGTGATTGGTGGCTCGCGCT
<i>Neurog2</i>	-457	AGGAGGTCGCGAGGCGCAGC
<i>Neurog2</i>	-509	TGCTGAAAGGGAGCGGGCTC
<i>Neurog2</i>	-565	AGTGCTGGGGGCCCATGGCG
<i>Neurog2</i>	-135	TGAAAAGAATAAGCTGGGGA

<i>Neurog2</i>	-237	GGACGGAGGGGCGGGGTGA
<i>Neurog2</i>	-76	CGGGGAAGGGTAGGTGAGG
<i>Neurog2</i>	-609	GACGGGCGGGACGCGTATGG
<i>Neurog2</i>	-693	GAGAGTCAGAATCCCGGAGA
<i>Neurog2</i>	-821	GTCACGTACGTGTGCCAGAC
<i>Neurog2</i>	-911	CGACCAATTTCCCTTCTAG
<i>Neurog2</i>	-1013	GTGAAGCCTCACTGTGTCTC
<i>Neurog2</i>	-1069	GGGGGCTTCTGGTGCGGAAG
<i>Acta1</i>	-55	ACCCAAATATGGCTTGGGAA
<i>Acta1</i>	-98	CCAGGCTGAGAACCGCCGA
<i>Acta1</i>	-137	TCTCCTTCTTTGGTCAGTGC
<i>Acta1</i>	-188	TCTCCATATACGGCCTGGTC
<i>Dkk1</i>	-27	GCAGCCAGAGGTGGCGGTGG
<i>Dkk1</i>	-233	GTCCAGCTCACCTTAGAGTG
<i>Dkk1</i>	-345	TGAGCTTGAGTGTCTGCTG
<i>Dkk1</i>	-522	GGTTTTGTGAAAAGCCCAGG
<i>Dkk1</i>	-124	TGGGATTTCAAAGCTTTGGG
<i>Dkk1</i>	-428	GAAAGCGAGGGTACTCATA
<i>Neurod1</i>	-59	GCTGATGCTGAGCGCGGGCG
<i>Neurod1</i>	-96	TGGACGCGTGCGCGATTGCG
<i>Neurod1</i>	-147	GCGGGAGGAAAGTTCTGGGG
<i>Neurod1</i>	-211	TGCCGGGGAGGAAGGAGCAG
<i>Neurod1</i>	-256	CGTGGTTCCCGGCTCTTGGC
<i>Neurod1</i>	-324	GCTCCATTCCGGCCCTTTG
<i>Neurod1</i>	-368	GTCGCCAGTTAGAGACTCCG
<i>Bcl2</i>	-56	CGGAGAATGAAGTAAGAGGC
<i>Bcl2</i>	-87	TGACGTACGTACAGGAAACC
<i>Bcl2</i>	-186	CGCGGCGCCTTTAACCCGGG
<i>Bcl2</i>	-335	TGGCTCAGTGGGCGTGTGAG
<i>Bcl2</i>	-259	GGCCCAGCGTAGCCCGCGGG
<i>Hbb</i>	-108	AGAGAGTCTGGGCAAGACAG
<i>Prdm16</i>	-84	AGCCCCCAATCCCGCGCCG
<i>Prdm16</i>	-155	CGAGCTGCGCTGAAAAGGGG
<i>Prdm16</i>	-221	AGTGTCAGGGTGCGGGCCC
<i>Prdm16</i>	-353	AGTCGCGCAGAAACCCGCTG
<i>Znrf3</i>	-82	CGCCTACCCGCTCCCCTCGG
<i>Znrf3</i>	-152	GGACTCAGTCGATTGGGCG
<i>Znrf3</i>	-199	TGGGCGGAGCAAGGGTGGAG
<i>Rnf43</i>	-48	TGGATTACTTTTTCGGGCTT
<i>Rnf43</i>	-94	GAGGACAGTAGCTCTCGTCT
<i>Rnf43</i>	-184	GATATTCCGTACAGAGGCGG
<i>Rnf43</i>	-399	GGAAACCTGTGGTTTGTAA
<i>Slc6a4</i>	-46	TGCCGCCCTCCCACCGGACA
<i>Slc6a4</i>	-85	GCCCTGGCTGCTGTATGTGC

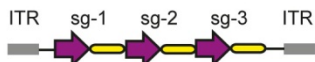
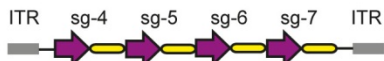
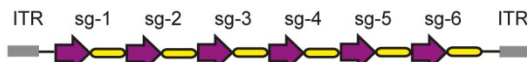
<i>Slc6a4</i>	-222	GCAGGACCTTAACGTAATTT
<i>Slc6a4</i>	-256	GTCAAGAAAGAATGCTCTTA
<i>Miat</i>	-35	CGTTGCTATGGCAGCGCCGC
<i>Miat</i>	-103	GTGCTTCTCGCTTAGGCGCC
<i>Miat</i>	-148	GAGAGCCAAGCACGGATACC
<i>Miat</i>	-241	GAGACCTCTGCCACAGACTT
<i>Lncpint</i>	-44	TGTTGCTGCTGCAGTCACGT
<i>Lncpint</i>	-109	GAGGGGCTCCTGGTGGGTGG
<i>Fendrr</i>	-51	GCGGCAGGCCGAGCCATA
<i>Fendrr</i>	-75	AGTAGAGAAGCCCGCGGGCG
<i>Halgr</i>	-34	AGTCGGGACCGGCCAGTGCG
<i>Halgr</i>	-75	GTGGCTTCATATACCGGCGG
<i>Slc7a11</i>	-161	GTAGTTTGTAAGTTACAGA
<i>Slc7a11</i>	-28	GAAAAATATGTCAAGGCCAC
<i>Slc7a11</i>	-245	AGATATGATTAGAAAGTGGT
<i>li10</i>	-74	GGCAAAGGTTTTTGTATTTC
<i>li10</i>	-178	GTAAGCGCTAAAGAACTGGT
<i>li10</i>	-303	GACAGCTGTTCTATGTACAG
<i>Grm2</i>	-55	GGAGTCCGGAGGAACGGAGG
<i>Grm2</i>	-170	GATCTGCTGGAAGCTGCTGG
<i>Grm2</i>	-227	GGGGATTACAGCACCACTG
<i>Glut4</i>	-50	GCGTGGCCTTTTGGGTGTG
<i>Glut4</i>	-172	AGTCCAAGATTTTGGATGGC
<i>Glut4</i>	-234	GTGCAGCTGGTCCCCCTGAA
<i>Glut4</i>	-292	GGGTACGGGGTAACTCCAGC
<i>TGFβ1</i>	-71	AGCCCCAGGGGGAGGGCATG
<i>TGFβ1</i>	-152	GGGGTCCCTTCAGCCCTGCG
<i>TGFβ1</i>	-249	GACCAACCAAAGCGCCCCGG
<i>Ins2</i>	-203	GTTAAGACTCTAATTACCCT
<i>Ins2</i>	-300	TGTGGAAAAATGCTCAGCCA
<i>Ins2</i>	-351	GTCCAAGGGACAAAGATACT
Control(LacZ)		TGCGAATACGCCACGCGAT

Supplementary Table 2: qPCR Primers (*M. musculus*)

Target	Forward primer (5'-3')	Reverse primer (5'-3')
<i>Ascl1</i>	GGAACAAGAGCTGCTGGACT	GTTTTTCTGCCTCCCCATTT
<i>Neurog2</i>	AACTCCACGTCCCCATACAG	GAGGCGCATAACGATGCTTCT
<i>Acta1</i>	CGAGGTATCTGACCCTGAA	GAAGGAATAGCCACGCTCAG
<i>Dkk1</i>	TCCGTCTGCCTCCGATCATC	GCCTTTCGTTTGTGCTTGG
<i>Neurod1</i>	ATGACCAAATCATACAGCGAGAG	TCTGCCTCGTGTTCCTCGT
<i>Bcl2</i>	ATGCCTTTGTGGAACATATGGC	GGTATGCACCCAGAGTGATGC
<i>Hbb-bh1</i>	CACTTGAGATCATCTCCAAGC	TAACCCCCAAGCCCAAGGATG

<i>Prdm16</i>	AGATGAACCAGGCATCCACTCGAA	ACTTCCCGGCTAAGCTGTATCAT
<i>Znrf3</i>	GGCGACTATACCAACCCACAC	CTTCACCACTCCTACCCAGC
<i>Rnf43</i>	TCCGAAAGATCAGCAGAACAGA	GGACTGCATTAGCTTCCCTTC
<i>Slc6a4</i>	TATCCAATGGGTACTCCGCAG	CCGTTCCCTTGGTGAATCT
<i>Miat</i>	GAGTGGAGAGATTGGGAAAGGTCACG	ATCCTGAGTGGAGGAACCTGAGGAG
<i>Glut4</i>	GTGACTGGAACACTGGTCCTA	CCAGCCACGTTGCATTGTAG
<i>Lncpint</i>	CAGGAGGGTGTTCCTTATAG	GTCTACCCAGCCAGAAATAA
<i>Fendrr</i>	GGCCCTGTAGTGAGGATTATG	CACACAGAAGAGAGGCTGTATC
<i>Halgr</i>	GTGTAGAGAGCCGGGAAATAA	CTGGAAAGTTGTCCGTGTAAAG
<i>Slc7a11</i>	AGGGCATACTCCAGAACACG	GGACCAAAGACCTCCAGAATG
<i>IL10</i>	CTTACTGACTGGCATGAGGATCA	GCAGCTCTAGGAGCATGTGG
<i>TGFβ1</i>	CCACCTGCAAGACCATCGAC	CTGGCGAGCCTTAGTTGGAC
<i>Ins2</i>	GGCTTCTTCTACACCCAT	CCAAGGTCTGAAGGTCACCT
<i>Grm2</i>	CTTTGTGCGTGCCTCACTCA	TCATAACGGGACTTGTGCGTC
<i>Gapdh</i>	CATGGCCTTCCGTGTTCTA	GCGGCACGTCAGATCCA

Supplementary Table3: sgRNAs target ANN factors

		<i>Ascl1</i>	
			
		<i>Neurog2</i>	
		<i>Neurod1</i>	
		<i>Ascl1</i>	
sg-1	GCAGCCGCTCGCTGCAGCAG		
sg-2	AGCTGAGGAGGTGGGGGAAG		
sg-3	GAGTTTGCAAGGAGCGGGCG		
sg-4	GGACTCCCGGCTGAATAAAC		
sg-5	GGGGGTGGCTCTAGAAATGG		
sg-6	TGCCTAGGTGGAAGTCTGG		
sg-7	GAAAATTCAGGGAAGGTTT		
		<i>Neurog2</i>	
sg-1	TGTGATTGGTGGCTCGCGCT		
sg-2	AGGAGGTCGCGAGGCGCAGC		
sg-3	GAAACAATCAGATCTGCCC		
sg-4	CGGGGACCAGGACAGGCGG		
sg-5	AGGATGGATGGCCAGGCCAG		
sg-6	CGGTAGCTTGGGCTGCAGCC		
		<i>Neurod1</i>	
sg-1	CGTGTTCCCGGCTCTTGGC		
sg-2	GCTCATTCCGGCCCTTTG		
sg-3	GCTGATGCTGAGCGCGGGCG		
sg-4	TGGACGCTGCGCGATTGCG		
sg-5	GCGGGAGGAAAGTTCTGGGG		
sg-6	TGCCGGGAGGAAGGAGCAG		

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')
<i>Grm2</i>	GGTACCAATTCAAAAAGCACCGACT	TAGCCATATGTTAATTAACGCGTTTTGGTT
<i>Ins2</i>	CCAAACTCTAGACTTTCAAGACCTAGCT	GATCTGCTGGAAGCTGCTGG
<i>Neurog2 Slc6a4</i>	CTTCCCCCACCTCCTCAGCT	AGCTAGGTCTTGAAAGCTAGAGTTTG
<i>Neurod1</i>	CTTCCCCCACCTCCTCAGCT	GCGTACTAGTGGATCCTTTTGGTTA
<i>Ascl1</i>	CCAAACTCTAGACTTTCAAGACCTAGCT	GCTGATGCTGAGCGCGGGCG
<i>Il10</i>	TCTGTGAACCTACAAACTAC	AGCTAGGTCTTGAAAGCTAGAGTTTG
<i>Slc7a11</i>	GAATTCTAGGATCCTTCAAGACCTAGCT	GACAGCTGTTCTATGTACAG
<i>Hbb-bh1</i>	CCCAAAGCTTTGAAATCCCA	AGGATCCTAGAAATTCATCGATTTTGGTTA
<i>Dkk1</i>	CCAAACTCTAGACTTTCAAGACCTAGCT	AGAGAGTCTGGGCAAGACAG
<i>Neurog2 Slc6a4</i>	CGATCGCATCGATTTTCAAGACCTAG	TGGGATTTCAAAGCTTTGGG

10-sgRNA-array

Target	Forward primer (5'-3')	Reverse primer (5'-3')
<i>MiatLncpint</i>	GTACCTTAATTAACCAAAAGGATCCACT	TAGCCATATGTTAATTAACGCGTTTTGGTT
<i>Neurod1</i>	CTTCCCCCACCTCCTCAGCT	GCGTACTAGTGGATCCTTTTGGTTA
<i>Ascl1</i>	CCAAACTCTAGACTTTCAAGACCTAGCT	GCTGATGCTGAGCGCGGGCG
<i>Il10</i>	TCTGTGAACCTACAAACTAC	AGCTAGGTCTTGAAAGCTAGAGTTTG
<i>Slc7a11</i>	GAATTCTAGGATCCTTCAAGACCTAGCT	GACAGCTGTTCTATGTACAG
<i>Hbb-bh1</i>	CCCAAAGCTTTGAAATCCCA	AGGATCCTAGAAATTCATCGATTTTGGTTA
<i>Dkk1</i>	CCAAACTCTAGACTTTCAAGACCTAGCT	AGAGAGTCTGGGCAAGACAG
<i>Neurog2 Slc6a4</i>	CGATCGCATCGATTTTCAAGACCTAG	TGGGATTTCAAAGCTTTGGG

Supplementary Table 5, Probes for in situ Hybridization

Dkk1

ATGATGGTTGTGTGTCAGCGCAGCTGTCCGGTTCTTGGCCGTGTTTACAATGATGGCTCTCTGCAGCCTCCCTCTGCTAGGAGCCAGTG
CCACCTTGAAGTCAAGTCTCATCAATTCCAACGCGATCAAGAACCTGCCCCACCGCTGGGTGGTGCTGGGGGGCAGCCGGGCTCTGCTG
TCAGTGTGGCGCCGGAGTCTCTATGAGGGCGGGAACAAGTACCAGACTCTTGACAACCTACCAGCCCTACCCTTGCCTGAAGATGAGG
AGTGCGGCTCTGACGAGTACTGCTCCAGCCCCAGCCGCGGGGCGAGCCGGCGTCCGAGGTGTACAGATCTGTCTGGCTTGCCGAAAGCGC
AGGAAGCGCTGCATGAGGCACGCTATGTGCTGCCCGGGAACCTACTGCAAAAATGGGAATATGCATGCCCTCTGACCACAGCCATTTTCCT
CGAGGGGAAATTGAGGAAAGCATCATTGAAAACCTTGGAATGACCACAACGCCCGCGGGGGATGGATATCCCAGAAGAACCACACTG
ACTTCAAAAATATATCACACCAAAGGGACAAGAAGGCTCCGTCTGCCTCCGATCATCAGACTGTGCCGAGGGCTGTGTTGTGCAAGACAC
TTCTGGTCCAAGATCTGTAAACCTGTCCTTAAAGAAGTCAAGGTGTGCACCAAGCACAACGGAAGGCTCCACGGGCTGGAGATATTCC
AGCGCTGTTACTGCGGGGAAGGCCTGGCTTGCAAGATACAGAAAGATCACCATCAAGCCAGCAATTCTTCTAGGCTCCACCTGCCAGAG
ACACTAAA

Hbb

TTACAGCTGAGGAGAAGGCAGCTATCACAAAGCATCTGGGATAAAGTGGACTTGGAAGAGTTGGAGGAGAACTCTGGGAAGGCTCCTGA
TTGTTTACCATGGACTCAGAGATTTTGTACAAGTTTGAAACCTCTCTTCTGCCCTGGCCATCATGGGAACCCCGGATTAGAGCCCAT
GGCAAGAAAGTGTGACATCCTTGGGCTTGGGGTTAAGAACATGGACAACCTCAAGGAGACCTTTGCTCATCTCAGTGAGCTGCACTGTG
ACAAGCTTCATGTGGATCCTGAGAACTTCAAGCTCCTGGGCAACATGTTGGTGATTGTCTTTCTACTCATTTTGGCAAGGAATTCACCCCA

GAGGTGCAGGCTGCCTGGCAGAACTGGTGATTGGAGTGGCCAATGCTCTGTCCACAAGTACCATTAACTCCATTCCAGTACACTGGCA
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)

ACATAACTTACGGTAAATGGCCCGCTGGCTGACCGCCCAACGACCCCGCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGC
CAATAGGGACTTTCCATTGACGTCAATGGTGGAGTATTTACGGTAACTGCCACTTGGCAGTACATCAAGTGATCATATGCCAAGTACG
CCCCCTATTGACGTCAATGACGGTAAATGGCCCGCTGGCATTATGCCAGTACATGACCTTATGGGACTTTCCTACTTGGCAGTACATCTA
CGTATTAGTCATCGCTATTACCATGGTCGAGGTGAGCCCCACGTTCTGCTTCACTCTCCCATCTCCCCCCTCCCCACCCCAATTTTGT
ATTTATTTATTTTAAATTATTTTGTGACGCGATGGGGCGGGGGGGGGGGGGGGCGCGCCAGGCGGGGCGGGGCGGGGCGAGGG
GCGGGGCGGGGCGAGGCGGAGAGGTGCGGCGGCAGCCAATCAGAGCGGCGCGCTCCGAAAGTTTCCTTTATGGCGAGGCGGCGGCG
GCGGCGGCCCTATAAAAGCGAAGCGCGCGGGGCGGGGAGTCGTCGACGCTGCCTTCGCCCGTGCCCGCTCCGCGCGCGCT
CGCGCGCCCGCCCGGCTCTGACTGACCGCTTACTCCACAGGTGAGCGGGCGGGACGGCCCTTCTCCTCGGGGTGTAATTAGCGC
TTGGTTAATGACGGCTTGTTCTTTCTGTGGCTGCGTGAAAGCCTTGAGGGGCTCCGGGAGGGCCCTTTGTGCGGGGGAGCGGCTCG
GGGGTGCGTGCGTGCTGTGTGCTGCGTGGGGAGCGCGCGTGCGGCTCCGCGCTGCCGCGCGGCTGTGAGCGCTGCGGGCGCGCGCG
GGGCTTTGTGCGCTCCGCGAGTGTGCGCGAGGGGAGCGCGCGGGGGCGGTGCCCGCGGTGCGGGGGGGGCTGCGAGGGGAACAAA
GGCTGCGTGCGGGGTGTGTGCTGGGGGGTGAGCAGGGGTGTGGCGCGTGGTGGGCTGCAACCCCCCTGCACCCCCCTCCC
CGAGTTGCTGAGCACGCGCCGCTTCGGGTGCGGGGCTCCGTACGGGGCGTGGCGCGGGGCTCGCCGTGCCGGGCGGGGGGTGGCGG
CAGGTGGGGGTGCCGGGCGGGGCGGGGCGCCCTCGGGCGGGGAGGGCTCGGGGGAGGGGCGGGGCGGCCCGGAGCGCCGCG
GCTGTCGAGGCGCGGCGAGCCGACGCCATTGCCTTTTATGGTAATCGTCGAGAGGGCGCAGGACTTCCTTTGTCCAAATCTGTGCGG
AGCCGAAATCTGGGAGGCGCCGCGCACCCCCCTAGCGGGCGCGGGGCGAAGCGGTGCGGCGCCGGCAGGAAGGAAATGGGCGGGG
AGGGCCTTCGTGCGTCGCCGCGCGCGCTCCCTTCTCCCTCTCCAGCTCGGGGCTGTCCGCGGGGGACGGCTGCCTTCGGGGGGG
ACGGGGCAGGGCGGGGTTGCGCTTCTGCGGTGTGACCGGCGGCTCTAGAGCTCTGCTAACCATGTTTCATGCCTTCTCTTTTCTTCTACAG
CTCCTGGGCAACGTGCTGTTATTGTGCTGTCTCATCATTTTGGCAAAGAATTGATTTGATACCGGGGCCCTAAATAACTTCGTATAGCATA
CATTATACGAAGTTATGTCGTGGCAGCGAGCTAACTTTAAATAATTGGCATTATTTAAAGTTATCGCGATGAATAAATGAAGCTTGAGATCT
GCGACTCTAGAGGATCTGCGACTCTAGAGGATCATAATCAGCCNTACCACATTTTGTAGAGGTTTTACTNGCTTTAAAAACCTCCACACCT
CCCCCTGAACCTGAAACATAAAATGAATGCAATTGTTGTTGTTAACTTGTTTATTGCAGCTTATAATGGTTACAAATAAGCAATAGCATCACA
AATTTACAAATAAAGCATTTTTTTCACTGCATTCTAGTTGTGGTTTGCCAAACTCATCAATGTATCTTATCATGTCTGGATCTGCGACTCTA
GAGGATCATAATCAGCCATACCACATTTGTAGAGGTTTTACTTGCTTTAAAAACCTCCACACCTCCCCCTGAACCTGAAACATAAAATGAA
TGCAATTGTTGTTGTTAACTTGTTTATTGCAGCTTATAATGGTTACAAATAAAGCAATAGCATCACAATTTACAAATAAAGCATTTTTTTAC
TGCAATTCTAGTTGTGGTTTGCCAAACTCATCAATGTATCTTATCATGTCTGGATCTGCGACTCTAGAGGATCATAATCAGCCATACCACATTT
GTAGAGGTTTTACTTGCTTTAAAAACCTCCACACCTCCCCCTGAACCTGAAACATAAAATGAATGCAATTGTTGTTGTTAACTTGTTTATTG
CAGCTTATAATGTTTACAAATAAAGCAATAGCATCACAATTTACAAATAAAGCATTTTTTTCACTGCATTCTAGTTGTGGTTTGCCAAACT
CATCAATGTATCTTATCATGTCTGGATCCCCATCAAGCTGATCCGGAACCTTAATATAACTTCGTATAGCATAATTATACGAAGTTATAGG
TCCCTCGACCTGCAGCCCAAGCTAGATCGAATTCGGCCGGCCGATTGGTTCACTCTCAAGCCTCAGACAGTGTTCAAGTTTTTTTCTTCC
ATTCAGGTGTCGTGACGTACGATGCCAAGAAGAAGCGCAAGGTGGGACGCGTCTGCAGGATATCAAGCTTGCGGTACCGCGGGGCCG
GGATCGCCACCATGGACAAGAAGTACAGCATCGGCCTGGCCATCGGCACCAACTCTGTGGGCTGGGCCGTGATACCGACGAGTACAAG
GTGCCAGCAAGAAATTCAAGGTGCTGGGCAACACCGACCGGCACAGCATCAAGAAGAACCTGATCGGCGCCCTGCTGTTTCGACAGCGGA
GAAACAGCCGAGGCCACCCGGCTGAAGAGAACCGCAGAAGAATACACCAGACGGAAGAACCGGATCTGCTATCTGCAAGAGATCTTC
AGCAACGAGATGGCCAAGGTGGACGACAGCTTCTCCACAGACTGGAAGAGTCCTTCTGGTGAAGAGGATAAGAAGCACGAGCGGCAC

CCCATCTTCGGCAACATCGTGGACGAGGTGGCCTACCACGAGAAGTACCCACCATCTACCACCTGAGAAAGAACTGGTGGACAGCACC
GACAAGGCCGACCTGCGGCTGATCTATCTGGCCCTGGCCACATGATCAAGTTCGGGGGCACTTCCTGATCGAGGGCGACCTGAACCCC
GACAACAGCGACGTGGACAAGCTGTTTCATCCAGCTGGTGCAGACCTACAACCAGCTGTTTCGAGGAAAACCCCATCAACGCCAGCGGCGTG
GACGCCAAGGCCATCCTGTCTGCCAGACTGAGCAAGAGCAGACGGCTGGAAAACTGATCGCCAGCTGCCCGGCGAGAAGAAGATGG
CCTGTTGCGCAACCTGATTGCCCTGAGCCTGGGCTGACCCCAACTTCAAGAGCAACTTCGACCTGGCCGAGGATGCCAACTGCAGCT
GAGCAAGGACACCTACGACGACGACCTGGACAACCTGCTGGCCAGATCGGCGACCACTACGCCGACCTGTTTCTGGCCGCCAAGAACCT
GTCCGACGCCATCCTGCTGAGCGACATCCTGAGAGTGAACACCGAGATCACCAAGGCCCCCTGAGCGCCTCTATGATCAAGAGATACGA
CGAGCACCACCAGGACCTGACCCTGCTGAAAGCTCTCGTGCGCGCAGCAGCTGCCTGAGAAGTACAAAGAGATTTTCTTCGACCAGAGCAA
GAACGGCTACGCCGGCTACATCGATGGCGGAGCCAGCCAGGAAGAGTTCTACAAGTTCATCAAGCCCATCCTGGAAAAGATGGACGGCAC
CGAGGAACTGCTCGTGAAGCTGAACAGAGAGGACCTGCTGCGGAAGCAGCGGACCTTCGACAACGGCAGCATCCCCACCATGACCT
GGGAGAGCTGCACGCCATTCTGCGCGGCGAGGAAGATTTTACCCATTCTGAAGGACAACCGGAAAAGATCGAGAAGATCCTGACCTT
CCGCATCCCCTACTACGTGGGCCCTCTGGCCAGGGGAAACAGCAGATTGCTGATGACCAGAAAAGAGCGAGGAAACCATCACCCCTG
GAACTTCGAGGAAGTGGTGGACAAGGGCGCCAGCGCCAGAGCTTCATCGAGCGGATGACCAACTTCGATAAGAACCTGCCAACGAGAA
GGTCTGCCCAAGCACAGCCTGCTGTACGAGTACTTCACCGTGTACAACGAGCTGACCAAAGTGAAATACGTGACCGAGGGAATGAGAAA
GCCCGCCTTCTGAGCGGCGAGCAGAAAAAGCCATCGTGACCTGCTGTTCAAGACCAACCGGAAAAGTGACCGTGAAGCAGCTGAAAGA
GGACTACTTCAAGAAAATCGAGTGCTTCGACTCCGTGGAAATCTCCGGCGTGGAAAGATCGGTTCAACGCCCTCCCTGGGCACATACCAGAT
CTGCTGAAAATTATCAAGGACAAGGACTTCTGGAATGAGGAAAACGAGGACATTCTGGAAGATATCGTGCTGACCTGACACTGTTTGA
GGACAGAGAGATGATCGAGGAACGGCTGAAAACCTATGCCACCTGTTTCGACGACAAAGTGATGAAGCAGCTGAAGCGGCGGAGATACAC
CGGCTGGGGCAGGCTGAGCCGGAAGCTGATCAACGGCATCCGGGACAAGCAGTCCGGCAAGACAATCCTGGATTTCTGAAGTCCGACG
GCTTCGCCAACAGAACTTCATGCAGCTGATCCACGACGACAGCCTGACCTTTAAAGAGGACATCCAGAAAGCCAGGTGTCCGGCCAGG
GCGATAGCCTGCACGAGCACATTGCCAATCTGGCCGCGAGCCCCGCCATTAAGAAGGGCATCCTGCAGACAGTGAAGGTGGTGGACGAG
CTCGTGAAAGTGATGGGCCGGCACAGCCCGAGAACATCGTGATCGAAATGGCCAGAGAGAACCAGACCACCCAGAAGGGACAGAAGAAC
AGCCGCGAGAGAATGAAGCGGATCGAAGAGGGCATCAAAGAGCTGGGCAGCCAGATCCTGAAAGAACACCCCGTGGAAAACACCCAGCT
GCAGAACGAGAAGCTGTACCTGTACTACCTGCAGAATGGGCGGGATATGTACGTGGACCAGGAACTGGACATCAACCGGCTGTCCGACTA
CGATGTGGACGCTATCGTGCTCAGAGCTTTCTGAAGGACGACTCCATCGATAACAAAGTGCTGACTCGGAGCGACAAGAACCGGGGCAA
GAGCGACAACGTGCCCTCCGAAGAGGTCGTGAAGAAGATGAAGAACTACTGGCGCCAGCTGCTGAATGCCAAGCTGATTACCCAGAGGAA
GTTTCGACAATCTGACCAAGGCCGAGAGAGCGGCCCTGAGCGAACTGGATAAGGCCGGCTTCATCAAGAGACAGCTGGTGAAACCCGGC
AGATCACAAAGCAGCTGGCAGAGATCCTGGACTCCCGGATGAACACTAAGTACGACGAGAACGACAACTGATCCGGGAAGTGAAAGTGAT
CACCTGAAGTCCAAGCTGGTGTCCGATTTCCGGAAGGATTTCCAGTTTTACAAAGTGCGCGAGATCAACAACTACCACCACGCCACGAC
GCCTACCTGAACGCCGTGCTGGGAACCGCCCTGATCAAAAAGTACCCTAAGCTGGAAAGCGAGTTCTGTACGGCGACTACAAGGTGTAC
GACGTGCGGAAGATGATCGCCAAGAGCGAGCAGGAAATCGGCAAGGCTACCGCCAAGTACTTCTTCTACAGCAACATCATGAACTTTTCA
AGACCGAGATTACCCTGGCCAACGGCGAGATCCGGAAGCGGCCTCTGATCGAGACAAACGGCGAAACAGGCGAGATCGTGTGGGATAAG
GGCCGGGACTTTGCCACCGTGGGAAAGTGCTGTCTATGCCCAAGTGAATATCGTGAAAAAGACCGAGGTGAGACAGGCGGCTTCAGC
AAAGAGTCTATCCTGCCAAGAGGAACAGCGACAAGCTGATCGCCAGAAAGAAGGACTGGGACCCTAAGAAGTACGGCGGCTTCGACAGC
CCCACCGTGGCCTATTCTGTGCTGGTGGTGGCCAAAGTGAAAAAGGGCAAGTCCAAGAACTGAAGAGTGTGAAAGAGCTGCTGGGGATC
ACCATCATGAAAGAAGCAGCTTCGAGAAGAATCCCATCGACTTTCTGGAAGCCAAGGGCTACAAAGAAGTGAAAAAGGACCTGATCATCA
AGCTGCCTAAGTACTCCCTGTTTCGAGCTGAAAAACGGCCGAAGAGAATGCTGGCCTCTGCCGCGAACTGCAGAAGGGAACGAAGTGG
CCCTGCCCTCCAATATGTGAACCTCCTGTACCTGGCCAGCCACTATGAGAAGCTGAAGGGCTCCCCGAGGATAATGAGCAGAAACAGCT
GTTTGTGGAACAGCACAAACACTACCTGGACGAGATCATCGAGCAGATCAGCGAGTTCTCCAAGAGAGTGATCCTGGCCGACGCTAATCTG
GACAAGGTGCTGAGCGCCTACAACAAGCACAGAGACAAGCCTATCAGAGAGCAGGCCGAGAATATCATCCACCTGTTTACCCTGACCAATC
TGGGAGCCCTGCCGCCTTCAAGTACTTTGACACCACCATCGACCGGAAGAGGTACACCAGCACCAAGAGGTGCTGGACGCCACCTGTA
TCCACCAGAGCATACCGGCCCTGTACGAGACACGATCGACCTGTCTCAGCTGGGAGGCGACGCCTATCCCTATGACGTGCCCGATTATG
CCAGCCTGGGCAGCGGCTCCCCAAGAAAAACGCAAGGTGGAAGATCCTAAGAAAAAGCGGAAAGTGACGGCATTGGTAGTGGGAGC
AACGGCAGCAGCGGATCCAACGGTCCGACTGACGCCGCGGAAGAAGAAGTCTTTGAGCAAGAATTATCATCTTGAGAACGAAGTGCTCGT
CTTAAGAAAGGTTCTGGCAGTGGAGAAGAACTGCTTTCAAAGAATTACCACCTGGAAAATGAGGTAGCTAGACTGAAAAAGGGGAGCGGAA

GTGGGGAGGAGTTGCTGAGCAAAAATTATCATTGGAGAACGAAGTAGCACGACTAAAGAAAGGGTCCGGATCGGGTGAGGAGTTACTCTC
GAAAAATTATCATCTCGAAAACGAAGTGCTCGGCTAAAAAGGGCAGTGTTCTGGAGAAGAGCTATTATCTAAAACTACCACCTCGAAA
ATGAGGTGGCACGCTTAAAAAGGGAAGTGGCAGTGTTGAAGAGCTACTATCCAAGAATTATCATCTTGAGAACGAGGTAGCGCGTTTGAA
GAAGGGTTCCGGCTCAGGAGAGGAAGTGTCTCGAAGAACTATCATCTTGAAAAATGAGGTGCTCGATTAAAAAGGGATCGGGCAGTGTT
GAGGAAGTACTTTCAAAGAATTACCACCTCGAAAACGAAGTAGCTCGATTAAAGAAAGGTTACGGGTGCGGTGAAGAATTACTGAGTAAAA
TTATCATCTGGAAGATGAGGTAGCGAGACTAAAAAGGGGAGTGTTCTGGCGAGGAATTGCTATCGAAAAATTATCATCTTGAGAACGAAG
TTGCTAGGCTCAAAAAGGGCTCAGGCTCAGGCACCGCGGTAAACATAGGTGGTGAACCGGTCCGATGGATCTACAGCGGCCCAAGGTG
GAGGTGGACCCAAGAAGAAGCGCAAGGTGGGAAGCGGAGCTACTAAGTTCAGCCTGCTGAAGCAGGCTGGAGACGTGGAGGAGAACCCT
GGACCTGCACCAGGAAGTATGAGCGAGCTGATTAAGGAGAACATGCACATGAAGCTGTACATGGGCCCCGACATCGTGATGACCCAGAGC
CCCAGCAGCCTGAGCGCCAGCGTGGGCGACCGCTGACCATCACCTGCCGAGCAGCACCGGCGCGTGACCACCAGCAACTACGCCA
GCTGGGTGCAGGAGAAGCCCGCAAGCTGTTCAAGGGCCTGATCGGCGGCACCAACAACCGCGCCCCGGCGTGCCAGCGCGTTGAG
CGGCAGCCTGATCGGCGACAAGGCCACCCTGACCATCAGCAGCCTGCAGCCCAGGACTTCGCCACCTACTTCTGCGCCCTGTGGTACAG
CAACCACTGGGTGTTTCGGCCAGGGCACCAAGGTGGAGCTGAAGCGCGCGCGCGCGCGCAGCGCGCGCGCGCGCGCGCGCGCGCG
GCAGCAGCGCGCGCGCGCAGCGAGGTGAAGCTGCTGGAGAGCGCGCGCGCGCTGGTGACCCCGCGCGCAGCCTGAAGCTGAGCTGCG
CCGTGAGCGGCTTCAGCCTGACCGACTACGGCGTGAAGTGGTGCGCCAGGCCCCGGCGCGCGCTGGAGTGATCGCGTGATCTG
GGGCGACGGCATCACCGACTACAACAGCGCCCTGAAGGACCGCTTCATCATCAGCAAGGACAACGGCAAGAACACCGTGACCTGCAGAT
GAGCAAGGTGCGCAGCGACGACACCGCCCTGTACTACTGCTGACCGGCTGTTGACTACTGGGGCCAGGGCACCCCTGGTGACCGTGA
GCAGCTACCCATACGATGTTCCAGATTACGCTGGTGAGGCGGAGGTTCTGGGGGAGGAGGTAGTGGCGGTGGTGGTTCAAGGAGCGCGC
GGAAGCCCTAAGAAAAGAGGAAGGTGGCGGCCGCTGGATCCCTTCAGGGCAGATCAGCAACCAGGCCCTGGCTCTGGCCCCTAGCTC
CGCTCCAGTGCTGGCCAGACTATGGTGCCCTCTAGTGCTATGGTGCTCTGGCCAGCCACCTGCTCCAGCCCCCTGTGCTGACCCAGG
ACCACCCAGTCACTGAGCGCTCCAGTGCCCAAGTCTACACAGGCCGCGGAGGGGACTCTGAGTGAAGCTCTGCTGCACCTGCAGTTGCA
CGCTGATGAGGACCTGGGAGCTCTGCTGGGAACAGCACCATCCCGAGTGTTACAGATCTGGCCTCCGTGGACAACCTCTGAGTTTCA
GCAGCTGCTGAATCAGGGCGTGTCATGTCTCATAGTACAGCCGAACCAATGCTGATGGAGTACCCGAAGCCATTACCCGGCTGGTGAC
CGGCAGCCAGCGGCCCGCCGACCCGCTCCAACCTCCCTGGGAACAGCGGCTGCCTAATGGGCTGTCCGGAGATGAAGACTTCTCAA
GCATCGTGATATGGAAGTTAGTGCCCTGCTGTACAGATTCTCTAGTGGGCAGGGAGGAGGTGAAGCGGCTTCAGCGTGAGACCA
GTGCCCTGCTGGACCTGTTAGCCCCCTCGGTGACCGTGCCCGACATGAGCCTGCCTGACCTTGACAGCAGCCTGGCCAGTATCCAAGAGC
TCCTGTCTCCCAGGAGCCCCCAGGCCTCCCGAGGCAGAGAAGCAGCAGCCCGGATTAGGGAAGCAGCTGGTGCACTACACAGCGCAG
CCGCTGTTCTGCTGGACCCCGGCTCCGTGGACACCGGGAGCAACGACCTGCCGGTGCTGTTGAGCTGGGAGAGGGCTCCTACTTCTC
CGAAGGGGACGGCTTCGCGGAGGACCCACCATCTCCCTGCTGACAGGCTCGGAGCCTCCAAAGCCAAGGACCCCACTGTCTCCGCTA
GCGAGGGCAGAGGAAGTCTGCTAACATGCGATTACAAGACGATGACGATAAGGGATCCAGTGGAAGGGCAGAGGAAGTCTGCTAACAT
GCGGTGACGTCGAGGAGAATCTGGCCAGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGCCCATCTGGTCGAGCTGGACGG
CGACGTAACGGCCACAAGTTCAGCGTGTCGGCGAGGGCGAGGGCGATGCCACCTACGGCAAGCTGACCCTGAAGTTCATCTGCACCA
CCGCAAGCTGCCCGTCCCTGGCCACCCCTCGTGACCACCTGACCTACGGCGTGCACTGCTTCAGCCGTACCCCGACCATGAAG
CAGCAGGACTTCTTCAAGTCCGCCATGCCGAAGGTACGTCCAGGAGCGCACCATCTTCTTCAAGGACGACGGCAACTACAAGACCCGC
GCCGAGGTGAAGTTCGAGGGCGACACCCTGGTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCA
CAAGCTGGAGTACAACACAAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAACGGCATCAAGGTGAAGTTCAGATCCGCCAC
AACATCGAGGACGGCAGCGTGACGCTCGCCGACCACTACCAGCAGAACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCGACAACCA
CTACCTGAGCAGCCAGTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCTGCTGGAGTTCGTGACCGCCCGGGAT
CACTCTCGGCATGGACGAGCTGTACAAGTAAATCGGCGCGACCCGGGTACGCGTATCAAGCTTATCGATAATCAACCTCTGGATTACAAAA
TTTGTGAAGATTGACTGGTATTCTTAACATATGTTGCTCCTTTACGCTATGTGGATACGCTGCTTAATGCCTTTGATCATGCTATTGCTTC
CCGTATGGCTTTTATTTCTCCTCTGTATAAATCCTGGTGCTGTCTTTATGAGGAGTTGTGGCCCGTTGTGACGGCAACGTGGCGTGG
TGTGCACTGTGTTGCTGACGCAACCCCACTGGTTGGGGCATTGCCACCACCTGTGAGCTCCTTCCGGGACTTTCGCTTTCCCCCTCCC
TATTGCCACGGCGGAACATCGCGCCTGCCTTCCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTC
GGGGAAATCATGCTCCTTCTTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGACGTCCTTCTGCTACGTCCTTCCGCCCTC
AATCCAGCGGACCTTCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCTTCCGCTTCGCCCTCAGACGAGTCGGATCTCC

CTTTGGGCCGCTCCCCGCATCGATACCGTCGATCCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCCCCTCCCCCGTGCCTTCCTTG
ACCCTGGAAGGTGCCACTCCCCTGTCCTTTCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCACTTATTCTGGGGGG
TGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGGCTCTATGG

U6-sgRNA-EF1 α -NLS-CRE-P2A-mCherry-WPRE(Letiviral vector used to infect primary cells)

GATCCGACGCGCCATCTCTAGGCCGCGCCGGCCCCCTCGCACGGAATTGTGGGAGAAGCTCGGCTACTCCCCTGCCCGGTTAATTGCG
ATATAATATTTCTAGTAAGTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTAATACTAGCTACATTTTACATGATAGGCT
TGGATTTCTATAACTTCGTATAGCATACATTATACGAAGTTATAAACAGCACAAAAGGAACTCACCCTAACTGTAAAGTAATTGTGTGTTTTG
AGACTATAAGTATCCCTTGGAGAACACCTTGTGGCAGCGTGAGCCACCGCGCCGTTTAAGAGCTATGCTGGAATGCTGTAGCAAGTT
TAAATAAGGCTAGTCGGTTATCAACTGAAAAAGTGCCACCGAGTCGGTGTCTTTTTCTCGGAATCAAGGATCTGCGATCGCTCCGGTGC
CCGTCACTGGGCAGAGCGCACATCGCCACAGTCCCCGAGAAGTTGGGGGAGGGGTGGCAATTGAACGGGTGCCTAGAGAAGGTGG
CGCGGGGTAAACTGGGAAAGTGATGTCTGTACTGGCTCCGCCTTTTTCCCGAGGGTGGGGGAGAACCGTATATAAGTGCAGTAGTCGCC
GTGAACGTTCTTTTTCGAACGGGTTTGCCGCCAGAACACAGCTGAAGCTTCGAGGGGCTCGCATCTCTCCTTACGCGCCCCGCCGCCCTA
CCTGAGGCCGCCATCCACGCCGTTGAGTCGCGTTCTGCCGCTCCCGCCTGTGGTGCCTCCTGAAGTGCCTCCGCCGTCTAGGTAAGTT
TAAAGCTCAGGTCGAGACCGGGCCTTTGTCCGGCGCTCCCTTGAGAGCTACCTAGACTCAGCCGGCTCTCCACGCTTTGCCTGACCCGTG
TTGCTCAACTCTACGTCTTTGTTTCTGTTTCTGTTCTGCGCGTTACAGATCCAAGCTGTGACCGGCGCTACACCGGTGCCACCATGCCCA
AGAAGAAGAGGAAGGTGTCCAATCTCCTGACTGTTCAACGAACTCCCTGCGCTGCCAGTAGATGCCACTAGCGATGAGGTCAAGAAAA
TCTCATGGATATGTTTAGGGATAGACAGGCGTTTTCTGAACACACCTGGAAAATGCTGCTTAGCGTGTGCCGATCCTGGGCAGCCTGGTGT
AAGCTGAACAATCGCAATGTTTCCCCGCCGAGCCGGAGGACGTGCGCGATTACCTGCTGTATCTCCAGGCAAGAGGGCTGGCTGTCAAG
ACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGCGAGGGCTCCCCCGGCTAGCGATTCAAACGCACTCTCCCTTGTTA
TGAGGAGAATTAGAAAGGAAAACGTAGATGCGGGTGAGAGGGCTAAGCAGGCTCTCGCTTTTGAGCGGACTGATTTGACACAGGTCAGAT
CCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTTCTGGGAATTGCATATAACACACTTCTGCGCATAGCTGAGAT
CGCCCGGATCAGAGTGAAGACATCAGTCGAACGACGGCGCGCGGATGCTTATTATATTGGACGCACAAAGACATTGGTCAGCACCGC
TGCGCTTGAAAAGGCCCTTGTCCTGGGCGTAACGAAGCTGGTGAAGATGGATCTCAGTGTCCGGCGTGGCTGACGACCCATAAATTAC
TTGTTCTGTGAGTGAGAAAAACGGAGTCGCCGCGCCCTCTGCCACCAGCCAATTGAGTACACGGGCCCTTGAAGGGATCTTTGAGGCAA
CCCACCGACTCATATACGGAGCCAAGGATGACAGTGGCCAGAGGTATCTCGCTGGTCAGGTCACTTCTGCTAGGGTGGGGGCCGACAG
ACATGGCGCGGGCAGGAGTCTCCATACCAGAGATTATGCAAGCTGGAGGTTGGACAAATGTGAACATCGTTATGAAGTATATCCGCAATCTT
GACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACAAAGGCCGCCAGGCAAAAAAGAAAAAGGAAGCGGAGCCACTAA
CTTCTCCCTGTTGAACAAGCAGGGGATGTGCAAGAGAATCCCGGGCCAATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAA
GGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCGGCCCTACG
AGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTGCCCTTCCCTTCCCTGGGACATCCTGTCCCTCAGTTCATGTACGGCT
CCAAGGCCTACGTGAAGCACCCCGCGACATCCCCGACTACTTGAAGCTGTCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAAC
TCGAGGACGGCGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTATCTACAAGGTGAAGCTGCGCGGCACCAAC
TTCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCCTGAA
GGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGC
AGCTGCCCGGCGCTACAACGTCAACATCAAGTTGGACATCACCTCCCAACAGGACTACACCATCGTGAACAGTACGAACGCGCCG
AGGGCCGCCACTCCACCGCGGCATGGACGAGCTGTACAAGTAAATCAACCTCTGGATTACAAAATTTGTGAAGATTGACTGGTATTCTT
AACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCTCTCTCT
TGATAAAATCCTGGTTGCTGTCTTTATGAGGAGTTGTGGCCCGTTGTCAAGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAAC
CCCCACTGGTTGGGCATTGCCACCACTGTCACTCCTTTCCGGGACTTTCGCTTTCCCTCCTCCTATTGCCACGGCGGAACATCATGCC
GCCTGCCTTGCCCGCTGCTGGACAGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTGCGGGAAATCATCGTCTTCTCTTGG
CTGCTCGCTGTGTTGCCACCTGGATTCTGCGCGGACGTCTTCTGCTACGTCCTTCCGGCCCTCAATCCAGCGGACCTTCTTCCCGCG
GCCTGCTGCCGGCTCTGCGGCCTCTCCGCGTCTTGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCGCCTCCCCGC

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

GATCCGACGCGCCATCTCTAGGCCGCGCCGGCCCCCTCGCACGGAAGCTTGTGGGAGAAGCTCGGCTACTCCCCTGCCCGGTTAATTGCT
ATATAATATTTCTAGTAAGTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTAATACTAGCTACATTTTACATGATAGGCT
TGGATTTCTATAACTTCGTATAGCATACATTATACGAAGTTATAAACAGCACAAGGAACTCACCCTAAGTGTAAAGTAATTGTGTGTTTTG
AGACTATAAGTATCCCTTGGAGAACACCTTGTGGCAGGCGTGAGCCACCGCGCCGTTTAAGAGCTATGCTGGAAATGCTGTAGCAAGTT
TAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGCCACCGAGTCGGTGCTTTTTTCTCGAGTACTAGGATCCATTAGGCGGCCGCGTGG
ATAACCGTATTACCGCCATGCATTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCGGTGATGCGGT
TTTGGCAGTACATCAATGGGCGTGGATAGCGGTTTACTCACGGGATTTCAGTCTCCACCCATTGACGTAATGGGAGTTTGTGTTTGG
CACCAAAATCAACGGGACTTTCCAAATGTCGTAACAACTCCGCCCATGACGCAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATA
TAAGCAGAGCTGGTTAGTGAACCGTCAGATCCGCTAGCCACCATGACCGAGTACAAGCCACGGTGCGCCTCGCCACCCGCGACGACG
TCCCCGGGGCGCTACGCACCCCTCGCCGCGCGCTTCGCCGACTACCCCGCCACGCGCCACACCGTCGACCCGGACCGCCACATCGAGCG
GGTACCGAGCTGCAAGAACTTCTCTACGCGCGTCGGGCTCGACATCGGCAAGGTGTGGGTGCGCGACGACGGCGCCGCGGTGGCG
GTCTGGACCACGCCGAGAGCGTGAAGCGGGGCGGTGTTGCGCGAGATCGGCCCGCGCATGGCCGAGTTGAGCGGTTCCGCGCTGG
CCGCGCAGCAACAGATGGAAGGCCCTCTGGCGCGCACCGGCCAAGGAGCCCGCGTGGTTCCTGGCCACCGTCGCGCTCTCGCCGA
CCACCAGGCAAGGGTCTGGGAGCGCGCTCGTGCTCCCGGAGTGAGGCGGCCGAGCGCGCCGGGTGCCCGCCTTCCTGGAGAC
CTCCGCGCCCGCAACCTCCCTTCTACGAGCGGCTCGGCTTACCGTACCGCGGACGTCGAGGTGCCGGAAGGACCGCGCACCTGGT
GCATGACCCGCAAGCCCGGTGCGGATCGGGAGAGGGCAGAGGAAGTCTGCTAACATGCGGTGACGTCGAGGAGAATCCTGGCCACCG
GTGCGCCACCATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCATGAGGAGCTCCGTC
AACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCGGCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTG
GCCCCCTGCCCTTCGCTGGGACATCTGTCCCTCAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCGACATCCCGACT
ACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAAGTTCGAGGACGGCGCGTGGTGACCGTGACCCAGGACTCCT
CCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGTGCAGCGGCACCAACTTCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGG
GCTGGGAGGCCCTCTCCGAGCGGATGTACCCCGAGGACGCGGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGG
CCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGACGCTGCCCCGCGCCTACAACGTCAACATCAAGTTGGACAT
CACCTCCCAACGAGGACTACACCATCGTGAACAGTACGAACGCGCCGAGGGCCGCACTCCACCGCGGCATGGACGAGCTGTACA
AGTAAAGAAATTCGTCGAGGGACCTAATAACTTCGTATAGCATACATTATACGAAGTTATACATGTTTAAGGGTTCCGTTTCCACTAGGTACAAT
TCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAAGTATGTTGCTCCTTTACGCTATG
TGGATACGCTGCTTAATGCCTTTGTATCATGCTATTGCTCCCGTATGGCTTTCATTTCTCCTCCTGTATAAATCCTGGTTGCTGTCTCTT
TATGAGGAGTTGTGGCCGTTGTACGGCAACGTGGCGTGGTGTGCACTGTGTTGCTGACGCAACCCCACTGGTTGGGGCATTGCCACC
ACCTGTACGCTCCTTCCGGGACTTTGCTTTCCCTCCCTATTGCCACGCGGAACTCATCGCCGCTGCCTTGCCGCTGCTGGACAG
GGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAATCATCGTCTTTCCTTGGCTGCTGCGCTGTGTTGCCACCTGGAT
TCTGCGCGGGACGTCCTTCTGCTACGTCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCCGCGGCTGCTGCCGCTCTGCGGCTCT
TCCGCGTCTTCCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCGCCTCCCCG

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

GTCCCCTCCACCCACAGTGGGCGAGGTAGGCGGTACGGTGGGAGGCTATATAAGCAGAGTCGTTTGTGAACCGTCAGATCGCCT
GGAACGCGTGCCACCATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGG
CTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCGGCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACC
AAGGGTGGCCCCCTGCCCTTCGCTGGGACATCTGTCCCTCAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCGGACATC
CCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAAGTTCGAGGACGGCGGCGTGGTGACCGTGACCCA
GGACTCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGTGCAGCGGCACCAACTTCCCTCCGACGGCCCCGTAATGCAGAAGAA
GACCATGGGCTGGGAGGCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAG
GACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGACGCTGCCCCGCGCCTACAACGTCAACATCAA

GTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGAACAGTACGAACGCGCCGAGGGCCGCGCACTCCACGGCGGCATGGACG
AGCTGTACAAGTAAACCGGTTAGGGGCCCGTTTAAACCCGCTGATCAGCCTCGACTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTGCC
CTCCCCCGTGCCCTTCCTTGACCTGGAAGGTGCCACTCCCACTGTCTTTCTTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGT
GTCATTCTATTCTGGGGGTGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGG
CTCTATGG

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

GATCCGACGCGCCATCTCTAGGCCGCGCCGGCCCCCTCGCACGGAAGCTCGGCTACTCCCTGCCCGGTTAATTGCG
ATATAATATTTCTAGTAAGTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTAACTAGCTACATTTACATGATAGGCT
TGGATTTCTATACTTCGTATAGCATACATTATACGAAGTTATAAACAGCACAAGGAACTCACCCTAAGTAAAGTAATTGTGTGTTTTG
AGACTATAAGTATCCCTTGGAGAACACCTTGTGGCAGCGTGAGCCACCGCGCCGTTTAAGAGCTATGCTGGAATGCTGTAGCAAGTT
TAAATAAGGCTAGTCCGTTATCAACTGAAAAAGTGGCACCAGTGGTGTCTTTTTCTCGAGTACTAGGATCCATTAGGCGGCCGCGTGG
ATAACCGTATTACGCCATGCATTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGAGATTCCGCGTGATGCGGT
TTTGGCAGTACATCAATGGGCGTGGATAGCGGTTTACTCACGGGATTTCGAAGTCTCCACCCATTGACGTCAATGGGAGTTTGTGTTGG
CACCAAAATCAACGGGACTTTCCAAAATGTCTGAACAACTCCGCCCATGACGCAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATA
TAAGCAGAGCTGGTTAGTGAACCGTCAGATCCGCTAGCCACCATGACCGAGTACAAGCCACGGTGCGCCTCGCCACCGCGCAGCAGC
TCCCCGGGGCGGTACGCACCTCGCCGCCGCGTTCGCCGACTACCCGCCACGCGCCACACCGTCGACCCGGACCGCCACATCGAGCG
GGTCACCGAGCTGCAAGAACTCTTCTCACGCGCGTCGGGCTCGACATCGGCAAGGTGTGGGTGCGGACGACGCGCGCGGTGGCG
GTCTGGACCACGCCGAGAGCGTCGAAGCGGGGCGGTGTTCCGCCGAGATCGGCCCGCGCATGGCCGAGTTGAGCGGTTCCCGGCTGG
CCGCGCAGCAACAGATGGAAGGCCTCTGCGCGCCGACCGGCCCAAGGAGCCGCGTGGTTCCTGGCCACCGTCGGCGTCTCGCCCGA
CCACCAGGGCAAGGTCTGGGACGCGCGTCTGCTCCCGGAGTGAGGCGGGCGAGCGCGCGGGGTGCCCGCTTCTCGGAGAC
CTCGCGCCCCGCAACCTCCCTTCTACGAGCGGCTCGGCTTACCCTGTCACCGCCGACGTCGAGGTGCCGAAGGACCGCGCACCTGGT
GCATGACCCGCAAGCCCGGTGCGGATCGGGAGAGGGCAGAGGAAGTCTGCTAACATGCGGTGACGTCGAGGAGAATCCTGGCCACCG
GTCGCCACCATGGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGGCCATCTGGTCGAGCTGGACGGCGACGTAACCGGCCACAA
GTTTCAGCGTGTCCGGCGAGGGCGAGGGCGATGCCACCTACGGCAAGCTGACCCTGAAGTTCATCTGACACCACGGCAAGCTGCCCGTGC
CCTGGCCACCCTCGTGACCACCCTGACCTACGGCGTGCACTGCTTACCGCGTACCCCGACCATGAAGCAGCAGACTTCTTCAAGT
CCGCCATGCCGAAGGTACGTCAGGAGCGCACCATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAG
GGCGACACCCTGGTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGAGTACAATACT
AACAGCCACAACGTCTATATCATGCGCGACAAGCAGAAGAACGGCATCAAGGTGAAGTTCAGATCCGCCACAACATCGAGGACGGCAGC
GTGCAGCTCGCCGACCACTACCAGCAGAACACCCCATCGGCGACGGCCCCGTGCTGCTGCCCGACAACCACTACCTGAGCACCAGTC
CGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCTGCTGGAGTTCGTGACCGCGCCGGGATCACTCTCGGCATGGACG
AGCTGTACAAGTAAATTCGTGAGGGACCTAATAACTTCGTATAGCATACATTATACGAAGTTATACATGTTTAAGGGTCCGGTTCCTACT
AGGTACAATTCGATATCAAGCTTATCGATTAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTT
TACGCTATGTGGATACGCTGCTTAAATGCCTTTGTATCATGCTATTGCTTCCGATGCGCTTTCATTTCTCCTCCTGTATAAATCCTGGTTG
CTGTCTCTTATGAGGAGTTGTGGCCGTTGTACAGCAACGTGGCGTGGTGTGCACTGTGTTGCTGACGCAACCCCACTGGTTGGGGC
ATTGCCACCACCTGTCAGCTCCTTCCGGGACTTTCGCTTTCCTCCCTATTGCCACGGCGGAACATCGCCGCTGCTTGGCCGCT
GCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAATCATGCTCCTTCTTGGCTGCTCGCCTGTGTTG
CCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCGCGGCTGCTGCCGGCTC
TGCGGCCTCTCCGCGTCTTCGCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGCCGCTCCCCGC

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

AGGCAGGCAGAAGTATGCAAAGCATGCATCTCAATTAGTCAGCAACCATAGTCCCGCCCTAACTCCGCCATCCCGCCCTAACTCCGCC
CAGTTCGCCCATCTTCGCCCATGGCTGACTAATTTTTTTATTTATGAGAGGCGGAGGCCGCTCTGCCTCTGAGCTATTCCAGAAGT
AGTGAGGAGGCTTTTTTGGAGGCCATAGGCTACGCGCGCCACCATGCCAAGAAGAAGCGCAAGGTGGACGCGTCTGCAGGATATCAAGC
TTGCGGTACCGCGGGCCGGGATCGCCACCATGGACAAGAAGTACAGCATCGGCCTGGCCATCGGCACCAACTCTGTGGGCTGGGCCGT

GATCACCAGACGAGTACAAGGTGCCAGCAAGAAATTC AAGGTGCTGGGCAACACCGACCGGCACAGCATCAAGAAGAACCTGATCGGCGC
CCTGCTGTTTCGACAGCGGAGAAACAGCCGAGGCCACCCGGCTGAAGAGAACCGCCAGAAGAAGATACACCAGACGGAAGAACCGGATCT
GCTATCTGCAAGAGATCTTCAGCAACGAGATGGCCAAGGTGGACGACAGCTTCTCCACAGACTGGAAGAGTCTTCTCTGGTGGAAAGAGGA
TAAGAAGCACGAGCGGCACCCCATCTTCGGCAACATCGTGGACGAGGTGGCCTACCACGAGAAGTACCCACCATCTACCACCTGAGAAA
GAAACTGGTGGACAGCACCGACAAGGCCGACCTGCGGCTGATCTATCTGGCCCTGGCCACATGATCAAGTTCGGGGGCCACTTCTGAT
CGAGGGCGACCTGAACCCCGACAACAGCGACGTGGACAAGCTGTTTCATCCAGCTGGTGCAGACCTACAACCAAGCTGTTTCGAGGAAAAACCC
CATCAACGCCAGCGCGCTGGACGCCAAGGCCATCCTGTCTGCCAGACTGAGCAAGAGCAGACGGCTGGAAAATCTGATCGCCAGCTGC
CCGCGCAGAAGAAGATGGCCTGTTTCGGCAACCTGATTGCCCTGAGCCTGGGCCTGACCCCAACTTCAAGAGCAACTTCGACCTGGCCG
AGGATGCCAACTGCAGCTGAGCAAGGACACCTACGACGACGACCTGGACAACCTGCTGGCCAGATCGGCGACCAGTACGCCGACCTGT
TTCTGGCCGCCAAGAACCTGTCCGACGCCATCCTGCTGAGCGACATCCTGAGAGTGAACACCGAGATACCAAGGCCCCCTGAGCGCCT
CTATGATCAAGAGATACGACGAGCACCACCAGACCTGACCCTGCTGAAAGCTCTCTGTCGGCAGCAGCTGCCTGAGAAGTACAAAGAGA
TTTTCTTCGACCAGAGCAAGAACGGCTACGCCGGCTACATCGATGGCGGAGCCAGCCAGGAAGAGTTCTACAAGTTCATCAAGCCATCCT
GGAAAAGATGGACGGCACCGAGGAACTGCTCGTGAAGCTGAACAGAGAGGACCTGCTGCGGAAGCAGCGGACCTTCGACAACGGCAGCA
TCCCCCACCAGATCCACCTGGGAGAGCTGCACGCCATTCTGCGGCGGCAGGAAGATTTTTACCCATTCTGAAGGACAACCGGAAAAAGA
TCGAGAAGATCCTGACCTTCGCATCCCTACTACGTGGGCCCTCTGGCCAGGGGAAACAGCAGATTGCGCTGGATGACCAGAAAGAGCG
AGGAAACCATCACCCCTGGAACTTCGAGGAAGTGGTGACAAGGGCGCCAGCGCCAGAGCTTCATCGAGCGGATGACCAACTTCGATA
AGAACTGCCAACGAGAAGGTGCTGCCAAGCACAGCCTGCTGTACGAGTACTTCACCGTGTACAACGAGCTGACCAAAGTGAATACGT
GACCGAGGGAATGAGAAAGCCCGCTTCTGAGCGGCGAGCAGAAAAAGCCATCGTGGACCTGCTGTTCAAGACCAACCGGAAAGTGAC
CGTGAAGCAGCTGAAAGAGGACTACTTCAAGAAAATCGAGTGTTCGACTCCGTGGAATCTCCGGCGTGGAAGATCGGTTCAACGCCTCC
CTGGGCACATACCACGATCTGCTGAAAATTATCAAGGACAAGGACTTCTGGACAATGAGGAAAACGAGGACATTCTGGAAGATATCGTGC
TGACCCTGACACTGTTTGAGGACAGAGAGATGATCGAGGAACGGCTGAAAACCTATGCCACCTGTTTCGACGACAAAAGTATGAAGCAGCT
GAAGCGGCGGAGATACACCGGCTGGGGCAGGCTGAGCCGGAAGCTGATCAACGGCATCCGGGACAAGCAGTCCGGCAAGACAATCCTGG
ATTTCTGAAGTCCGACGGCTTCGCCAACAGAACTTATGACGCTGATCCACGACGACAGCCTGACCTTTAAGAGGACATCCAGAAAGC
CCAGGTGTCCGGCCAGGGCGATAGCCTGCACGAGCACATTGCCAATCTGGCCGGCAGCCCCGCCATTAAGAAGGGCATCCTGCAGACAG
TGAAGTGGTGGACGAGCTCGTGAAGTGTGGGCCGGCACAAGCCCGAGAACATCGTATCGAAATGGCCAGAGAGAACCAGACCACC
CAGAAGGGACAGAAGAACAGCCGCGAGAGAATGAAGCGGATCGAAGAGGGCATCAAAGAGCTGGGCAGCCAGATCCTGAAAGAACACCC
CGTGAAAACACCCAGCTGCAGAACGAGAAGCTGTACCTGTACTACCTGCAGAATGGGCGGGATATGTACGTGGACCAGGAACTGGACAT
CAACCGGCTGTCCGACTACGATGTGGACGTATCGTGCTCAGAGCTTTCTGAAGGACGACTCCATCGATAACAAAGTGTGACTCGGAGC
GACAAGAACCGGGCAAGAGCGACAACGTGCCCTCCGAAGAGGTCTGAAGAAGATGAAGAACTACTGGCGCCAGCTGCTGAATGCCAA
GCTGATTACCCAGAGGAAGTTCGACAATCTGACCAAGGCCGAGAGAGGCGGCTGAGCGAACTGGATAAGGCCGGCTTCATCAAGAGACA
GCTGGTGGAAACCCGGCAGATCAGAAAGCAGTGGCACAGATCCTGGACTCCCGGATGAACACTAAGTACGACGAGAACGACAACTGAT
CCGGAAGTGAAGTGATCACCTGAAGTCCAAGCTGGTGTCCGATTTCCGGAAGGATTTCCAGTTTACAAAGTGCGCGAGATCAACAAC
TACCACCACGCCACGACGCTACCTGAACGCCGTCTGGGAACCGCCCTGATCAAAAAGTACCCTAAGCTGGAAAGCGAGTTCGTGTAC
GGCGACTACAAGGTGTACGAGTGCAGGAGATGATGCCAAGAGCGAGCAGGAAATCGGCAAGGCTACCGCCAAGTACTTCTCTACAGC
AACATCATGAACTTTTTCAAGACCGAGATTACCTGGCCAACGGCGAGATCCGGAAGCGGCCTCTGATCGAGACAAACGGCGAAACAGGC
GAGATCGTGTGGGATAAGGGCCGGGACTTTGCCACCGTGCAGAAAGTGTGTCTATGCCCCAAGTGAATATCGTGAAAAAGACCGAGGTG
CAGACAGCGCGCTTCAGCAAAGAGTCTATCCTGCCAAGAGGAACAGCGACAAGCTGATCGCCAGAAAGAAGGACTGGGACCCTAAGAA
TACGGCGGCTTCGACAGCCCCACCGTGGCCTATTCTGTGCTGGTGGTGCCAAAGTGGAAGGGCAAGTCCAAGAACTGAAGAGTGTG
AAAGAGCTGCTGGGGATCACCATCATGGAAGAAGCAGCTTCGAGAAGAATCCATCGACTTTCTGGAAGCCAAGGGCTACAAAGAAGTGA
AAAAGGACCTGATCATCAAGCTGCCTAAGTACTCCCTGTTTCGAGCTGGAAAAACGGCCGGAAGAGAATGCTGGCCTCTGCCGGCGAACTGC
AGAAGGGAAACGAACTGGCCCTGCCCTCCAAATATGTGAATTCCTGTACCTGGCCAGCCACTATGAGAAGCTGAAGGGCTCCCCGAGG
ATAATGAGCAGAAACAGCTGTTTGTGGAACAGCACAAACACTACCTGGACGAGATCATCGAGCAGATCAGCGAGTTCTCCAAGAGAGTGAT
CCTGGCCGACGTAATCTGGACAAGGTGCTGAGCGCCTACAACAAGCACAGAGACAAGCCTATCAGAGAGCAGGCCGAGAATATCATCCA
CCTGTTTACCCTGACCAATCTGGGAGCCCTGCCGCCTTAAGTACTTTGACACCACCATCGACCGGAAGAGGTACACCAGCACCAAGAG
GTGCTGGACGCCACCCTGATCCACCAGAGCATCACCGGCTGTACGAGACAGGATCGACCTGTCTCAGCTGGGAGGCGACGCCATCCCG

GGGACGGCTTCGCCGAGGACCCACCATCTCCCTGCTGACAGGCTCGGAGCCTCCCAAAGCCAAGGACCCCACTGTCTCCGCTAGCGGC
AGTGGAGAGGGCAGAGGAAGTCTGCTAACATGCGGTGACGTGAGGAGAATCCTGGCCAGTGAGCAAGGGCGAGGAGCTGTTACCGG
GGTGGTGCCCATCTGCTGAGCTGGACGGCGACGTAACCGGCCACAAGTTCAGCGTGTCCGGCGAGGGCGAGGGCGATGCCACCTACG
GCAAGCTGACCCGAAGTTCATCTGCACACCGGCAAGCTGCCCGTGCCCTGGCCACCCTCTGACCACCCTGACCTACGGCGTGCACT
GCTTCAGCCGCTACCCCGACCACATGAAGCAGCACGACTTCTTCAAGTCCGCCATGCCCGAAGGCTACGTCCAGGAGCGCACCATCTTCTT
CAAGGACGACGGCAACTACAAGACCCGCGCGAGGTGAAGTTCGAGGGCGACACCCTGGTGAACCGCATCGAGCTGAAGGGCATCGACT
TCAAGGAGGACGGCAACATCTCGGGGCACAAGCTGGAGTACAACAGCAGCACAACGTCTATATCATGGCCGACAAGCAGAAGAACG
GCATCAAGGTGAAGTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGAGCTCGCCGACCCTACCAGCAGAACACCCCATCGGCG
ACGGCCCCGTGCTGCTGCCCGACAACCACTACCTGAGCACCAGTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCC
TGCTGGAGTTCTGTACCGCCGCCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAA GAATTCGATATCAAGCTTATCGATATCAACC
TCTGGATTACAAAATTTGTGAAGATTGACTGGTATTCTTAACATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTAAATGCCTTTGTAT
CATGCTATTGCTTCCCGTATGGCTTTCATTTTCTCCTCCTTGATAAATCCTGGTTGCTGTCTTTATGAGGAGTTGTGGCCGCTTGTGAGG
CAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCACTGGTTGGGGCATTGCCACCACCTGTGAGCTCCTTTCCGGGACTTTGCG
CTTTCCCTCCCTATTGCCACGGCGGAATCATCGCCGCTGCTTCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATT
CCGTGGTGTGTCGGGGAAATCATCGTCTTTCCTTGGCTGCTCGCTGTGTTGCCACCTGGATTCTGCCGGGAGCTCCTTCTGCTACGT
CCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCCGCGGCTGCTGCCGGCTCTGCCGGCTCTTCCGCGTCTTCCGCTTCCGCTTCAGAC
GAGTCGGATCTCCCTTTGGGCGGCTCCCGCATCGATACCGTCGACCTCGAGACCTAGAAAAACATGGAGCAATCACAAGTAGCAATACA
GCAGCTACCAATGCTGATTGTGCTGGCTAGAAGCACAAGAGGAGGAGGAGGTGGGTTTTCCAGTCACACCTCAGGTACCTTTAAGACCAA
TGACTTACAAGGCAGCTGTAGATCTTAGCCACTTTTTAAAAGAAAAGGGGGGACTGGAAGGGCTAATCACTCCCAACGAAGACAAGATATC
CTTGATCTGTGGATCTACCACACACAAGGCTACTTCCCTGATTGGCAGAATACACACCAGGGCCAGGGATCAGATATCCACTGACCTTTG
GATGGTGTGCTACAAGCTAGTACCAGTTGAGCAAGAGAAGGTAGAAGAAGCCAATGAAGGAGAGAACACCCGCTGTTACACCTGTGAGCCT
GCATGGGATGGATGACCCGGAGAGAGAAGTATTAGAGTGGAGTTTGACAGCCGCTAGCATTTTCATCACATGGCCCGAGAGCTGCATCC
GGACTGTACTGGGTCTCTCTGTTAGACCAGATCTGAGCCTGGGAGCTCTCTGGCTAACTAGGGAACCCACTGCTTAAGCCTCAATAAAGC
TTGCCTTGAGTGTCTCAAGTAGTGTGTGCCGTCTGTTGTGTGACTCTGGTAACTAGAGATCCCTCAGACCCTTTTAGTCAGTGTGAAAAAT
CTCTAGCAGGGCCGTTTAAACCCGCTGATCAGCCTCGACTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCCTCCCGCTGCCCTTC
CTTGACCCTGGAAGGTGCCACTCCCACTGTCTTTCTAATAAAATGAGGAAATGCATCGCATTGTCTGAGTAGGTGTCAATTCTATTCTGG
GGGGTGGGGTGGGGCAGGACAGCAAGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGGCTCTATGG

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

GGCTCCGGTGCCCGTCAGTGGGCAGAGCGCACATCGCCACAGTCCCGAGAAGTTGGGGGAGGGGTGGCAATTGAACCGGTGCCTA
GAGAAGGTGGCGGGGTAACTGGGAAAGTGATGTCGTGACTGGCTCCGCTTTTTCCCGAGGGTGGGGGAGAACCCTATATAAGTGC
AGTAGTCGCCGTGAACGTTCTTTTCGCAACGGGTTTCCCGCAGAACACAGGTAAGTGCCGTGTGTGGTTCCCGCGGGCCTGGCCTCTT
ACGGGTTATGGCCCTTGCCTGCTTGAATTACTTCCACTGGCTGCAGTACGTGATTCTTGATCCCGAGCTTCGGGTTGGAAGTGGGTGGGA
GAGTTCGAGGCTTGCCTTAAGGAGCCCTTCGCCTCGTCTTGAGTTGAGGCTGGCTGGGCGCTGGGGCCCGCGCTGCGAATCT
GGTGGCACCTTCGCGCTGTCTCGCTGCTTTCGATAAGTCTCTAGCCATTTAAATTTTGTGACCTGCTGCGACGCTTTTTTCTGGCAAG
ATAGTCTTGTAAATGCGGGCCAAGATCTGCACACTGGTATTTTCGGTTTTTGGGGCCGCGGGCGGCGACGGGGCCCGTGCCTCCAGCGCA
CATGTTTCGGCGAGGCGGGCCTGCGAGCGCGGCCACCGAGAATCGGACGGGGTAGTCTCAAGCTGGCCGCCTGCTCTGGTGCCTGG
CCTCGCGCCGCGTGTATGCCCCGCCCTGGGCGCAAGGCTGGCCCGTGGCACCAAGTTGCGTGAGCGGAAAGATGGCCGCTTCCC
GGCCCTGCTGCAGGGAGCTCAAAATGGAGGACGCGGCGCTCGGGAGAGCGGGCGGGTGAGTACCCACACAAAGGAAAAGGGCCTTTC
CGTCTCAGCCGTGCTTATGTGACTCCACGGAGTACCGGGCGCCGTCCAGGCACCTCGATTAGTTCTCGAGCTTTTGGAGTACGTCGTC
TTTAGGTTGGGGGAGGGGTTTTATGCGATGGAGTTTCCACACTGAGTGGGTGGAGACTGAAGTTAGGCCAGCTTGGCACTTGATGTAA
TTCTCCTTGAATTTGCCCTTTTTGAGTTGGATCTTGTTTCATTCTCAAGCCTCAGACAGTGGTTCAAAGTTTTTTCTCCATTTAGGTGT
CGTGACGTACGGCCACCATGGCTTCAAACCTTACTCAGTTCGTGCTCGTGGACAATGGTGGGACAGGGGATGTGACAGTGGCTCCTTCTAA
TTTCGCTAATGGGGTGGCAGAGTGGATCAGCTCCAACCTACGGAGCCAGGCCACAAAGGTGACATGCAGCGTCAGGCAGTCTAGTCCCCA
GAAGAGAAAGTATACCATCAAGGTGGAGGTCCCCAAAGTGGCTACCCAGACAGTGGGCGGAGTCGAACTGCCTGTGCGCGCTTGGAGGTC

CTACCTGAACATGGAGCTCACTATCCCAATTTTCGCTACCAATTCTGACTGTGAACTCATCGTGAAGGCAATGCAGGGGCTCCTCAAAGACG
GTAATCCTATCCCTTCGCCATCGCCGCTAACTCAGGTATCTACAGCGCTGGAGGAGGTGGAAGCGGAGGAGGAGGAAGCGGAGGAGGA
GGTAGCGGACCTAAGAAAAAGGAAGGTGGCGGCCGCTGGATCCCTTCAGGGCAGATCAGCAACCAGGCCCTGGCTCTGGCCCCTAG
CTCCGCTCCAGTGCTGGCCCAGACTATGGTGCCCTCTAGTGCTATGGTGCCCTCTGGCCCAGCCACCTGCTCCAGCCCCCTGTGCTGACCCC
AGGACCACCCCAGTCACTGAGCGCTCCAGTGCCCAAGTCTACACAGGCCGGCGAGGGGACTCTGAGTGAAGCTCTGCTGCACCTGCAGTT
CGACGCTGATGAGGACCTGGGAGCTCTGCTGGGGAACAGCACCAGTCCCGAGTGTTACAGATCTGGCCTCCGTGGACAACCTGAGTT
TCAGCAGCTGCTGAATCAGGGCGTGTCATGTCTCATAGTACAGCCGAACCAATGCTGATGGAGTACCCGAAGCCATTACCCGGCTGGT
ACCGGCAGCCAGCGCCCCCGACCCCGCTCCAATCCCTGGGAACAGCGGCCTGCCTAATGGGCTGTCCGGAGATGAAGACTTCTC
AAGCATCGTGATATGGACTTTAGTGCCCTGCTGTACAGATTTCTCTAGTGGGCAGGGAGGAGGTGGAAGCGGCTTCAGCGTGGAAC
CAGTGCCCTGCTGGACCTGTTAGCCCCCTCGGTGACCGTGCCCGACATGAGCCTGCCTGACCTTGACAGCAGCCTGGCCAGTATCCAAGA
GCTCCTGTCTCCCCAGGAGCCCCCAGGCCCTCCCGAGGACAGAAACAGCAGCCCGATTAGGGAAGCAGCTGGTGACATACACAGCGC
AGCCGCTGTTCTGCTGGACCCCGGCTCCGTGGACACCGGGAGCAACGACCTGCCGGTGCTGTTGAGCTGGGAGAGGGCTCCTACTTC
TCCGAAGGGGACGGCTTCGCCGAGGACCCACCATCTCCCTGCTGACAGGCTCGGAGCCTCCCAAAGCCAAGGACCCCACTGTCTCCGC
TAGCGGCAGTGGAAGGGCAGAGGAAGTCTGCTAACATCGCGTGACGTCGAGGAGAATCCTGGCCCAAGTGAGCAAGGGCGAGGAGCTGT
TCACCGGGGTGGTGCCCATCCTGGTCGAGCTGGACGGCGACGTAACGGCCACAAGTTCAGCGTGTCGGGCGAGGGCGAGGGCGATGC
CACCTACGGCAAGCTGACCCCTGAAGTTTCATCTGCACCACCGGCAAGCTGCCCGTGCCCTGGCCCAACCCTCGTGACCACCCCTGACCTACGG
CGTGCACTGCTTCAGCCGCTACCCCGACCATGAAGCAGCAGCAGCTTCTTCAAGTCCGCCATGCCCGAAGGCTACGTCCAGGAGCGCAC
CATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCGGAGGTGAAGTTCGAGGGCGACACCCTGGTGAACCGCATCGAGCTGAAGGG
CATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGAGTACAACACAACGCCACAACGCTCTATATCATGGCCGACAAGCAG
AAGAACGGCATCAAGGTGAAGTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCACTCGCCGACCACTACCAGCAGAACACCCCC
ATCGGGCAGGGCCCCGTGCTGCTGCCCGACAACCACTACCTGAGCACCAGTCCGCCCTGAGCAAGACCCCAACGAGAAGCGCGATCA
CATGGTCTGCTGGAGTTCGTGACCGCCGCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAAGAATTCGATATCAAGCTTATCGAT
AATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACATATGTTGCTCCTTTACGCTATGTGGATACGCTGCTTAAATGC
CTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATTTCTCCTCCTGTATAAATCCTGGTGTGCTGTCTTTATGAGGAGTTGTGGCCCGT
GTGCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGG
GACTTTGCTTTCCCCCTCCCTATTGCCACGGCGGAACATCATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCAC
TGACAATCCGTGGTGTGTCGGGGAAATCATGCTCCTTTCCTTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGCTCCTC
TGCTACGTCCCTCGGCCCTCAATCCAGCGGACCTTCTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTCCGCGTCTTCGCCTTCGC
CCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGC

EF1 α -HA-NLS-dCas9-NLS-VP64-WPRE(VP64)

GGCTCCGGTGCCCGTCAGTGGGCAGAGCGCACATCGCCACAGTCCCCGAGAAGTTGGGGGAGGGGTCGGCAATTGAACCGGTGCCTA
GAGAAGGTGGCGCGGGGTAAGTGGGAAAGTGATGTCTGTACTGGCTCCGCCTTTTCCCCAGGGTGGGGGAGAACCGTATATAAGTGC
AGTAGTCGCGTGAACGTTCTTTTCGCAACGGGTTTCCGCCAGAACACAGGTAAGTCCCGTGTGTGTTCCCGCGGCCTGGCCTCTTT
ACGGGTTATGGCCCTTGCGTGCCTGAATTACTTCCACCTGGCTGCAGTACGTGATTCTTGATCCCGAGCTTCGGGTTGGAAGTGGGTGGG
AGAGTTCGAGGCCTTGCCTTAAGGAGCCCCCTCGCCTCGTGCTTGAGTTGAGGCCTGGCTGGGCGCTGGGGCCGCCGCTGCGAATC
TGGTGGCACCTTCGCGCCTGTCTCGCTGCTTTGATAAGTCTCTAGCCATTTAAATTTTTGATGACCTGCTGCACGCTTTTTTCTGGCAA
GATAGTCTTGTAATGCGGGCCAAGATCTGCACACTGGTATTTTCGGTTTTTGGGGCCGCGGGCGGACGGGGCCCGTGCCTCCAGCG
CACATGTTGCGCGAGGCGGGGCTGCGAGCGCGGCCACCGAGAATCGGACGGGGTAGTCTCAAGCTGGCCGGCCTGCTCTGGTGCCT
GGCCTCGCGCCGCGGTGTATCGCCCCGCCCTGGGCGGCAAGGCTGGCCCGGTGCGCACCAAGTTGCGTGAGCGGAAAGATGGCCGCTTC
CCGGCCCTGCTGCAGGGAGCTCAAAATGGAGGACGCGGCCTCGGAGAGCGGGCGGGTGAGTACCCACACAAAGGAAAAGGCCTT
TCCGTCTCAGCCGTGCTTCATGTACTCCACGAGTACCGGGCGCGTCCAGGCACCTCGATTAGTTCTCGAGCTTTTGGAGTACGTGC
TCTTAGGTTGGGGGAGGGGTTTTATGCGATGGAGTTCCCCACACTGAGTGGGTGGAGACTGAAGTTAGGCCAGCTTGGCACTTGATGT
AATTCTCCTTGAATTTGCCCTTTTGTAGTTTGGATCTTGTTTCTCAAGCCTCAGACAGTGGTCAAAGTTTTTTCTTCCATTTAGGT
GTCGTGAGGATCGCCACCATGTACCCATACGATGTTCCAGATTACGCTTCGCCGAAGAAAAAGCGCAAGGTGCAAGCGTCCGACAAGAAGT

ACAGCATCGGCCTGGCCATCGGCACCAACTCTGTGGGCTGGGCCGTGATACCGACGAGTACAAGGTGCCAGCAAGAAATCAAGGTGC
TGGGCAACACCGACCGGCACAGCATCAAGAAGAACCTGATCGGAGCCCTGCTGTTTCGACAGCGGCGAAACAGCCGAGGCCACCCGGCTG
AAGAGAACCGCCAGAAGAAGATACACCAGACGGAAGAACCGGATCTGCTATCTGCAAGAGATCTTCAGCAACGAGATGGCCAAGGTGGAC
GACAGCTTCTTCCACAGACTGGAAGAGTCTTCTGGTGGAAGAGGATAAGAAGCACGAGCGGCACCCCATCTTCGGCAACATCGTGGAC
GAGGTGGCCTACCACGAGAAGTACCCACCATCTACCACCTGAGAAAGAACTGGTGGACAGCACCGACAAGGCCGACCTGCGGCTGATC
TATCTGGCCCTGGCCACATGATCAAGTTCCGGGGCCACTTCTGATCGAGGGCGACCTGAACCCCGACAACAGCGACGTGGACAAGCTG
TTCATCCAGCTGGTGCAGACCTACAACCAGCTGTTTCGAGGAAAACCCCATCAACGCCAGCGGCGTGGACGCCAAGGCCATCTGTCTGCC
AGACTGAGCAAGAGCAGACGGCTGGAATCTGATCGCCAGCTGCCCGCGAGAAGAAGATGGCCTGTTTCGGCAACCTGATTGCCCTG
AGCCTGGGCTGACCCCCAACTTCAAGAGCAACTTCGACCTGGCCGAGGATGCCAACTGCAGCTGAGCAAGGACACCTACGACGACGAC
CTGGACAACCTGCTGGCCAGATCGGCGACCAGTACGCCGACCTGTTTCTGGCCGCAAGAACCTGTCCGACGCCATCTGTGAGCGAC
ATCTGAGAGTGAACACCGAGATCACCAAGGCCCCCTGAGCGCTCTATGATCAAGAGATACGACGAGCACCACCGAGGACCTGACCCTG
CTGAAAGCTCTCGTGCAGCAGCTGCCTGAGAAGTACAAAGAGATTTTCTTCGACCAGAGCAAGAACGGCTACGCCGGCTACATTGACG
GCGGAGCCAGCCAGGAAGATTCTACAAGTTCATCAAGCCCATCTGGAAAAGATGGACGGCACCGAGGAACGTCTCGTGAAGCTGAACA
GAGAGGACCTGCTGCGGAAGCAGCGGACCTTCGACAACGGCAGCATCCCCACCAGATCCACCTGGGAGAGCTGCACGCCATTCTGCGG
CGGCAGGAAGATTTTACCATTCTGAAGGACAACCGGAAAAGATCGAGAAGATCCTGACCTTCGTCATCCCTACTACGTGGGCCCTC
TGGCCAGGGGAAACAGCAGATTGCTGATGACCAGAAAGAGCGAGGAAACCATCACCCCTGGAACCTCGAGGAAGTGGTGGACAAG
GGCGCTTCGCCCAGAGCTTATCGAGCGGATGACCAACTTCGATAAGAACCTGCCAACGAGAAGGTGCTGCCAACGACAGCCTGCTG
TACGAGTACTTCACCGTGTATAACGAGCTGACCAAGTGAATACGTGACCGAGGGAATGAGAAAGCCCGCTTCTGAGCGGCAGCAG
AAAAAGGCCATCGTGGACCTGCTGTTCAAGACCAACCGGAAAGTGACCGTGAAGCAGCTGAAAGAGGACTACTTCAAGAAAATCGAGTGT
TCGACTCCGTGGAATCTCCGGCGTGAAGATCGGTTCAACGCCTCCCTGGGCACATACCACGATCTGCTGAAAATTATCAAGGACAAGGA
CTTCTGGAATGAGGAAAACGAGGACATTCTGGAAGATATCGTGTGACCTGACACTGTTTGAGGACAGAGAGATGATCGAGGAACGG
CTGAAAACCTATGCCACCTGTTTCGACGACAAAGTATGAAGCAGCTGAAGCGGCGGAGATACCCGCTGGGGCAGGCTGAGCCGGA
GCTGATCAACGGCATCCGGGACAAGCAGTCCGGCAAGACAATCCTGGATTCTGAAAGTCCGACGGCTTCGCCAACAGAACTTCATGCAG
CTGATCCACGACGACAGCCTGACCTTTAAGAGGACATCCAGAAAGCCAGGTGTCCGGCCAGGGCGATAGCCTGCACGAGCACATTGCC
AATCTGGCCGGCAGCCCCGCCATTAAGAAGGGCATCTGCAGACAGTGAAGGTGGTGGACGAGCTCGTGAAGTGATGGGCCGGCACA
GCCCCGAGAATCGTGATCGAAATGGCCAGAGAGAACCAGACCACCCAGAAAGGGACAGAAGAACAGCCGCGAGAGAATGAAGCGGATCG
AAGAGGGCATCAAGAGCTGGGCAGCCAGATCCTGAAAGAACACCCGTGGAACACCCAGCTGCAGAACGAGAAGCTGTACCTGTACT
ACCTGCAGAATGGGCGGATATGTACGTGGACCAGGAAGTGGACATCAACCGGCTGTCCGACTACGATGTGGACGCCATCGTGCCTCAGA
GCTTTCTGAAGGACGACTCCATCGACAACAAGGTGCTGACCAGAAGCGACAAGAACCGGGCAAGAGCGACAACGTGCCCTCCGAAGAGG
TCGTGAAGAAGATGAAGAACTACTGGCGGCAGCTGCTGAACGCCAAGCTGATTACCCAGAGAAAGTTCGACAATCTGACCAAGGCCGAGA
GAGGCGGCTGAGCGAACTGGATAAGGCCGGCTTCATCAAGAGACAGCTGGTGAACCCGGCAGATCACAAAGCAGTGGCACAGATC
CTGACTCCCGGATGAACACTAAGTACGACGAGAATGACAAGCTGATCCGGGAAGTGAAGTGATCACCTGAAGTCCAAGCTGGTGTCC
GATTTCCGGAAGGATTTCCAGTTTTACAAGTGCGCGAGATCAACAATACCACCACGCCACGACGCCTACCTGAACGCCGTGCTGGGAA
CCGCCCTGATCAAAAAGTACCCTAAGCTGGAAGCGAGTTCTGTACGGCGACTACAAGGTGTACGACGTGCGGAAGATGATGCCAAGA
GCGAGCAGGAAATCGGCAAGGCTACCGCCAAGTACTTCTTACAGCAACATCATGAACTTTTCAAGACCGAGATTACCTGGCCAACGG
CGAGATCCGGAAGCGGCCTCTGATCGAGACAAACGGCGAAACCGGGGAGATCGTGTGGGATAAGGGCCGGGATTTTGCACCGTGCGGA
AAGTGCTGAGCATGCCCCAAGTGAATATCGTGAAGAAGACCGAGGTGCAGACAGCGGCTTCAGCAAAGAGTCTATCCTGCCAAGAGGA
ACAGCGATAAGCTGATCGCCAGAAAGAAAGGACTGGGACCCTAAGAAGTACGGCGGCTTCGACAGCCCCACCGTGGCCTATTCTGTGCTGG
TGGTGGCCAAAGTGAAAAGGGCAAGTCCAAGAACTGAAGAGTGTGAAGAGCTGCTGGGGATCACCATCATGAAAGAAGCAGCTTCG
AGAAGAATCCCATCGACTTTCTGGAAGCCAAGGGCTACAAGAAGTGAAGAAGGACCTGATCATCAAGCTGCCTAAGTACTCCCTGTTCTGA
GCTGAAAACGGCCGGAAGAGAATGCTGGCCTCTGCCGGCAACTGCAGAAGGGAAACGAAGTGGCCCTGCCCTCCAAATATGTGAACCT
CCTGTACCTGGCCAGCCACTATGAGAAGCTGAAGGGCTCCCCGAGGATAATGAGCAGAAACAGCTGTTTGTGAACAGCACAAGCACTA
CCTGGACGAGATCATCGAGCAGATCAGCGAGTTCTCCAAGAGAGTATCCTGGCCGACGCTAATCTGGACAAAGTGTGTCCGCTACAA
AAGCACCGGGATAAGCCCATCAGAGAGCAGGCGAGAATATCATCCACCTGTTTACCCTGACCAATCTGGGAGCCCTGCCGCTTCAAGT
ACTTTGACACCACCATCGACCGGAAGAGGTACACCAGCACCAAGAGGTGCTGGACGCCACCCTGATCCACCAGAGCATCACCGGCTGT

ACGAGACACGGATCGACCTGTCTCAGCTGGGAGGCGACAGCCCCAAGAAGAAGAGAAAGGTGGAGGCCAGCGGGCCGGCCGGATCCGG
GCGCGCCGACGCGCTGGACGATTCGATCTCGACATGCTGGTTCTGATGCCCTCGATGACTTTGACCTGGATATGTTGGGAAGCGACGC
ATTGGATGACTTTGATCTGGACATGCTCGGCTCCGATGCTCTGGACGATTTGATCTCGATATGTTATATATCGATTGATTAATTAAGAATTC
GGTACAAGTAAAGCGGCCGCGTCGACAAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACATGTTGCTCCTTTTA
CGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATTTTCTCCTCCTTGATAAATCCTGGTTGCT
GTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATT
GCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACATCGCCGCCTGCCTTGCCCGCTGCT
GGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAAGCTGACGTCCTTCCATGGCTGCTCGCCTGTGTTGCCA
CCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGC
GGCCTCTTCCGCGTCTTCGCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGC

U6-sgRNA2.0(sgRNA vector for SAM)

GAGGGCCTATTTCCCATGATTCCCTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTGGAATTAATTTGACTGTAACACAAAG
ATATTAGTACAAAATACGTGACGTAGAAAAGTAATAATTTCTGGGTAGTTGCAGTTTTAAATATGTTTTAAATGGACTATCATATGCTTAC
CGTAACTGAAAGTATTTTCGATTTCTTGGCTTTATATATCTTGTGGAAGGACGAACACCGGTCCCTCCACCCACAGTGTTTTAGAGCT
AGGCCAACATGAGGATCACCCATGTCTGCAGGGCCTAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGGCCAACATGAGGATCACCC
ATGTCTGCAGGGCCAAGTGGCACCGAGTCGGTGCTTTT

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

TAATCCCACCTCCCTCTCTGTGCTGGGACTCACAGAGGGAGACCTCAGGAGGCAGTCTGTCCATCACATGTCCAAATGCAG
AGCATACCTGGGCTGGGCGCAGTGGCGCACAACCTGTAATTCAGCACTTTGGGAGGCTGATGTGGAAGGATCACTTGAG
CCCAGAAGTTCTAGACCAGCCTGGGCAACATGGCAAGACCCTATCTCTACAAAAAAGTTAAAAATCAGCCACGTGTGG
TGACACACACCTGTAGTCCCAGCTATTCAGGAGGCTGAGGTGAGGGGATCACTTAAGGCTGGGAGGTTGAGGCTGCAGTG
AGTCGTGGTTGCGCCACTGCACTCCAGCCTGGGCAACAGTGAGACCCTGTCTCAAAAGACAAAAAAAAAAAAAAAAAAAA
AAAGAACATATCTGGTGTGGAGTAGGGGACGTGCTCTGACAGAGGCTCGGGGGCCTGAGCTGGCTCTGTGAGCTGGGG
AGGAGGCAGACAGCCAGGCCTTGTCTGCAAGCAGACCTGGCAGCATTGGGCTGGCCGCCCCCAGGGCCTCCTCTTCATG
CCCAGTGAATGACTCACCTTGGCACAGACACAATGTTCCGGGTGGGCACAGTGCCTGCTTCCCGCCGACCCCCAGCCCCC
TCAATGCCTTCCGAGAAGCCATTGAGCAGGGGGCTTGCAATTGCACCCAGCCTGACAGCCTGGCATCTTGGGATAAAA
GCAGCACAGCCCCCTAGGGGCTGCCCTTGCTGTGTGGCGCCACCGCGGTGGAGAACAAGGCTCTATTACGCTGTGCCC
AGGAAAGGGGATCAGGGGATGCCCAGGCATGGACAGTGGGTGGCAGGGGGGAGAGGAGGGCTGTCTGCTTCCCAGAAG
TCCAAGGACACAAATGGGTGAGGGGACTGGGCAGGGTCTGACCTGTGGGACCAGAGTGAGGGGCGTAGATGGACCTG
AAGTCTCCAGGGACAACAGGGCCCAGGTCTCAGGCTCCTAGTTGGGCCCAGTGGCTCCAGCGTTTCAAACCCATCCATCC
CCAGAGGTTCTTCCCATCTCTCAGGCTGATGTGTGGAACTCGAGGAAATAAATCTCCAGTGGGAGACGAGGGGTGGC
CAGGGAAACGGGGCGCTGCAGGAATAAAGACGAGCCAGCAGCCAGCTCATGTGTAACGGCTTTGTGGAGCTGTCAAG
GCCTGGTCTCTGGGAGAGAGGCACAGGGAGGCCAGACAAGGAAGGGGTGACCTGGAGGGACAGATCCAGGGGCTAAAGT
CCTGATAAGGCAAGAGAGTGCCGGCCCCCTCTTGCCCTATCAGGACCTCCACTGCCACATAGAGGCCATGATTGACCCCTTA
GACAAAGGGCTGGTGTCCAATCCCAGCCCCCAGCCCCAGAACTCCAGGGAATGAATGGGCAGAGAGCAGGAATGTGGGA
CATCTGTGTTCAGGGAAGGACTCCAGGAGTCTGCTGGGAATGAGGCCTAGTAGGAAATGAGGTGGCCCTTGAGGGTACA
GAACAGGTTTATTCTTCGCCAAATTCAGCACCTTGACAGGCACTTACAGCTGAGTGAGATAATGCCTGGGTTATGAAATC
AAAAAGTTGGAAGCAGGTCAGAGGTCATCTGGTACAGCCCTTCCTTCCCTTTTTTTTTTTTTTTTTTTGTGAGACAAGGTCT
CTCTCTGTTGCCAGGCTGGAGTGGCGCAAACACAGCTCACTGCAGCCTCAACCTACTGGGCTCAAGCAATCCTCCAGCCT
CAGCCTCCCAAAGTGCTGGGATTACAAGCATGAGCCACCCACTCAGCCCTTTCCTTCCCTTTTAAATGATGCATAATAATT
GTAAGTATTCATCATGGTCCAACCAACCCTTCTTGACCCACCTTCCTAGAGAGAGGGTCTCTTGCTTCAGCGGTCAGGG
CCCCAGACCATGGTCTGGCTCCAGGTACCACCTGCCTCATGCAGGAGTTGGCGTGCCAGGAAGCTCTGCCTCTGGGCAC
AGTGACCTCAGTGGGGTGGGGGAGCTCTCCCCATAGCTGGGCTGCGGCCCAACCCACCCCTCAGGCTATGCCAGGGG

GTGTTGCCAGGGGCACCCGGGCATCGCCAGTCTAGCCCACTCCTTCATAAAGCCCTCGCATCCCAGGAGCGAGCAGAGCC
AGAGCAGGTTGGAGAGGAGACGCATCACCTCCGCTGCTCGCGGGGATCCATGGCCATCATCAAGGAGTTCATGCGCTTCA
AGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCTACGAGGGCAC
CCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCTCAGTTTCATGTACGG
CTCCAAGGCCTACGTGAAGCACCCCGCGACATCCCCGACTACTTGAAGCTGTCCTTCCCGAGGGCTTCAAGTGGGAGCG
CGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGG
TGAAGCTGCGCGGCACCAACTTCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAG
CGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACG
CTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGCAGCTGCCCCGGCGCCTACAACGTCAACATCAAGTTGGACATC
ACCTCCCAACAGGAGACTACACCATCGTGAACAGTACGAACGCGCGGAGGGCCGCCACTCCACCGCGGCATGGACG
AGCTGTACAAGTAA GAATTCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTA
TTCTTAACATATGTTGCTCCTTTACGCTATGTGGATACGCTGCTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCT
TTCATTTTCTCCTCTGTATAAATCCTGGTTGCTGTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGG
TGTGCACTGTGTTGTGACGCAACCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTCCGGGACTTTTCGCTTT
CCCCCTCCCTATTGCCACGGCGAACTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGA
CAATTCGTTGGTGTGTCGGGAAATCATCGTCTTTCTTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACG
TCCTTCTGTACTGCTCCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCCTTCCGC
GTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTGGGCGCCTCCCCGATCGATACCGTTCGACCCGGGCGGCCG
TTCGAGCAGACATGATAAGATACATTGATGAGTTTGGACAAACCACAAGTAAAGTGCAGTGAAAAAATGCTTTATTGT
GAAATTTGTGATGCTATTGCTTTATTTGTAACCATTATAAGCTGCAATAACAAGTT

U6-sgMiat-U6-sgLncpint-U6-sgNeurod1-U6-sgAscl1-U6-sgIlf10-U6-sgSlc7a11-U6-sHbb-
U6-sgDkk1-U6-sgScf6a4-U6-sgNeurog2-EF1a-NLS-Cre-P2A-mCherry-
WPRE (Supplementary Fig.8)

GAGGGCCTATTTCCCATGATTCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGA
TATTAGTACAAAATACGTGACGTAGAAAAGTAATAATTTCTGGGTAGTTGCAGTTTTAAAATTATGTTTTAAATGGACTATCATATGCTTACC
GTAACCTGAAAGTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGGTGCTTCTCGCTTAGGCGCCGTTTTAGAGCTA
GAAATAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAAAGTGGCACCAGTTCGGTGCTTTTTGAATTGGTACCAGGGCCATTT
TCCCATGATTCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAA
AATACGTGACGTAGAAAAGTAATAATTTCTGGGTAGTTGCAGTTTTAAAATTATGTTTTAAATGGACTATCATATGCTTACCGTAACCTGAAA
GTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGGAGGGGCTCCTGGTGGGTGGTTTTAGAGCTAGAAAATAGCAA
GTTAAATAAGGCTAGTCCGTTATCAACTTGAAAAGTGGCACCAGTTCGGTGCTTTTTGAATTCGCTAGCTAGGTCTTGAAACGCGTACTA
GTGGATCCTTTTGGTTAATTAAGGTACCAGGGCCATTTCCCATGATTCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAAT
TAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAAAATACGTGACGTAGAAAAGTAATAATTTCTTGGGTAGTTGCAGTTTTAAAATTAT
GTTTTAAATGGACTATCATATGCTTACCGTAACCTTGAAAGTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGGCTG
ATGCTGAGCGCGGGCGGTTTTAGAGCTAGAAAATAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAAAGTGGCACCAGTTCGGTG
CTTTTTGAATTGGTACCAGGGCCATTTCCCATGATTCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTT
TGACTGTAAACACAAAGATATTAGTACAAAATACGTGACGTAGAAAAGTAATAATTTCTTGGGTAGTTGCAGTTTTAAAATTATGTTTTAAATG
GACTATCATATGCTTACCGTAACCTTGAAAGTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGAGCTGAGGAGGTGG
GGGAAGGTTTTAGAGCTAGAAAATAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAAAGTGGCACCAGTTCGGTGCTTTTTGAATT
CGCTAGCTAGGTCTTGAAAGTCTAGAGTTTGGTTAATTAAGGTACCAGGGCCATTTCCCATGATTCTTCATATTTGCATATACGATACAA
GGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAAAATACGTGACGTAGAAAAGTAATAATTTCTTGGGTAG
TTTGAGTTTTAAAATTATGTTTTAAATGGACTATCATATGCTTACCGTAACCTTGAAAGTATTTGATTTCTTGGCTTTATATATCTTGTGAA
AGGACGAAACACCGGACAGCTGTCTATGTACAGTTTTAGAGCTAGAAAATAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAAA
GTGGCACCAGTTCGGTGCTTTTTGAATTGGTACCAGGGCCATTTCCCATGATTCTTCATATTTGCATATACGATACAAGGCTGTTAGA

GAGATAATTAGAATTAATTTGACTGTAACACAAAGATATTAGTACAAAATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTT
TAAAATTATGTTTTAAATGGACTATCATATGCTTACCGTAACCTGAAAGTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAAC
ACCGGTAGTTGTAGGTTCAAGAGTGTAGAGCTAGAAAATAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGA
GTCGGTGCTTTTTGAATTCGCTAGCTAGGTCCTGAAGGATCCTAGAATTCATCGATTTTGGTTAATTAAGGTACCAGGGCCATTTCCCAT
GATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAACACAAAGATATTAGTACAAAATACG
TGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTAAAAATTATGTTTTAAATGGACTATCATATGCTTACCGTAACCTGAAAGTATTT
CGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGAGAGAGTCTGGGCAAGACAGGTTTTAGAGCTAGAAAATAGCAAGTTAAA
ATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTGAATTTGGTACCAGGGCCATTTCCCATGATTCCTTCAT
ATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAACACAAAGATATTAGTACAAAATACGTGACGTAGAAA
GTAATAATTTCTTGGGTAGTTTGCAGTTTAAAAATTATGTTTTAAATGGACTATCATATGCTTACCGTAACCTGAAAGTATTTGATTTCTTGG
CTTTATATATCTTGTGAAAGGACGAAACACCGTGGGATTTCAAGCTTGGGGTTTTAGAGCTAGAAAATAGCAAGTTAAATAAGGCTAGTC
CGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTGAATTCGCTAGCTAGGTCCTGAAAGTCTAGAGTTGGTTAATTAAGGTACC
GAGGGCCATTTCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAACACAAAGA
TATTAGTACAAAATACGTGACGTAGAAAATTAATTTCTTGGGTAGTTTGCAGTTTAAAAATTATGTTTTAAATGGACTATCATATGCTTACC
GTAACCTGAAAGTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGGCCCTGGCTGCTGTATGTGCGTTTTAGAGCTA
GAAATAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTGAATTTGGTACCAGGGCCATTT
TCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAACACAAAGATATTAGTACAA
AATACGTGACGTAGAAAATTAATTTCTTGGGTAGTTTGCAGTTTAAAAATTATGTTTTAAATGGACTATCATATGCTTACCGTAACCTGAAA
GTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGCGGGGACCAGGACAGGCGGGTTTTAGAGCTAGAAAATAGCAA
GTAAAAATAAGGCTAGTCCGTTATCAACTTGAAAAAGTGGCACCGAGTCGGTGCTTTTTGAATTCGCTAGCTAGGTCCTGAAAATCGATGC
GATCGCTCCGGTGCCCGTCAGTGCGCAGAGCGCACATCGCCACAGTCCCGGAGAAGTTGGGGGAGGGGTCGGCAATTGAACGGGTG
CCTAGAGAAGGTGGCGCGGGGTAACTGGGAAAGTGATGTCGTGACTGGCTCCGCTTTTTCCCGAGGGTGGGGGAGAACCGTATATAA
GTGCAGTAGTCGCCGTGAACGTTCTTTTCGCAACGGGTTTGCCGCCAGAACACAGCTGAAGCTTCGAGGGGCTCGCATCTCTCCTTCACG
CGCCCGCCGCCCTACCTGAGGCCGCCATCCACGCCGTTGAGTCGCGTTCTGCCGCCCTCCGCCCTGTGGTGCTCCTGAACTGCGTCCG
CCGTCTAGGTAAGTTAAAGCTCAGGTCGAGACCGGCCCTTGTCCGGCGCTCCCTTGAGCCTACCTAGACTCAGCCGGCTCTCCACGC
TTTGCTGACCCTGCTTGCTCAACTCTACGCTTTTGTTCGTTTTCTGTTCTGCGCCGTTACAGATCCAAGCTGTGACCGGCGCCTACACCG
GTGCCACCATGCGCAAGAGAGAGAGGTGTCCAATCTCCTGACTGTTACCAGAACCTCCCTGCGCTGCCAGTAGATGCCACTAGCGA
TGAGGTGAGAAAAATCTCATGGATATGTTAGGGATAGACAGCGCTTTCTGAACACACCTGAAAAATGCTGCTTAGCGTGTGCCGATCCT
GGGACGCTGTTAGCTGAACAATCGAAATGGTCCCCGCCGAGCCGAGGACGTGCGGATTACCTGCTGTATCTCCAGGCAAGAG
GGCTGGCTGTCAAGACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGACGCGGCTCCCCGGCTAGCGATTCAAACG
CAGTCTCCCTGTTATGAGGAGAATTAGAAAGGAAAACGTAGATCGGGTGAGAGGGCTAAGCAGGCTCTCGCTTTTGAGCGGACTGATTT
CGACCAGGTGATCCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTTCTGGGAATTGCATATAACACACTTCTG
CGCATAGCTGAGATCGCCGGATCAGAGTGAAAGACATCAGTCGAACGGACGGCGCGGATGCTTATTCATATTGGACGACAAAGACA
TTGGTCAGCACCGCTGGCGTTGAAAGGCCCTGTCCCTGGCGTAACGAAGCTGGTGAAAGATGGATCTCAGTGTCCGGCGTGGCTGAC
GACCCTAATAATTACTTGTCTGAGTGAGAAAAACGGAGTCGCCGCGCCCTCTGCCACCAGCAATTGAGTACACGGGCCCTTGAAG
GGATCTTTGAGGCAACCCACCGACTCATATACGGAGCCAAGGATGACAGTGGCCAGAGGTATCTCGCCTGGTCAGGTCATTCTGCTAGGGT
GGGGGCCGACGAGACATGGCGCGGCGAGGAGTCCATACCAGAGATTGCAAGCTGGAGGTTGGACAAATGTGAACATCGTTATGAA
CTATATCCGCAATCTGACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACAAGGCCGCCAGGCAAAAAAGAAAAAGGG
AAGCGGAAGCACTAACTTCTCCCTGTTGAAACAAGCAGGGGATGTGCAAGAGAATCCCGGGCAATGTTGAGCAAGGGCGAGGAGATAA
CATGGCCATCATCAAGGAGTTTATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTTCGAGATCGAGGGCGAGGGCG
AGGGCCGCCCTACGAGGGCACCCAGACGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCTGGGACATCTGTCCCT
CAGTTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCGCCGACATCCCCGACTACTTGAAGCTGTCTTCCCCGAGGGCTTCAAGTGG
GAGCGCGTGATGAACCTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCTGCAAGGACGGCGAGTTTATCTACAAGGTGAA
GCTGCGCGGCACCAACTTCCCTCCGACGGCCCCGAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCG
AGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAG

GCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGAA
CAGTACGAACGCGCGGAGGGCCGCACTCCACCGCGGCATGGACGAGCTGTACAAGTAAATCAACCTCTGGATTACAAAATTTGTGAA
GATTGACTGGTATTCTTAACATATGTTGCTCCTTTACGCTATGTGGATACGCTGCTTAATGCCTTTGTATCATGCTATTGCTCCCGTATGGC
TTTCATTTCTCCTCCTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTG
TGTTTGCTGACGCAACCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTCGCTTTCCCTCCCTATTGCCAC
GGCGGAACATCATGCGCGCTGCCCTTCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAAAT
CATCGTCCTTTCTTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTCGGCCCTCAATCCAGC
GGACCTTCCTCCCGCGCCTGCTGCCGGCTCTGCGGCCTCTCCGCGCTTCGCCCTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGC
CGCCTCCCCGC

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

GAGGGCCTATTTCCCATGATTCCCTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGA
TATTAGTACAAAATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAATATGTTTTAAATGGACTATCATATGCTTACC
GTAACCTGAAAGTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGTGGGATTTCAAAGCTTTGGGGTTTTAGAGCTA
GAAATAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAGGAGTGCCACCGAGTCGGTGCCTTTTGAATTGGTACCAGGGCCCTATT
TCCCATGATTCCCTCATATTTGCATATACGATACAAGGCTGTTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAA
AATACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAATATGTTTTAAATGGACTATCATATGCTTACCCTAACCTGAAA
GTATTTGATTTCTTGGCTTTATATATCTTGTGAAAGGACGAAACACCGAGAGAGTCTGGGCAAGACAGTTTTTAGAGCTAGAAATAGCAA
GTAAATAAGGCTAGTCCGTTATCAACTTGAAGGAGTGCCACCGAGTCGGTGC

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

CTGCAGAGGGCCCTGCGTATGAGTGCAAGTGGGTTTTAGGACCAGGATGAGCGGGGTGGGGGTGCCTACCTGACGACCGACCCCGACC
CACTGGACAAGCACCCCAACCCCATTCCCCAAATTGCGCATCCCTATCAGAGAGGGGAGGGGAAACAGGATGCGGCGAGGCGCGTGC
GCACTGCCAGCTTACGACCCGCGGACAGTGCCTTCGCCCCGCGCTGCGGCGCGCGCCACCGCCGCTCAGCACTGAAGGCGCGCTGA
CGTCACTCGCCGGTCCCCGCAAACTCCCCTTCCCGGCCACCTTGGTGGCTCGCGCGCGCGCGCCGCGGCCAGCCGGACCGCACACGC
GAGGCGCGAGATAGGGGGGACGGGCGCGACCATCTGCGCTGCGGCGCGGCGACTCAGCGCTGCCTCAGTCTGCGGTGGGCAGCGG
AGGAGTCGTGCTGCTGAGAGCGCAGTCAGAAATCACCTCCGCTGCTCGCGCCACCATTGGTGAGCAAGGGCGAGGAGGATAACATG
GCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGG
CCGCCCCCTACGAGGGGACCCAGACCGCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCTGGGACATCCTGTCCCCTCAGT
TCATGTACGGCTCAAGGCCTACGTGAAGCACCCCGCGACATCCCCGACTACTGAAGCTGTCTTCCCCGAGGGCTTCAAGTGGGAGC
GCGTGATGAACCTCGAGGACGGCGCGTGGTGACCGTGACCCAGGACTCCTCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTG
CGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGA
CGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCA
AGAAGCCCGTGCAGTGCCTGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAACAGT
ACGAACGCGCGGAGGGCGGCCACTCCACCGCGGCATGGACGAGCTGTACAAGGCTAGCGGAAGCGGAAGCCACTAACTTCTCCTGTTG
AAACAAGCAGGGGATGTGGAAGAGAATCCCGGGCCCAAGAAGAAGAGGAAGGTGTCCAATCTCCTGACTGTTACCAGAACCTCCCT
GCGTGCCAGTAGATGCCACTAGCGATGAGGTGAGGAAATCTCATGATATGTTTAGGGATAGACAGGCGTTTTCTGAACACACCTGGA
AAATGCTGCTTAGCGTGTGCCGATCCTGGGCAGCCTGGTGTAAAGCTGAACAATCGCAATGGTTCCCGCCGAGCCGGAGGACGTGCGCG
ATTACCTGCTGTATCTCCAGGCAAGAGGGCTGGCTGTCAAGACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGACGCG
GCTCCCCCGCCTAGCGATTCAAACGCAGTCTCCCTGTTATGAGGAGAATTAGAAAGGAAAACGTAGATGCGGGTGAGAGGGCTAAGCA
GGCTCTCGCTTTTGAAGCGGACTGATTTGACACAGGTGAGATCCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTT
CTGGGAATTGCATATAACACACTTCTGCGCATAGCTGAGATCGCCCGGATCAGAGTGAAAGACATCAGTCGAACGGACGGCGCGCGGATG
CTTATTCATATTGACGACACAAGACATTGGTCAGCACCCTGGCGTTGAAAGGCCTTGTCCCTGGCGTAACGAAGCTGGTGAAAGAT
GGATCTCAGTGTCCGGCGTGGCTGACGACCCTAATAATTACTTGTCTGTCGAGTGAGAAAAACGGAGTCGCCGCGCCCTCTGCCACCAG

CCAATTGAGTACACGGGCCCTTGAAGGGATCTTTGAGGCAACCCACCGACTCATATACGGAGCCAAGGATGACAGTGGCCAGAGGTATCTC
GCCTGGTCAGGTCATTCTGCTAGGGTGGGGCCGCACGACATGGCGCGGCAGGAGTCTCCATACCAGAGATTATGCAAGCTGGAGG
TTGGACAAATGTGAACATCGTTATGAACTATATCCGCAATCTTGACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACTACC
CATACGATGTTCCAGATTACGCTTAAGAATTCGATATCAAGCTTATCGATAAGTAAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGAC
TGGTATTCTTAACATATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTAAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATT
TTCTCCTCCTGTATAAATCCTGGTTGCTGTCTCTTATGAGGAGTTGTGGCCGTTGTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGC
TGACGCAACCCCACTGGTTGGGGCATTGCCACCACCTGTGAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAA
CTCATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAAGCTGACGTCC
TTTCATGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTC
CTTCCCGCGGCTGCTGCCGGCTCTGCGGCCTCTTCCGCTCTCCGCTTCGCCCTCAGACGAGTCGGATCTCCTTTGGCCGCTCCCC
GC

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

TTAACATTATGGCCTTAGGTCACCTTCATCTCCATGGGGTTCTTCTTCTGATTTTCTAGAAAATGAGATGGGGGTGCAGAGAGCTTCTCAGTG
ACCTGCCCAGGGTCACATCAGAAATGTCAGAGCTAGAACTTGAACCTCAGATTACTAATCTTAAATTCATGCCTTGGGGCATGCAAGTACG
ATATACAGAAAGGAGTGAACCTATTAGGGCAGATGACCAATGAGTTTAGGAAAGAAGAGTCCAGGGCAGGGTACATCTACACCAACCCGCCCA
GCCCTGGGTGAGTCCAGCCACGTTACCTCATTATAGTTGCTCTCTCCAGTCTACCTTGACGGAAGCACAAGCAGAACTGGGACAGG
AGCCCCAGGAGACCAATCTTCATGGTCCCTCTGGGAGGATGGGTGGGAGAGCTGTGGCAGAGGCCTCAGGAGGGGCCCTGCTGCTCA
GTGGTGACAGATAGGGGTGAGAAAGCAGACAGAGTCATTCCGTCAGCATTCTGGGTCTGTTTGGTACTTCTTCTCACGCTAAGGTGGCGGT
GTGATATGCACAATGGCTAAAAAGCAGGGAGAGCTGGAAGAAACAAGGACAGAGACAGAGGCCAAGTCAACCAGACCAATTCCCAGAGG
AAGCAAGAAACCATTACAGAGACTACAAGGGGAAGGGAAGGAGAGATGAATTAGCTTCCCTGTAAACCTTAGAACCCAGCTGTTGCCA
GGGCAACGGGGCAATACCTGTCTTTCAGAGGAGATGAAGTTGCCAGGGTAACTACATCCTGTCTTCTCAAGGACCATCCCAGAATGTGG
CACCCACTAGCCGTTACCATAGCAACTGCCTCTTTGCCCACTTAATCCCATCCCGTCTGTTAAAAGGGCCCTATAGTTGGAGGTGGGGGA
GGTAGGAAGAGCGATGATCACTTGTGACTAAGTTTGTTCGCATCCCTTCTCCAACCCCTCAGTACATACCCTGGGGGAACAGGGTCC
ACTTGCTCCTGGGCCACACAGTCTGCAGTATTGTGTATATAAGGCCAGGGCAAGAGGAGCAGGTTTTAAAGTGAAGGCAGGCAGGTG
TTGGGGAGGCAGTTACCGGGGCAACGGGAACAGGGCCTTTCGGAGGTGGTTGCCATGGGGACCTGGATGCTGACGAAGGCTCGCGAGG
CTGTGAGCAGCCACAGTGCCCTGCTCAGAAGCCCCAAGCTCGTCAGTCAAGCCGGTTCTCCGTTGCACTCAGGAGCAGGGCAGGCGAG
TGCCCCCTAGTTCTGGGGGACGCTCGTGAATCACCTCCGCTGCTCGGCCACCATGGTGAGCAAGGGCGAGGAGATAACATGGCCAT
CATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCAGGGCGAGGGCCGCC
CCTACGAGGGCACCCAGACCGCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCCTCAGTTATGT
ACGGCTCCAAGGCCTACGTGAAGCACCCCGCCGACATCCCCGACTACTTGAAGCTGTCTTCCCCGAGGGCTCAAGTGGGAGCGCGTGA
TGAATTCGAGACGCGCGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGCGAGTTTATCTACAAGGTGAAGCTGCGCGGC
ACCAACTTCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGC
CCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGC
CCGTGCAGCTGCCCGGCCCTACAACGTCAACATCAAGTTGGACATCACCTCCACAACGAGGACTACCCATCGTGGAACAGTACGAAC
GCGCCGAGGGCCGCCACTCCACCGGGCGCATGGACGAGCTGTACAAGGCTAGCGGAAGCGGAGCCACTAACTTCTCCCTGTTGAACAA
GCAGGGGATGTGCAAGAGAATCCCGGGCCAACCAAGAAGAAGAGGAAGGTGTCCAATCTCCTGACTGTTACCAGAACTCCCTGCGCTG
CCAGTAGATGCCACTAGCGATGAGGTCAGGAAAAATCTCATGGATATGTTTAGGGATAGACAGGCGTTTTCTGAACACACCTGGAAATGCT
GCTTAGCGTGTGCCGATCCTGGGCAGCCTGGTGTAAAGCTGAACAATCGCAATGGTTCCCGCCGAGCCGAGGACGTGCGCGATTACCT
GCTGTATCTCCAGGCAAGAGGGCTGGCTGTCAAGACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGACGCGGGCTCCC
CCGGCTAGCGATTCAAACGCACTCTCCCTTGTATGAGGAGAATTAGAAAGGAAAAAGCTAGATGCGGGTGAGAGGGCTAAGCAGGCTCTC
GCTTTTGAGCGGACTGATTCGACCAGGTGAGATCCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTTCTGGGAA
TTGCATATAACACACTTCTGCGCATAGCTGAGATCGCCGGATCAGAGTGAAAGACATCAGTCGAACGGACGGCGGCCGGATGCTTATTCA
TATTGGACGCACAAAGACATTGGTCAGCACCGCTGGCGTTGAAAGGCCTGTCCCTGGGCGTAACGAAGCTGGTGAAAGATGGATCTCA
GTGTCCGGCGTGGCTGACGACCTAATAATTACTTGTCTGTGAGTGAGAAAAACGGAGTCGCCGCGCCCTCTGCCACCAGCAATTGA

GTACACGGGCCCTTGAAGGGATCTTTGAGGCAACCCACCGACTCATATACGGAGCCAAGGATGACAGTGGCCAGAGGTATCTCGCCTGGT
CAGGTCAATTCTGCTAGGGTGGGGGCCGCACGAGACATGGCGCGGCAGGAGTCTCCATACCAGAGATTATGCAAGCTGGAGTTGGACA
AATGTGAACATCGTTATGAACATATATCCGCAATCTTGACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACTACCCATACGA
TGTTCCAGATTACGCTTAAGAATTCGATATCAAGCTTATCGATAAGTAAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATT
CTTAACATATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATTTTCTCCT
CCTTGATAAATCCTGGTTGCTGCTCTTTATGAGGAGTTGTGGCCCGTTGTCAAGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGC
AACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTGCTTTCCCCCTCCCTATTGCCACGGCGGAACATC
GCCGCTGCCCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTGTCGGGGAAGCTGACGTCCTTTCCA
TGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTCCGGCCCTCAATCCAGCGGACCTTCCTTCCC
GCGGCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTCCGCCCTCGCCCTCAGACGAGTCGGATCTCCCTTTGGCCGCTCCCCGCCAC
CGGTAGGGGCCGTTTAAACCCGCTGATCAGCCTCGA

CTGTGCTTCTAGTTGCCAGCCATCTGTTGTTGCCCTCCCCGTCCTTCC
TTGACCCTGGAAGGTGCCACTCCCACTGTCCTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGG
GGGTGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGGCTCTATGGC

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

CTAGCTTCCTTAGCATGACGTTCCACTTTTTCTAAGGTGGAGCTTACTTCTTTGATTTGATCTTTTGTAACCTTTTGAAATTACCCATCTTC
CTAAGCTTCTGCTTCTCTCAGTTTTCTGCTTGTCTCATTCCACTTTTCCAGCTGACCCTGCCCCCTACCAACATTGCTCCACAAGCACAAATTC
ATCCAGAGAAAAATAATTCTAAGTTTTATAGTTGTTTGGATCGCATAGGTAGCTAAAGAGGTGGCAACCCACACATCCTTAGGCATGAGCTTG
ATTTTTTTTGATTTAGAACCTTCCCCTCTCTGTTCTAGACTACACTACACATTCTGCAAGCATAGCACAGAGCAATGTTCTACTTTAATTACTT
TCATTTTCTGTATCCTCACAGCCTAGAAAAAACCCTGCGTTACAGCATCCACTCAGTATCCCTTGAGCATGAGGTGACACTACTTAACATAG
GGACGAGATGGTACTTTGTGTCTCCTGCTCTGTGACGAGGGCACTGTACTTGTGATACCAGGGAATGTTTGTCTTAATAACCATCATTCC
GGACGTGTTTGCCTTGGCCAGTTTTCCATGTACATGCAGAAAGAAGTTTGGACTGATCAATACAGTCCTCTGCCTTTAAAGCAATAGGAAAA
GGCCAACTTGCTACGTTTAGTATGTGGCTGTAGAAAGGTATAGATATAAAAAATTAAGCAATGAAATGGCAGTCTTACACATTTTTGGCA
GCTTATTTAAAGTCTTGGTGTTAAGTACGCTGGAGCTGTACAGCTACCAATCAGGCATGTCTGGGAATGAGTACACGGGGACCATAAGTTA
CTGACATTCTGTTTCCATTCCATTGAATACACACTTTTTGTCATGGTATTGCTTGTGAAATTGTTTGCAAAAAAACCCCTTCAAAATTCATAT
ATATTATTTAATAAATGAATTTAATTTATCTCAATGTTATAAAAAAGTCAATTTAATAATTAGGTACTTATATACCCAATAATATCTAACAATC
ATTTTAAACATTTGTTTATTGAGCTTATTATGGATGAATCTATCTCTATATACTCTATAACTCTAAAAAAGAAGAAGACCATAGACAATCAT
CTATTGATATGTGTAAGTTTACATGTGAGTAGACATCAGATGCTCCATTCTCACTGTAATACCATTTATAGTTACTTGCAAAACTAACTGG
AATTCTAGGACTTAAATATTTAAGTTTTAGCTGGGTGACTGGTTGAAAAATTTAGGTAACTGAAACCAAGAGATTATAAAACAATAAAT
TCTAAAGTTTGAAGTGATCATAATCAATATTACCCTCTAATGAAATATTCCAAAGTTGAGCTACAGAAATTTCAACATAAGATAATTTAG
CTGTAACATGTAATTTGTTGTCTATTTTCTTTGAGATACAGTTTTTCTGTCTAGCTTTGGCTGTCCTGGACCTTGCTCTGTAGACCAGGTT
GGTCTTGAACCTCAGAGATCTGCTTGCCTCTGCCTTGCAAGTGCTAGGATTAAGCATGTGCCACCACTGCCTGGCTACAATCTATGTTTTA
TAAGAGATTATAAGCTCTGGCTTTGTGACATTAATCTTTCAGATAATAAGTCTTTTGGATTGTGCTGGAGAACATACAGACTGTGAGCAGA
TGTTAGAGGTATATTTGCTTAGGGGTGAATTCAATCTGCAGCAATAATTATGAGCAGAATTACTGACACTTCCATTTTATACATTCTACTTGC
TGATCTATGAAACATAGATAAGCATGCAGGCATTATCATAGTTTTCTTTATCTGGAAAAACATTAAATATGAAGAAGCACTTTATTAATACA
GTTTAGATGTGTTTTGCCATCTTTAATTTCTTAAGAAATACTAAGCTGATGCAGAGTGAAGAGTGTGTGAAAGCAGTGGTGCAGCTTGGCT
TGAACCTGTTCTCCAGCTTGGGATCGACCTGCAGGCATGCTTCCATGCCAAGGCCACACTGAAATGCTCAATGGGAGACAAAGAGATTA
AGCTCTTATGTAATAATTTGCTGTTTACATACTTTAATGAATGGACAAAGTCTTGTGCATGGGGTGGGGTGGGGTTAGAGGGGAACAGC
TCCAGATGGCAACATACGCAAGGATTAGTCAAACTTTTGGCAAGATGGTATGATTTTGAATGGGTAGGAACCAATGAAATGC
GAGGTAAGTATGGTTAATGATCTACAGTTATTGGTTAAAGAAGTATATTAGAGCGAGTCTTTCTGCACACAGATCACCTTTCCTATCAACCCC
GCCACCATGCCCAAGAAGAAGAGGAAGGTGTCATCTCTGACTGTTCAACAGAACCTCCCTGCGCTGCCAGTAGATGCCACTAGCGATG
AGGTCAGGAAAAATCTCATGGATATGTTTAGGGATAGACAGCGCTTTTCTGAACACACCTGGAATGCTGCTTAGCGTGTGCCGATCCTGG
GCAGCCTGGTGTAAGCTGAACAATCGCAATGGTTCCCCGCCGAGCCGGAGGACGTGCGCGATTACCTGCTGTATCTCCAGGCAAGAGGG
CTGGCTGTCAAGACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGAGCGGGCTCCCCGCCCTAGCGATTCAAACGCA
GTCTCCCTGTTATGAGGAGAATTAGAAAGGAAACGTAGATGCGGGTGAGAGGGCTAAGCAGGCTCTCGCTTTTGAGCGGACTGATTTCC

ACCAGGTCAGATCCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTTCTGGGAATTGCATATAACACACTTCTGCG
CATAGCTGAGATCGCCCGATCAGAGTGAAAGACATCAGTCGAACGGACGGCGCCGGATGCTTATTCATATTGGACGCACAAAGACATTG
GTCAGCACCGCTGGCGTTGAAAAGGCCTTGTCCCTGGGCGTAACGAAGCTGGTGAAAGATGGATCTCAGTGTCCGGCGTGGCTGACGAC
CCTAATAATTACTTGTCTGTCGAGTGAGAAAAACGGAGTCGCCGCGCCCTCTGCCACCAGCCAATTGAGTACACGGGCCCTTGAAGGGA
TCTTTGAGGCAACCCACCGACTCATATACGGAGCCAAGGATGACAGTGGCCAGAGGTATCTCGCCTGGTCAGGTCAATTCTGCTAGGGTGG
GGGCCGCACGAGACATGGCGGGGAGGAGTCTCCATACCAGAGATTATGCAAGCTGGAGGTTGGACAAATGTGAACATCGTTATGAAC
ATATCCGCAATCTTGACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACTACCCATACGATGTTCCAGATTACGCTTAAGAA
TTCGATATCAAGCTTATCGATAAGTAAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACATGTTGCTCCTTTAC
GCTATGTGGATACGCTGCTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCAATTTCTCCTCCTTGATAAATCCTGGTTGCTG
TCTCTTTATGAGGAGTTGTGGCCGTTGTACGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTG
CCACCACCTGTCAGTCTCTTCCGGGACTTTCGCTTCCCCCTCCCTATTGCCACGGCGAACTCATCGCCGCTGCTTGCCCGCTGCTG
GACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAAGCTGACGTCCTTTCATGGCTGCTCGCTGTGTTGCCAC
CTGGATTCTGCGCGGGACGTCTTCTGTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCGCGGCTGCTGCCGGCTCTGCG
GCCTTTCGCGCTCTCCGCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGCCGCTCCCCGCCACCGGTTAGGGGCCCTTTAAACCC
GCTGATCAGCCTCGA

CTGTGCCCTTAGTTGCCAGCCATCTGTTGTTGCCCTCCCCGTGCCTTCCTTGACCCTGGAAGGTGCCACTCC
CACTGTCTTTCTAATAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCTATTCTATTCTGGGGGTGGGGTGGGGCAGGACAGC
AAGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGATGCGGTGGGCTCTATGGC

EF1 α -dCas9-VP64-WPRE-PolyA-WPRE-mCherry-EF1 α (SAM, Supplementary Fig. 3)

GGCTCCGGTGCCCGTCAGTGGGCAGAGCGCACATCGCCACAGTCCCGAGAAGTTGGGGGAGGGGTGGCAATTGAACCGTGCCTA
GAGAAGGTGGCGGGGTAACTGGGAAAGTGATGTCGTACTGGCTCCGCCTTTTCCGAGGGTGGGGGAGAACCCTATATAAGTGC
AGTAGTCGCGTGAACGTTCTTTTCGCAACGGGTTTCCGCCAGAACACAGGTAAGTGCCGTGTGTGTTCCCGCGGGCCTGGCCTCTT
ACGGGTTATGGCCCTTGCCTGAATTACTTCCACCTGGCTGCAGTACGTGATTCTTGATCCCGAGCTTCGGGTTGGAAGTGGGTGGG
AGAGTTCGAGGCCTTGCCTTAAGGAGCCCTTCGCCTCGTGTGAGTTGAGGCCTGGCTGGGCGCTGGGGCCGCCGCTGCGAATC
TGGTGGCACCTTCGCGCTGTCTCGCTGCTTTCGATAAGTCTCTAGCCATTTAAATTTTTGATGACCTGCTGCACGCTTTTTTCTGGCAA
GATAGTCTTGTAATGCGGGCCAAGATCTGCACACTGGTATTTCCGTTTTTGGGGCCGCGGGCGGCGACGGGGCCCGTGCCTCCAGCG
CACATGTTGCGCGAGGCGGGGCTGCGAGCGCGGCCACCGAGAATCGGACGGGGTAGTCTCAAGCTGGCCGGCTGCTCTGTTGCCCT
GGCTCGCGCCGCGTGTATCGCCCCGCCCTGGGCGCAAGGCTGGCCCGTGGCACCAAGTTGCGTGAGCGGAAAGATGGCCGCTTC
CCGGCCCTGCTGCAGGGAGCTCAAAATGGAGGACGCGCGCTCGGGAGAGCGGGCGGGTGAGTCACCCACACAAAGGAAAAGGCCTT
TCCGTCCTACGCCGTGCTTCATGTGACTCCACGGAGTACCGGGCGCGCTCCAGGCACCTCGATTAGTTCTCGAGCTTTTGAGTACGTG
TCTTTAGGTTGGGGGAGGGGTTTTATGCGATGGAGTTCCCCACACTGAGTGGGTGGAGACTGAAGTTAGGCCAGCTTGGCACTTGATG
AATTCTCCTTGGAATTTGCCCTTTTGTGTTTGATCTTGTTTCAAGCCTCAGACAGTGGTTCAAAGTTTTTTCTTCCATTTAGGT
GTCGTGAGGATCGCCACCATGTACCCATACGATGTTCCAGATTACGCTTCGCCGAAGAAAAGCGCAAGGTCAAGCGCTCCGACAAGAAGT
ACAGCATCGGCTGGCCATCGGCACCAACTCTGTGGGCTGGCCGTGATCACCGACGAGTACAAGGTGCCAGCAAGAAATCAAGGTGC
TGGGCAACACCGACCGGCACAGCATCAAGAAGAACCTGATCGGAGCCCTGCTGTTTCGACAGCGGCGAAACAGCCGAGGCCACCCGGCTG
AAGAGAACCGCCAGAAGAAGATACACCAGACGGAAGAACCGGATCTGCTATCTGCAAGAGATCTTCAGCAACGAGATGGCCAAGGTGGAC
GACAGCTTCTTCCACAGACTGGAAGAGTCTTCTGTTGGAAGAGGATAAGAAGCACGAGCGGCACCCATCTTCGCAACATCTGGAC
GAGGTGGCTACACGAGAAGTACCCACCATCTACCACTGAGAAAGAACTGGTGGACAGCACCGACAAGGCCGACCTGCGGCTGATC
TATCTGGCCCTGGCCACATGATCAAGTTCCGGGGCCACTTCTGATCGAGGGCGACCTGAACCCCGACAACAGCGAGCTGGACAAGCTG
TTATCCAGCTGGTGACAGCTACAACCAGCTGTTTCGAGGAAAACCCATCAACGCCAGCGGCTGGACGCCAAGGCCATCTGTCTGCC
AGACTGAGCAAGAGCAGACGGCTGGAATCTGATCGCCAGCTGCCCGCGAGAAGAAGATGGCCTGTTTCGCAACCTGATTGCCCTG
AGCCTGGGCTGACCCCAACTTCAAGAGCAACTTCGACCTGGCCGAGGATGCCAACTGCAGCTGAGCAAGGACACCTACGACGACGAC
CTGGACAACCTGCTGGCCAGATCGGCGACCACTACGCCGACCTGTTTCTGGCCGCAAGAACCTGTCCGACGCCATCTGCTGAGCGAC
ATCTGAGAGTGAACACCGAGATACCAAGGCCCCCTGAGCGCTCTATGATCAAGAGATACGACGAGCACCACGAGCTGACCCTG
CTGAAAGCTCTCGTGCGGCAGCAGCTGCCTGAGAAGTACAAAGAGATTTTCTCGACCAGAGCAAGAACGGCTACGCCGGCTACATTGACG

GCGGAGCCAGCCAGGAAGAGTTCTACAAGTTCATCAAGCCCATCCTGGAAGAGATGGACGGCACCCGAGGAACTGCTCGTGAAGCTGAACA
GAGAGGACCTGCTGCGGAAGCAGCGGACCTTCGACAACGGCAGCATCCCCACCAGATCCACCTGGGAGAGCTGCACGCCATTCTGCGG
CGGCAGGAAGATTTTACCATTCTCTGAAGGACAACCGGGAAAAAGATCGAGAAGATCCTGACCTTCCGCATCCCCTACTACGTGGGCCCTC
TGCCAGGGGAAACAGCAGATTGCGCTGGATGACCAGAAAGAGCGAGGAAACCATCACCCCTGGAACCTCGAGGAAGTGGTGACAAG
GGCGCTTCGCCCCAGAGCTTCATCGAGCGGATGACCAACTTCGATAAGAACCTGCCAACGAGAAGGTGCTGCCAAGCACAGCCTGCTG
TACGAGTACTTCACCGTGATAACGAGCTGACCAAAGTGAATACGTGACCGAGGGAATGAGAAAGCCCCGCTTCTGAGCGGCAGCAG
AAAAAGGCCATCGTGGACCTGCTGTTCAAGACCAACCGGAAAGTGACCGTGAAGCAGCTGAAAGAGGACTACTTCAAGAAAATCGAGTGCT
TCGACTCCGTGGAATCTCCGGCGTGGAAGATCGGTTCAACGCCTCCCTGGGCACATACCACGATCTGCTGAAAATTATCAAGGACAAGGA
CTTCTGGACAATGAGGAAAACGAGGACATTCTGGAAGATATCGTGCTGACCCTGACACTGTTTGAGGACAGAGAGATGATCGAGGAACGG
CTGAAAACCTATGCCACCTGTTTCGACGACAAAGTGATGAAGCAGCTGAAGCGGCGGAGATACACCGCTGGGGCAGGCTGAGCCGGAA
GCTGATCAACGGCATCCGGGACAAGCAGTCCGGCAAGACAATCCTGGATTTCCTGAAGTCCGACGGCTTCGCCAACAGAACTTCATGCAG
CTGATCCACGACGACAGCCTGACCTTTAAGAGGACATCCAGAAAGCCCAGGTGTCCGGCCAGGGCGATAGCCTGCACGAGCACATTGCC
AATCTGCGCCGGCAGCCCCGCCATTAAGAAGGGCATCCTGCAGACAGTGAAGGTGGTGACGAGCTCGTGAAGTGATGGGCCGGCACA
GCCCCAGAACATCGTGATCGAAATGGCCAGAGAGAACCAGACCACCCAGAAGGGACAGAAGAACAGCCGCGAGAGAATGAAGCGGATCG
AAGAGGGCATCAAAGAGCTGGGCAGCCAGATCCTGAAAGAACACCCCTGGAAGAACACCCAGCTGCAGAACGAGAAGCTGTACCTGTACT
ACCTGCAGAATGGGCGGGATATGTACGTGGACCAGGAACTGGACATCAACCGGCTGTCCGACTACGATGTGGACGCCATCGTGCTCAGA
GCTTTCTGAAGGACGACTCCATCGACAACAAGGTGCTGACCAGAAGCGACAAGAACCGGGGCAAGAGCGACAACGTGCCCTCCGAAGAGG
TCGTGAAGAAGATGAAGAACTACTGGCGGCAGCTGCTGAACGCCAAGCTGATTACCCAGAGAAAGTTCGACAATCTGACCAAGGCCGAGA
GAGGCGGCCTGAGCGAACTGGATAAGGCCGGCTTCATCAAGAGACAGCTGGTGAAACCCGGCAGATCACAAAGCACGTGGCACAGATC
CTGGACTCCCGATGAACACTAAGTACGACGAGAATGACAAGCTGATCCGGGAAGTGAAAGTGATCACCTGAAGTCCAAGCTGGTGCC
GATTTCCGAAGGATTTCCAGTTTTACAAAGTGCGCGAGATCAACAACCTACCACCACGCCACGACGCCTACCTGAACGCCGTCTGGGAA
CCGCCCTGATCAAAAAGTACCCTAAGCTGGAAGCGAGTTCGTGTACGGCGACTACAAGGTGTACGACGTGCGGAAGATGATCGCCAAGA
GCGAGCAGGAAATCGGCAAGGTACCGCCAAGTACTTCTTCTACAGCAACATCATGAACTTTTCAAGACCGAGATTACCCTGGCCAACGG
CGAGATCCGGAAGCGGCTCTGATCGAGACAAACGGCGAAACCGGGGAGATCGTGTGGGATAAGGGCCGGGATTTTGCACCGTGCGGA
AAGTGCTGAGCATGCCCCAAGTGAATATCGTGAAAAAGACCGAGGTGCAGACAGCGGCTTCAGCAAAGAGTCTATCCTGCCCAAGAGGA
ACAGCGATAAGCTGATCGCCAGAAAGAAGGACTGGGACCCTAAGAAGTACGGCGGCTTCGACAGCCCCACCGTGGCCTATTCTGTGCTGG
TGGTGCCCAAAGTGGAAGGGCAAGTCCAAGAACTGAAGAGTGTGAAAGAGCTGCTGGGGATCACCATCATGAAAGAAGCAGCTTCG
AGAAGAATCCCATCGACTTTCTGGAAGCCAAGGGCTACAAGAAGTGAAAAAGGACCTGATCATCAAGCTGCCTAAGTACTCCCTGTTCTGA
GCTGGAAGCGCCGGAAGAGAATGCTGGCCTCTGCCGGCGAACTGCAGAAGGGAAACGAACTGGCCCTGCCCTCCAAATATGTGAACCT
CCTGTACCTGGCCAGCCACTATGAGAAGCTGAAGGGCTCCCCCGAGGATAATGAGCAGAAACAGCTGTTTGTGGAACAGCACAAAGCACTA
CCTGGACGAGATCATCGAGCAGATCAGCGAGTTCTCCAAGAGAGTGATCCTGGCCGACGCTAATCTGGACAAAGTGTGTCCGCCTACAA
AAGCACCGGGATAAGCCCATCAGAGAGCAGGCCGAGAATATCATCCACCTGTTTACCCTGACCAATCTGGGAGCCCTGCCGCCTTCAAGT
ACTTTGACACCACCATCGACCGGAAGAGGTACACCAGCACCAAGAGGTGCTGGACGCCACCCTGATCCACCAGAGCATACCCGGCTGT
ACGAGACACGGATCGACCTGTCTCAGCTGGGAGGCGACAGC**CCCAAGAAGAAGAGAAAGTG**GAGGCCAGCGGGCCGGCCGGATCCGG
GCGCGCCGACGCGCTGGACGATTTTCGATCTCGACATGCTGGGTTCTGATGCCCTCGATGACTTTGACCTGGATATGTTGGGAAGCGACGC
ATTGGATGACTTTGATCTGGACATGCTCGGCTCCGATGCTCTGGACGATTTTCGATCTCGATATGTTATATATCGATTGATTAATTAAGAATTC
GGTACAAGTAAGCGGCCGCGTCGACATCAACCTCTGGATTACAAAATTTGTGAAGATTGACTGGTATTCTTAAGTATGTTGCTCCTTTA
CGTATGTGGATACGCTGCTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCATTTTCTCCTCTGTATAAATCTGGTTGCT
GTCTCTTTATGAGGAGTTGTGGCCCGTTGTACGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGCTGACGCAACCCCCACTGGTTGGGGCATT
GCCACCACCTGTGAGCTCCTTCCGGGACTTTCGCTTTCCTCCCTCCCTATTGCCACGGCGGAACATCGCCGCCTGCCTTGGCCGCTGCT
GGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTGTGCGGGGAAGCTGACGTCTTTCATGGCTGCTCGCCTGTGTTGCCA
CCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCGCGGCCTGCTGCCGGCTCTGC
GGCTCTTCCGCGTCTTCGCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCGCCTGGAATTCGAGCTCGGTATTTCCA
GCACACTGGACGCGCCGCCATAGAGCCACCGCATCCCCAGCATGCCTGCTATTGTCTTCCCAATCCTCCCCCTTGTGTCTGCCCCACC
CCACCCCCAGAATAGAATGACACCTACTCAGACAATGCGATGCAATTCCTCATTTTATTAGGAAAGGACAGTGGGAGTGGCACCTTCCAG

GGTCAAGGAAGGCACGGGGGAGGGGCAACAACAGATGGCTGGCAACTAGAAGGCACAGTCGAGGCTGATCAGCGGGTTTAAACGGGCC
CCTAACCGGTGGCGGGGAGGCGGCCAAAGGGAGATCCGACTCGTCTGAGGGCGAAGGCGGAGACGCGGAAGAGGCCGAGAGCCGGC
AGCAGGCCGCGGGAAGGAAGGTCCGCTGGATTGAGGGCCGAAGGGACGTAGCAGAAGGACGTCCCGCGCAGAATCCAGGTGGCAACAC
AGGCGAGCAGCCATGAAAGGACGTACAGTCCCCGACAAACACCGGAATTGTAGTCCCAACAGCCGAGCCCTGTCCAGCAGCGG
GCAAGGCAGGCGGCGATGAGTTCCGCGTGGCAATAGGGAGGGGGAAGCGAAAGTCCCGAAAGGAGCTGACAGGTGGTGGCAATGC
CCCAACCAAGTGGGGGTTGCGTCAGCAAAACAGGTGCACACCACGCCACGTTGCCTGACAACGGGCCACAACCTCTATAAGAGACAGCA
ACCAGGATTTATACAAGGAGGAGAAAATGAAAGCCATACGGGAAGCAATAGCATGATACAAAGGCATTAAAGCAGCGTATCCACATAGCGTA
AAAGGAGCAACATAGTTAAGAATACCAGTCAATCTTTCACAAATTTGTAATCCAGAGGTTGATTTACTTTGTACAGCTCGTCCATGCCGCCG
GTGGAGTGGCGGCCCTCGGCGCGTTCTGACTGTCCACGATGGTGTAGTCTCGTTGTGGGAGGTGATGTCCAACCTGATGTTGACGTTGT
AGGCGCCGGGACAGTGCACGGGCTTCTTGGCCTTGTAGGTGGTCTTGACCTCAGCGTCGTAGTGGCCGCCCTCCTTCAGCTTCAGCCTCT
GCTTGATCTCGCCCTCAGGGCGCCGTCTCGGGGTACATCCGCTCGGAGGAGGCCTCCAGCCCATGGTCTTCTTCTGATTACGGGGC
CGTCGGAGGGGAAGTTGGTCCGCGCAGCTTCACCTGTAGATGAACTCGCCGTCTGCAGGGAGGAGTCTGGGTACGGTCACCACG
CCGCCGTCTCGAAGTTCATCACGCGCTCCCACTTGAAGCCCTCGGGGAAGGACAGCTTCAAGTAGTCGGGGATGTCGGCGGGGTGCTTC
ACGTAGGCCCTTGAGCCGTACATGAACTGAGGGGACAGGATGTCCAGGCGAAGGGCAGGGGGCCACCCTTGGTCACCTTCAGCTTGGC
GGTCTGGGTGCCCTCGTAGGGGCGGCCCTCGCCCTCGCCCTCGATCTCGAACTCGTGCCGTTACGGAGCCCTCCATGTGCACCTTGAA
GCGCATGAACTCCTTGATGATGGCCATGTTATCTCTCGCCCTTGCTACCATGGTGGCACGCGTGTAGGCGCCGGTCACAGCTTGGATC
TGTAACGGCGCAGAACAGAAAACGAAACAAAGACGTAGAGTTGAGCAAGCAGGGTCAGGCAAGCGTGGAGAGCCGGCTGAGTCTAGGTA
GGCTCCAAGGGAGCGCCGACAAAGGCCCGGTCTCGACCTGAGCTTTAACTTACCTAGACGGCGGACGCAGTTCAGGAGGCACACAG
GCGGGAGGCGGCAGAACGCGACTCAACCGGCGTGGATGGCGGCCTCAGGTAGGGCGGCGGGCGCGTGAAGGAGAGATGCGAGCCCT
CGAAGCTTCAGCTGTGTTCTGGCGGCAACCCGTTGCGAAAAGAACGTTACGCGGCACTACTGCACTTATATACGGTTCTCCCCACCCT
CGGGAAAAGGCGGAGCCAGTACACGACATCACTTTCCAGTTTACCCGCGCCACCTTCTAGGCACCCGTTCAATTGCCGACCCCTCC
CCCCAATTCTCGGGGACTGTGGCGATGTGCGCTCTGCCACTGACGGGCACCGGAGCGATCGCAGATCCTT

U6-sgRNA(*Hbb*)-EF1 α -MS2-P65-HSF1-T2A-EGFP-WPRE(SAM, Supplementary Fig. 3)
GATCCGACGCGCATCTCTAGGCCGCGCCGGCCCCCTCGCACGGAAGTGTGGGAGAAGCTCGGCTACTCCCTGCCCGGTTAATTTGC
ATATAATATTTCTAGTAAGTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTAATACTAGCTACATTTTACATGATAGGCT
TGGATTTCTATACTTCGTATAGCATAACATTATACGAAGTTATAAACAGCACAAGGAACTACCCCTAAGAGAGTCTGGGCAAGACAGGTT
TTAGAGCTAGGCCAACATGAGGATACCCATGTCTCGAGGGCTAGCAAGTTAAATAAGGCTAGTCCGTATCAACTTGCCCAACATGAG
GATCACCCATGTCTCGAGGGCAAGTGGCACCGAGTCGGTGCTTTTTTTTTTCTCGGAATTCGGCTCCGGTGCCCGTCAGTGGGCAGAG
CGCATATCGCCACAGTCCCGGAGAAGTTGGGGGAGGGGTGCGCAATTGAACCGGTGCCTAGAGAAGGTGGCGCGGGGTAAACTGGGA
AAGTGATGTCGTGACTGGCTCCGCTTTTTCCGAGGGTGGGGGAGAACCGTATATAAGTGCAGTAGTCGCCGTGAACGTTCTTTTTTCGC
AACGGGTTTGCCGCCAGAACACAGGTAAGTGCCGTGTGTGTTCCCGCGGGCCTGGCCTCTTACGGGTATGCCCCTTGCCTGCCCTTGA
ATTACTTCCACTGGCTGCAGTACGTGATTCTTGATCCCGAGCTTCGGGTTGGAAGTGGGTGGGAGAGTTCAGAGCCCTTGCCTTAAGGAGC
CCCTTGCCTCGTGCTTGAGTTGAGGCTGGCCTGGCGCTGGGGCGCCCGCTGCGAATCTGGTGGCACCTTGCCTGCTGCTGCTG
CTTTCGATAAGTCTCTAGCCATTTAAATTTTTGATGACCTGCTGCGACGCTTTTTTCTGGCAAGATAGTCTTGAAATGCGGGCCAAGATC
TGCACACTGGTATTTTCGGTTTTTGGGGCCGCGGGCGGCGACGGGGCCCGTGCCTCCAGCGCACATGTTCCGGCAGGCGGGGCCTGCG
AGCGCGGCCACCGAGAATCGGACGGGGTAGTCTCAAGCTGGCCGGCCTGCTCTGGTGCCTGGCTCGCGCCCGCTGATCGCCCCG
CCCTGGGCGGCAAGGCTGGCCCGTGGCACCAAGTTGCGTGAGCGGAAAGATGGCCGCTTCCCGGCCCTGCTGCAGGGAGCTCAAAATG
GAGGACGCGGCGCTCGGGAGAGCGGGCGGGTGAGTACCCACACAAAGGAAAAGGGCCTTCCGTCCTCAGCCGTGCTTCATGTGACT
CCACGGAGTACCGGGCGCGCTCCAGGCACCTCGATTAGTTCTCGAGCTTTTGAGTAGCTGCTCTTAGGTTGGGGGAGGGGTTTTATG
CGATGGAGTTTCCACACTGAGTGGGTGGAGACTGAAGTTAGGCCAGCTTGGCACTTGATGTAATTCCTTGAATTTGCCCTTTTGTAG
TTTGATCTTGGTTCATTCTCAAGCCTCAGACAGTGTTCAAAGTTTTTTTCTTCATTCAGGTGTCGTGACGTACGGCCACCATGGCTTCA
AACTTTACTCAGTTCGTGCTCGTGGACAATGGTGGGACAGGGGATGTGACAGTGGCTCCTTCTAATTTTCGCTAATGGGGTGGCAGAGTGG
TCAGCTCCAACCTACGGAGCCAGGCCATCAAGGTGACATGCAGCGTCAGGCAGTCTAGTGCCAGAAGAGAAAGTATACCATCAAGGTGG
AGGTCCCAAGTGGCTACCCAGACAGTGGGCGGAGTCGAACTGCCTGTGCGCGCTTGAGAGTCTACCTGAACATGGAGCTCACTATCC

CAATTTTCGCTACCAATTCTGACTGTGAACTCATCGTGAAGGCAATGCAGGGGCTCCTCAAAGACGGTAATCCTATCCCTTCGCCATCGCC
GCTAACTCAGGTATCTACAGCGCTGGAGGAGGTGGAAGCGGAGGAGGAGGAAGCGGAGGAGGAGGTAGCGGACCTAAGAAAAAGAGGAA
GGTGGCGGCGCTGGATCCCTTCAGGGCAGATCAGCAACCAGGCCCTGGCTCTGGCCCTAGCTCCGCTCCAGTGCTGGCCAGACTA
TGGTGCCCTCTAGTGCTATGGTGCTCTGGCCAGCCACCTGCTCCAGCCCTGTGCTGACCCAGGACCACCCAGTCACTGAGCGCTC
CAGTGCCCAAGTCTACACAGGCCGCGAGGGGACTCTGAGTGAAGCTCTGCTGCACCTGCAGTTGACGCTGATGAGGACCTGGGAGCT
CTGCTGGGAACAGCACCGATCCCGGAGTGTTCACAGATCTGGCCTCCGTGGACAACCTGAGTTTCAGCAGCTGCTGAATCAGGGCGTG
TCCATGTCTCATAGTACAGCCGAACCAATGCTGATGGAGTACCCGAAGCCATTACCCGGCTGGTGACCGGCAGCCAGCGGCCCGGAC
CCCGCTCCAACCTCCCTGGGAACAGCGGCTGCCTAATGGGCTGTCCGGAGATGAAGACTTCTCAAGCATCGCTGATATGGAATTTAGTG
CCCTGCTGTACAGATTTCTCTAGTGGGAGGAGGAGGTGGAAGCGGCTTCAGCGTGGACACCAAGTGCCTGCTGGACCTGTTAGCC
CCTCGGTGACCGTGCCCGACATGAGCCTGCCTGACCTTGACAGCAGCCTGGCCAGTATCCAAGAGCTCCTGTCTCCCGAGGACCCCCA
GGCCTCCGAGGCAGAGAACAGCAGCCCGATTAGGGAAGCAGCTGGTGCATAACAGCGCAGCCGCTGTTCTGCTGGACCCCGG
TCCGTGGACACCGGAGCAACGACCTGCCGGTGCTGTTGAGCTGGGAGAGGGCTCCTACTTCTCCGAAGGGGACGGCTTCGCCGAGGA
CCCCACCATCTCCCTGCTGACAGGCTCGGAGCCTCCCAAGCCAAGGACCCCACTGTCTCCGCTAGCGGCAGTGGAAGGGCAGAGGAA
GTCTGCTAACATGCGGTGACGTGAGGAGAATCCTGGCCAGTGAGCAAGGGCAGGAGCTGTTACCGGGGTGGTGCCCATCTGTGTC
GAGCTGGACGGCGACGTAAACGGCCACAAGTTCAGCGTGTCCGCGCAGGGCGAGGGCGATGCCACCTACGGCAAGCTGACCCTGAAGTT
CATCTGACACCACCGCAAGCTGCCCGTGCCCTGGCCACCCCTCGTGACCACCTGACCTACGGCGTGACGTGTTACGCCGTACCCCGA
CCACATGAAGCAGCAGACTTCTCAAGTCCGCCATGCCGAAGGCTACGTCCAGGAGCGCACCATCTTCTCAAGGACGACGGCAACTAC
AAGACCCGCGCCGAGGTGAAGTTCGAGGGCGACACCTGTTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACAT
CCTGGGGCACAAGCTGGAGTACAACACAAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAAGCGCATCAAGGTGAATTTCAAG
ATCCGCCACAACATCGAGGACGGCAGCGTGCAGCTCGCCGACCACTACCAGCAGAACACCCCATCGGCGACGGCCCCGTGCTGCTGCC
CGACAACCACTACCTGAGCACCCAGTCCGCCCTGAGCAAGACCCCAACGAGAAGCGCGATCACATGGTCTGCTGGAGTTCGTGACCGC
CGCCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAAGAATTCGATATCAAGCTTATCGATATCAACCTCTGGATTACAAAATTTGTG
AAAGATTGACTGGTATTCTTAACATATGTTGCTCCTTTACGCTATGTGGATACGCTGCTTAATGCCTTTGTATCATGCTATTGCTCCCGTAT
GGCTTTCATTTCTCCTCCTGTATAAATCCTGGTGTCTGCTCTTTATGAGGAGTTGTGGCCGTTGTCAGGCAACGTGGCGTGGTGCA
CTGTGTTGCTGACGCAACCCCCACTGTTGGGGCATTGCCACCACCTGTCAGCTCCTTCCGGGACTTTCGCTTCCCCCTCCCTATTGC
CACGGCGGAACATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCGTTGGTGTGTCGGGGA
AATCATCGTCTTCTTCTGGCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCC
AGCGGACCTTCTTCCCGCGGCTGCTGCCGGCTGCTGCGGCTCTCCGCGTCTTCCGCTTCCGCTCAGACGAGTCGGATCTCCCTTG
GGCGCCTCCCCGC

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

GCCATAGAGCCACCGCATCCCAGCATGCCTGCTATTGTCTTCCAATCCTCCCCCTTGCTGTCTGCCCCACCCACCCCAAGAATAG
AATGACACCTACTCAGACAATGCGATGCAATTTCTCATTATTTATTAGGAAAGGACAGTGGGAGTGACACCTTCAGGGTCAAGGAAGGCAC
GGGGGAGGGGCAAAACAACAGATGGCTGGCAACTAGAAGGCACAGTCGAGGCTGATCAGCGGGTTTAAACGGGCCCTAACCGGTTACTT
GTACAGCTCGTCCATGCCGAGAGTGATCCCGGGCGGGTCACGAATCCAGCAGGACCATGTGATCGCGCTTCTCGTTGGGGTCTTTGCT
CAGGGCGGACTGGGTGCTCAGGTAGTGGTTGTCGGGCAGCAGCAGGGGCCGTGCGGATGGGGGTGTTCTGCTGGTAGTGTCGGCG
AGCTGCACGCTGCCGCTCTCGATGTTGTGGCGGATCTTGAAGTTACCTTGATGCCGTTCTTCTGCTGTCGGCCATGATATAGACGTTGTG
GCTGTTGTAGTTGTACTCCAGCTTGTGCCCCAGGATGTTGCCGCTCCTTGAAGTCGATGCCCTTCAGCTCGATGCGGTTACACAGGGTG
TCGCCCTCGAACTTACCTCGGCGCGGGTCTTGTAGTTGCCGTCGCTTGAAGAAGATGGTGCGCTCCTGGACGTAGCCTTCGGGCATG
GCGGACTTGAAGAAGTCGTGCTGCTTATGTGGTCGGGGTAGCGGCTGAAGCACTGCACGCCGTAGGTCAGGGTGGTCACGAGGGTGGG
CCAGGGCACGGGCAGCTTGCCGGTGGTGCAGATGAACTTCAGGGTCAGCTTGCCGTAGGTGGCATCGCCCTCGCCCTCGCCGACACGC
TGAACCTGTGGCCGTTTACGTCGCCGTCAGCTCGACCAGGATGGGCACACCCCGGTGAACAGCTCCTCGCCCTTGCTCACCATGGTGG
CACGCGTGATCTGACGGTTCACTAAACGACCTCTGCTTATATAGACCTCCCACCGTACACGCCTACCGCCATTGCGTCAACGGGGCGGG
GTTATTACGACATTTTGAAAGTCCCGTTGATTTGGTGCCAAAACAACTCCCATGACGTCAATGGGGTGGAGACTTGAATATCCCCGTG

AGTCAAACCGCTATCCACGCCCATTTGGTGTACTGCCAAAACCGCATCACCATGGTAATAGCGATGACTAATACGTAGATGTACTGCCAAGTA
GAAAAGTCCCGTAAGGTCATGTACTGGGCATAATGCCAGGCGGGCCATTTACCGTCATTGACGTCAATAGGGGGCGGACTTGGCATATGAT
ACACTTGATGTACTGCCAAGTGGGCAGTTTACCGTAAATACTCCACCCATTGACGTCAATGGAAGTCCCTATTGGCGTTACTATGGGAACA
TACGTCAATTATTGACGTCAATGGGCGGGGTCGTTGGGCGGTACGCCAGGCGGGCCATTTACCGTAAGTTATGTAACGCGGAACCTCATAT
ATGGGCTATGAACTAATGACCCCGTAATTGATTACTATGGCGGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGT
TCATAGCCCATATATGGAGTTCGCGTTACATAACTTACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCGCCCATTTGACGTCA
ATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCATTGACGTCAATGGGTGGAGTATTTACGGTAAACTGCCACTTGGCAGT
ACATCAAGTGATCATATGCCAAGTACGCCCCCTATTGACGTCAATGACGGTAAATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTAT
GGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATG**GTGATGCGGTTTTGGCAGTACATCAATGGGCGTGGATAG**
CGGTTTGACTCACGGGGATTTCAAGTCTCCACCCATTGACGTCAATGGGAGTTTGT**TTTTGGCACCAAAATCAACGGGACTTTC**AAAATG
TCGTAACAACTCCGCCCCATTGACGCAAATGGGCGGTAGGCGTGACGGTGGGAGGTCTATATAAGCAGAGCTCGTTTAGTAACCGTCAG
ATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCATAGAAGACACCGGGACCGATCCAGCCTCCGGACTCTAGAGGATCGAACCCCTT
GCCACC**ATGGACAAGAAGTACTCCATTGGGCTCGCTATCGGCACAAACAGCGTCGGCTGGGCCGTCA**TTACGGACGAGTACAAGGTGCCG
AGCAAAAAATTCAAAGTTCTGGGCAATACCGATCGCCACAGCATAAAGAAGAACCTCATTGGCGCCCTCTGTT**CGACTCCGGGGAGACGG**
CCGAAGCCACGCGGCTCAAAGAACAGCACGGCGCAGATATACCCGCAGAAAGAATCGGATCTGCTACCTGCAGGAGATCTTTAGTAATGA
GATGGCTAAGGTGGATGACTCTTTCTCCATAGGCTGGAGGAGTCCTTTTTGGTGGAGGAGGATAAAAGCACGAGCGCCACCCAATCTTT
GGCAATATCGTGGACGAGGTGGCGTACCATGAAAAGTACCCAACCATATATCATCTGAGGAAGAAGCTTGTAGACAGTACTGATAAGGCTG
ACTTGCGGTTGATCTATCTCGCGCTGGCGCATATGATCAAATTT**CGGGGACACTTCTCATCGAGGGGGACCTGA**ACCCAGACAACAGCGA
TGTCGATAAACTCTTTATCCA**ACTGGTTCAGACTTACAATCAGCTTTT**CGAAGAGAACCCGATCAACGCATCCGGAGTTGACGCCAAAGCAA
TCCTGAGCGCTAGGCTGTCCAAATCCCGCGGGCTCGAAAACCTCATCGCACAGCTCCCTGGGGAGAAGAAGAACGGCCTGTTTGGTAATC
TTATCGCCCTGTCACTCGGGCTGACCCCAACTTTAAATCTAACTTCGACCTGGCCGAAGATGCCAAGCTTCAACTGAGCAAAGACACCTAC
GATGATGATCTCGACAATCTGCTGGCCAGATCGGCGACCACTACGCAGACCTTTTTTTGGCGGCAAGAACCTGTCAGACGCCATTCTGC
TGAGTGATATTCTGCGAGTGAACACGGAGATCACCAAAGCTCCGCTGAGCGCTAGTATGATCAAGCGCTATGATGAGCACCACCAAGACTT
GACTTTGCTGAAGGCCCTTGTCAGACAGCAACTGCCTGAGAAGTACAAGGAAATTTTCTCGATCAGTCTAAAAATGGCTACGCCGGATACA
TTGACGCGGAGCAAGCCAGGAGGAATTTTACAAATTTATTAAGCCCATCTTGAAAAAATGGACGGCACCGAGGAGCTGCTGGTAAAGCT
TAACAGAGAAGATCTGTTGCGCAAACAGCGCACTTT**CGACAATGGAAGCATCCCCACCAGATTCA**CCTGGGCGAACTGCACGCTATCCTC
AGGCGGCAAGAGGATTTCTACCCCTTTTTGAAAGATAACAGGGAAGATTGAGAAAATCCTCACATTTCGGATACCCTACTATGTAGGCC
CCTCGCCCGGGGAAATTCAGATT**CGCGTGGATGACTCG**CAAATCAGAAGAGACCATCACTCCCTGGAACCTCGAGGAAGTCGTGGATAAG
GGGGCTCTGCCAGTCCTTCATCGAAAGGATGACTAACTTTGATAAAATCTGCCTAACGAAAAGGTGCTTCTTAAACACTCTCTGCTGTA
CGAGTACTTCACAGTTTATAACGAGCTCACCAAGGTCAAATACGTACAGAGGGATGAGAAAGCCAGCATTCTGTCTGGAGAGCAGAAG
AAAGCTATCGTGACCTCCTCTTCAAGACGAACCGGAAAGTTACCGTGAAACAGCTCAAAGAAGACTATTTCAAAAAGATTGAATGTTTCGA
CTCTGTTGAAATCAGCGAGTGGAGGATCGCTTCAACGCATCCCTGGGAACGTATCAGATCTCCTGAAAATCATTAAAGACAAGGACTTCC
TGGA**CAATGAGGAGAACGAGGACATTCTTGAGGACATTG**CCTCACCCCTTACGTTGTTTGAAGATAGGGAGATGATTGAAGAACGCTTGAA
ACTTACGCTCATCTCTCGACGACAAAGTCATGAAACAGCTCAAGAGGCGCCGATATACAGGATGGGGCGGCTGTCAAGAAAAGTATGATCA
ATGGGATCCGAGACAAGCAGAGTGGAAAGACAATCCTGGATTTTCTTAAGTCCGATGGATTG**GCAACCGAACTTCATGCAGTTGATCCAT**
GATGACTCTCTCACCTTTAAGGAGGACATCCAGAAAGCACAAGTTTCTGGCCAGGGGGACAGTCTT**CACGAGCACATCGCTAATCTTG**CAG
GTAGCCAGCTATCAAAAAGGAATACTGCAGACCGTTAAGGTCGTGGATGA**ACTCGTCAAAGTAATGGGAAGGCATAAGCCC**GAGAATAT
CGTTATCGAGATGGCCCAGAGAAACAACTACCCAGAAGGACAGAAAGACAGTAGGGAAAGGATGAAGAGGATTGAAGAGGGTATAAA
AGAACTGGGGTCCCAAATCCTTAAGGAACACCCAGTTGAAAACACCCAGCTT**CAGAATGAGAAGCTTACCTGTACTACCTGCAGAACGGC**
AGGGACATGTACGTGGATCAGGA**ACTGGACATCAATCGGCTCTCCGACTACGACGTGGCTGCTATCGTGCC**CCAGCTTTTCTCAAAGATG
ATTCTATTGATAATAAAGTGTGACAAGATCCGATAAAGCTAGAGGGAAGAGTGATAACGTCCCTCAGAGAAGTTGTCAAGAAAATGAAAA
ATTATTGGCGGCAGCTGCTGAACGCCAACTGATCACACACGGAAGTT**CGATAATCTGACTAAGGCTGAACGAGGTGGCCTGTCTGAGTT**
GGATAAGCGCGCTTCATCAAAAAGG**CAGCTTGTGAGACACGCCAGATC**ACCAAGCACGTGGCCCAAATTCTCGATTACGCATGAACACC
AAGTACGATGAAAATGACAACTGATT**CGAGAGGTGAAAGTTATTACTCTGAAGTCTAAGCTGGTCTCAGATTT**CAGAAAGGACTTTCAGTTT
TATAAGGTGAGAGAGATCAACAATTACCACCATGCGCATGATGCCTACCTGAATGCAGTGGTAGGCACTGCAC**TTATCAAAAAATATCCCAA**

GCTTGAATCTGAATTTGTTTACGGAGACTATAAAGTGTACGATGTTAGGAAAATGATCGCAAAGTCTGAGCAGGAAATAGGCAAGGCCACCG
CTAAGTACTTCTTTTACAGCAATATTATGAATTTTTTCAAGACCGAGATTACACTGGCCAATGGAGAGATTGGAAGCGACCACTTATCGAAA
CAAAACGGAGAAACAGGAGAAATCGTGTGGGACAAGGGTAGGGATTTTCGCGACAGTCCGGAAGGTCTGTCCATGCCGCGAGGTGAACATCG
TTAAAAAGACCGAAGTACAGACCGGAGGCTTCTCCAAGGAAAGTATCCTCCCGAAAAGGAACAGCGACAAGCTGATCGCACGCAAAAAAGA
TTGGGACCCCAAGAAATACGGCGGATTCTGATTCTCTACAGTCGCTTACAGTGTACTGGTTGTGGCCAAAGTGAGAAAGGGAAGTCTAAA
AAACTCAAAAGCGTCAAGGAACTGCTGGGCATCACATCATGGAGCGATCAAGCTTCGAAAAAACCCCATCGACTTTCTCGAGGCGGAAAG
GATATAAAGAGGTCAAAAAAGACCTCATCATTAAAGCTTCCCAAGTACTCTCTCTTTGAGCTTGAAAACGGCCGGAACGAATGCTCGCTAGT
GCGGGCGAGCTGCAGAAAGGTAACGAGCTGGCACTGCCCTCTAAATACGTTAATTTCTTGATCTGGCCAGCCACTATGAAAAGCTCAAAG
GGTCTCCCGAAGATAATGAGCAGAAGCAGCTGTTCTGGAACAACACAAACACTACCTTGATGAGATCATCGAGCAAATAAGCGAATTCTCC
AAAAAGAGTGATCCTCGCCGACGCTAACCTCGATAAGGTGCTTTCTGCTTACAATAAGCACAGGGATAAGCCCATCAGGGAGCAGGCAGAAA
ACATTATCCACTTGTTTACTCTGACCACTTGGGCGCGCTGCAGCCTTCAAGTACTTCGACACCACCATAGACAGAAAGCGGTACACCTCT
ACAAAGGAGGTCTGGACGCCACACTGATTCATCAGTCAATTACGGGGCTCTATGAAACAAGAATCGACCTCTCTCAGCTCGGTGGAGACA
GCAGGGCTGACCCCAAGAAGAAGAGGAAGGTGTCGCCAGGGATCCGTCGACTTGACGCGTTGATATCAACAAGTTTGTACAAAAAGCAG
GCTACAAAGAGGCCAGCGGTTCCGGACGGGCTGACGCATTGGACGATTTTGATCTGGATATGCTGGGAAGTGACGCCCTCGATGATTTTGA
CCTTGACATGCTTGGTTCGGATGCCCTTGATGACTTTGACCTCGACATGCTCGGCAGTGACGCCCTTGATGATTTGACCTGGACATGCTG
ATTAAGTCTAGAGTTCCGGATCTCCGAAAAAGAAACGCAAGTTGGTAGCCAGTACCTGCCCGACACCGACGACCGGCACCGGATCGAG
GAAAAGCGGAAGCGGACCTACGAGACATTCAAGAGCATCATGAAGAAGTCCCCCTTCAGCGGCCCCACCGACCTAGACCTCCACCTAGA
AGAATCGCCGTGCCAGCAGATCCAGCGCCAGCGTGCCAAAACCTGCCCCCGACCTTACCCCTTACCAGCAGCCTGAGCACCATCAAC
TACGACGAGTTCCCTACCATGGTGTTCCTCCAGCGGCCAGATCTCTCAGGCCTCTGCTCTGGCTCCAGCCCTCTCAGGTGCTGCCTCAG
GCTCTGCTCTCTGCACCAGTCCAGCCATGGTGTCTGCACTGGCTCAGGCACCAGCACCCGTGCCTGTGCTGGCTCTGACCTCCACAG
GCTGTGGCTCCACCAGCCCTAAACCTACACAGGCCGCGGAGGGCACACTGTCTGAAGCTCTGCTGCAGCTGCAGTTCGACGACGAGGAT
CTGGGAGCCCTGCTGGGAAACAGCACCGATCTGCCGTGTTACCGACCTGGCCAGCGTGACAACAGCGAGTTCAGCAGCTGCTGAA
CCAGGGCATCCCTGTGGCCCTTCACACCACCGAGCCCATGCTGATGGAATACCCCGAGGCCATCACCCGGCTCGTGACAGGCGCTCAGA
GGCCTCTGATCCAGCTCTGCCCTCTGGGAGCACGAGCCTGCCTAATGGACTGCTGTCTGGCGACGAGGACTTCAGCTCTATCGCCG
ATATGGATTTCTCAGCCTTGCTGGCTCTGGCAGCGGCAGCCGGGATTCCAGGGAAGGGATGTTTTTGCCGAAGCCTGAGGCCGGCTCCG
CTATTAGTGACGTGTTTGAGGGCCGCGAGGTGTGCCAGCCAAAACGAATCCGGCCATTTTCATCTCCAGGAAGTCCATGGGCCAACCGCC
CACTCCCGCCAGCCTCGCACCAACACCAACCGGTCCAGTACATGAGCCAGTCCGGTCACTGACCCCGGCACCACTCCCTCAGCCACTG
ATCCAGCGCCCGCAGTACTCCGAGGCCAGTCACCTGTTGGAGGATCCCGATGAAGAGACGAGCCAGGCTGTCAAAGCCCTTCGGGAG
ATGGCCGATACTGTGATTCCCGAGAAGGAAGAGGCTGCAATCTGTGGCCAAATGGACCTTTCCATCCGCCCCCAAGGGGCCATCTGGAT
GAGCTGACAACCACACTTGAGTCCATGACCGAGGATCTGAACCTGGACTCACCCCTGACCCCGGAATTGAACGAGATTCTGGATACCTTCC
TGAACGACGAGTGCCTCTTGATGCCATGCATATCAGCACAGGACTGTCCATCTTCGACACATCTCTGTTTTGAAACCCAGCTTTCTTGATC
AAAGTGTTGATATCATCTAGAGCGGCCGAGGTACCTGAATAACTAAGGCCGCTTCCCTTTAGTGAGGGTTAATGCTTCGAGCAGACAAA
GGGTTGATCCCTACCGGTTAGTAATGAGTTTAAACGGGGAGGCTAAGTGAACACGGAAGGAGACAATACCGGAAGGAACCCGCGCTA
TGACGGCAATAAAAAGACAGAATAAAACGCACGGGTGTTGGGTGTTTTGTTT

U6-sgRNA (*Hbb*)-EF1 α -CRE-P2A-mCherry-WPRE(VPR, Supplementary Fig. 3)

GATCCGACGCGCATCTCTAGGCCGCGCCGGCCCTCGCACGGAAGTGTGGGAGAAGCTCGGCTACTCCCTGCCCCGTTAATTTGC
ATATAATATTTCTAGTAAGTATAGAGGCTTAATGTGCGATAAAAGACAGATAATCTGTTCTTTTAATACTAGCTACATTTTACATGATAGGCT
TGGATTTCTATAACTTCGTATAGCATACATTATACGAAGTTATAAACAGCACAAAAGGAACTCACCCTAAGAGAGTCTGGGCAAGACAGGTT
TAAGAGCTATGCTGGAATGCTGTAGCAAGTTAAATAAGGCTAGTCCGTTATCAACTTGAAAAGTGGCACCGAGTGGTGCTTTTTTCTC
GGAATTCAGGATCTGCGATCGCTCCGGTGCCGTGAGTGGGAGAGCGCACATCGCCACAGTCCCGGAGAAGTTGGGGGGAGGGGTC
GGCAATTGAACGGGTGCCTAGAGAAGGTGGCGCGGGGTAAACTGGGAAAGTGATGTGCTGACTGGCTCCGCCTTTTTCCCGAGGGTGGG
GGAGAACCGTATATAAGTGAGTAGTCGCCGTGAACGTTCTTTTTCGCAACGGGTTTGCCGCCAGAACACAGCTGAAGCTTCGAGGGGCTC
GCATCTCTCTTACGCGCCCGCCGCCCTACCTGAGGCCGCCATCCAGCCGTTGAGTCGCTTCTGCCGCTCCCGCTGTGGTGCCT
CCTGAAGTGCCTCCGCGTCTAGGTAAGTTAAAGCTCAGGTGAGACCGGGCCTTTGTCCGGCGCTCCCTTGAGGCTACCTAGACTCA

GCCGGCTCTCCACGCTTTGCCTGACCCCTGCTTGTCTCAACTCTACGTCTTTGTTTCGTTTTCTGTTCTGCGCCGTTACAGATCCAAGCTGTGA
CCGGCGCCTACACCGGTGCCACCATGCCAAGAAGAAGAGGAAGGTGTCCAATCTCCTGACTGTTACCAGAACCTCCCTGCGCTGCCAG
TAGATGCCACTAGCGATGAGGTGAGGAAAAATCTCATGGATATGTTTAGGGATAGACAGGCGTTTTCTGAACACACCTGAAAAATGCTGCTT
AGCGTGTGCCGATCCTGGGCAGCCTGGTGAAGCTGAACAATCGAAATGGTTCGCCGCCGAGCCGGAGGACGTGCGCGATTACCTGCTG
TATCTCCAGGCAAGAGGGCTGGCTGTCAAGACTATCCAGCAGCACTTGGGCCAACTGAATATGCTGCATCGACGCAGCGGGCTCCCCGG
CCTAGCGATTCAAACGCAGTCTCCCTTGTATGAGGAGAATTAGAAAGGAAAACGTAGATGCGGGTGAGAGGGCTAAGCAGGCTCTCGCTT
TTGAGCGGACTGATTTGACCAGGTGAGATCCCTGATGGAGAACAGCGATCGGTGCCAGGACATCAGGAACCTCGCATTTCTGGGAATTGC
ATATAACACACTTCTGCGCATAGCTGAGATCGCCCGGATCAGAGTGAAGACATCAGTCGAACGGACGGCGGCCGGATGCTTATTCATATT
GGACGCACAAAGACATTGGTCAGCACCGCTGGCGTTGAAAAGGCCCTGTCCCTGGGCGTAACGAAGCTGGTGAAAGATGGATCTCAGTG
TCCGGCGTGGCTGACGACCCTAATAATTACTTGTCTGTGAGTGAGAAAAACGGAGTCGCCGCGCCCTCTGCCACCAGCCAATTGAGTA
CACGGGGCCCTTGAGGGATCTTTGAGGCAACCCACCGACTCATATACGGAGCCAAGGATGACAGTGCCAGAGGTATCTCGCCTGGTCAG
GTCAATCTGCTAGGGTGGGGGCCGACGAGACATGGCGCGGCGAGGAGTCTCCATACCAGAGATTATGCAAGCTGGAGGTTGGACAAATG
TGAACATCGTTATGAACATATCCGCAATCTTGACTCTGAAACCGGGGCCATGGTGAGACTGCTCGAAGATGGTGACAAAGCCGGCCAGGC
AAAAAGAAAAAGGGAAGCGGAGCCACTAATTCTCCCTGTTGAAACAAGCAGGGGATGTGCAAGAGAATCCCGGCCAATGTGTAGCAA
GGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGAT
CGAGGGCGAGGGCGAGGGCCGCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCCTGG
GACATCTGTCCCTCAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCGACATCCCGACTACTTGAAGCTGTCTTCCCCG
AGGGCTTCAAGTGGGAGCGCGTGATGAACTTCGAGGACGGCGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTC
ATCTACAAGGTGAAGCTGCGCGGCACCAACTTCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAG
CGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAA
GACCACCTACAAGGCCAAGAAGCCCGTGACGTGCCCGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCAACGAGGACTA
CACCATCGTGGAACAGTACGAACGCGCCGAGGGCCGCCACTCCACCGCGGCATGGACGAGCTGTACAAGTAAATCAACCTCTGGATTA
CAAAATTTGTGAAGATTGACTGGTATTCTTAACATATGTTGCTCCTTTACGCTATGTGGATACGCTGCTTAAATGCCTTTGTATCATGCTATT
GCTTCCCGTATGGCTTTCATTTCTCCTCCTTGATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCGTTGTACAGGCAACGTGG
CGTGGTGTGCACTGTGTTTGTGACGCAACCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTCCGGGACTTTCGCTTCCCC
CTCCCTATTGCCACGGCGGAACATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTG
TTGTGCGGGAAATCATCGTCTTTCCTTGGCTGCTGCGCTGTGTTGCCACCTGGATTCTGCGCGGACGTCTCTGTACTAGTCCCTTCGG
CCCTCAATCCAGCGGACCTTCTCCCGCGCCTGCTGCCGGCTCTGCGGCCTCTTCGCGTCTTCGCTTCGCCCTCAGACGAGTCGGA
TCTCCCTTTGGGCGCCTCCCCGC

EF1 α -dCas9-HA -10xGCN4(SPH, Supplementary Fig. 3)

AAGGATCTGCGATCGCTCCGGTGCCCGTCAGTGGGCAGAGCGCACATCGCCACAGTCCCCGAGAAGTTGGGGGGAG
GGGTGGCAATTGAACGGGTGCCTAGAGAAGGTGGCGCGGGGTAACTGGGAAAGTGATGTCGTGTACTGGCTCCGC
CTTTTCCCGAGGGTGGGGGAGAACCGTATATAAGTGCAGTAGTCGCCGTGAACGTTCTTTTCGCAACGGGTTGCCG
CCAGAACACAGCTGAAGCTTCGAGGGGCTCGCATCTCTCCTTACGCGCCCCGCCCTACCTGAGGCCGCCATCCAC
GCCGGTTGAGTCGCGTTCTGCCGCTCCCGCTGTGGTGCCCTCTGAACTGCGTCCGCCGTCTAGGTAAGTTTAAAGC
TCAGGTCGAGACCGGCCCTTGTCCGGCGCTCCCTTGAGGCCTACCTAGACTCAGCCGGCTCTCCACGCTTTGCCTGA
CCCTGCTTGCTCAACTCTACGTCTTTGTTTCTGTTTCTGTTCTGCGCCGTTACAGATCCAAGCTGTGACCGGCGCCTACA
CCGGTGCCACCATGCCAAGAAGAAGAGGAAGGTGCGGCTCTGCAGGATATCAAGCTTGCGGTACCGCGGGCCCCGGG
ATCGCCACCATGGACAAGAAGTACAGCATCGGCCTGGCCATCGGCACCAACTCTGTGGGCTGGGCGGTGATCACCGAC
GAGTACAAGGTGCCAGCAAGAAATTCAAGGTGCTGGGCAACACCGACCGGCACAGCATCAAGAAGAACCTGATCGGC
GCCCTGCTGTTGACAGCGGAGAAACAGCCGAGGCCACCCGGCTGAAGAGAACCGCCAGAAGAAGATACACCAGACG
GAAGAACCGGATCTGCTATCTGCAAGAGATCTTCAGCAACGAGATGGCCAAGGTGGACGACAGCTTCTTCCACAGACTG
GAAGAGTCTTCTGCTGGAAGAGGATAAGAAGCACGAGCGGCACCCCATCTTCGGCAACATCGTGACGAGGTGGC

CTACCACGAGAAGTACCCACCATCTACCACCTGAGAAAGAACTGGTGACAGCACCGACAAGGCCGACCTGCGGCT
GATCTATCTGGCCCTGGCCACATGATCAAGTTCGGGGGCCACTTCCTGATCGAGGGCGACCTGAACCCCGACAACAG
CGACGTGGACAAGCTGTTTCATCCAGCTGGTGCAGACCTACAACCAGCTGTTTCGAGGAAAACCCCATCAACGCCACGCG
CGTGGACGCCAAGGCCATCCTGTCTGCCAGACTGAGCAAGAGCAGACGGCTGGAAAATCTGATCGCCACAGTGCCCG
GCGAGAAGAAGAATGGCCTGTTTCGGCAACCTGATTGCCCTGAGCCTGGGCCTGACCCCAACTTCAAGAGCAACTTCG
ACCTGGCCGAGGATGCCAACTGCAGCTGAGCAAGGACACCTACGACGACGACCTGGACAACCTGCTGGCCGAGATC
GGCGACCAGTACGCCGACCTGTTTCTGGCCGCCAAGAACCTGTCCGACGCCATCCTGCTGAGCGACATCCTGAGAGTG
AACACCGAGATCACCAAGGCCCCCTGAGCGCCTCTATGATCAAGAGATACGACGAGCACCACCAGGACCTGACCCTG
CTGAAAGCTCTCGTGCGGCAGCAGCTGCCTGAGAAGTACAAAGAGATTTTCTTCGACCAGAGCAAGAACGGCTACGCC
GGCTACATCGATGGCGGAGCCAGCCAGGAAGAGTTCTACAAGTTCATCAAGCCCATCCTGGAAAAGATGGACGGCACC
GAGGAAGTGTCTGTAAGCTGAACAGAGAGGACCTGCTGCGGAAGCAGCGGACCTTCGACAACGGCAGCATCCCCCA
CCAGATCCACCTGGGAGAGCTGCACGCCATTCTGCGGCGGCAGGAAGATTTTACCCATTCTGAAGGACAACCGGGA
AAAGATCGAGAAGATCCTGACCTTCGCGATCCCCTACTACGTGGGCCCTCTGGCCAGGGGAAACAGCAGATTGCGCTG
GATGACCAGAAAGAGCGAGGAAACCATCACCCCTGGAACCTCGAGGAAGTGGTGGACAAGGGCGCCAGCGCCGAG
GCTTCATCGAGCGGATGACCAACTTCGATAAGAACCTGCCCAACGAGAAGGTGCTGCCAAGCACAGCCTGCTGTACG
AGTACTTCACCGTGTACAACGAGCTGACCAAAGTGAATACGTGACCGAGGGAATGAGAAAGCCCGCCTTCCTGAGCG
GCGAGCAGAAAAAGCCATCGTGGACCTGCTGTTCAAGACCAACCGGAAAGTGACCGTGAAGCAGCTGAAAGAGGACT
ACTTCAAGAAAATCGAGTGCTTCGACTCCGTGGAATCTCCGGCGTGGAAGATCGGTTCAACGCCTCCCTGGGCACATA
CCACGATCTGCTGAAAATTATCAAGGACAAGGACTTCCTGGACAATGAGGAAAACGAGGACATTCTGGAAGATATCGTG
CTGACCCTGACACTGTTTGAGGACAGAGAGATGATCGAGGAACGGCTGAAAACCTATGCCACCTGTTTCGACGACAAA
GTGATGAAGCAGCTGAAGCGGCGGAGATACCCGGCTGGGGCAGGCTGAGCCGGAAGCTGATCAACGGCATCCGGGA
CAAGCAGTCCGGCAAGACAATCCTGGATTTCCTGAAGTCCGACGGCTTCGCCAACAGAACTTCATGCAGCTGATCCAC
GACGACAGCCTGACCTTTAAAGAGGACATCCAGAAAGCCAGGTGTCCGGCCAGGGCGATAGCCTGCACGAGCACATT
GCCAATCTGGCCGGCAGCCCCGCCATTAAGAAGGGCATCCTGCAGACAGTGAAGGTGGTGGACGAGCTCGTGAAGT
GATGGGCCGGCACAAGCCCAGAACATCGTGATCGAAATGGCCAGAGAGAACCAGACCACCCAGAAGGGACAGAAGA
ACAGCCCGGAGAGAATGAAGCGGATCGAAGAGGGCATCAAAGAGCTGGGCAGCCAGATCCTGAAAGAACACCCCGTG
GAAAACACCCAGCTGCAGAACGAGAAGCTGTACCTGTACTACCTGCAGAATGGGCGGGATATGTACGTGGACCAGGAA
CTGGACATCAACCGCTGTCCGACTACGATGTGGACGCTATCGTGCCTCAGAGCTTTCTGAAGGACGACTCCATCGATA
ACAAAGTGCTGACTCGGAGCGACAAGAACCGGGGCAAGAGCGACAACGTGCCCTCCGAAGAGGTGCTGAAGAAGATG
AAGAACTACTGGCCCGAGCTGCTGAATGCCAAGCTGATTACCCAGAGGAAGTTCGACAATCTGACCAAGGCCGAGAGA
GGCGGCCTGAGCGAACTGGATAAGGCCGGCTTCATCAAGAGACAGCTGGTGGAAACCCGGCAGATCACAAAGCACGT
GGCACAGATCCTGGACTCCCGGATGAACACTAAGTACGACGAGAACGACAACTGATCCGGGAAGTGAAAGTGATCAC
CCTGAAGTCCAAGCTGGTGTCCGATTTCCGGAAGGATTTCCAGTTTTACAAAGTGCGCGAGATCAACAACTACCACCAC
GCCACGACGCCTACCTGAACGCCGTGCTGGGAACCGCCCTGATCAAAAAGTACCCTAAGCTGGAAAGCGAGTTCTGT
TACGGCGACTACAAGGTGTACGACGTGCGGAAGATGATCGCCAAGAGCGAGCAGGAAATCGGCAAGGCTACCGCCAA
GTACTTCTTCTACAGCAACATCATGAACTTTTTCAAGACCGAGATTACCCTGGCCAACGGCGAGATCCGGAAGCGGCCT
CTGATCGAGACAAACGGCGAAACAGGCGAGATCGTGTGGGATAAGGGCCGGGACTTTGCCACCGTGCGGAAAGTGCT
GTCTATGCCCCAAGTGAATATCGTGAAAAAGACCGAGGTGCAGACAGGCGGCTTCAGCAAAGAGTCTATCCTGCCCAA
GAGGAACAGCGACAAGCTGATCGCCAGAAAGAAGGACTGGGACCCTAAGAAGTACGGCGGCTTCGACAGCCCCACCG
TGGCCTATTCTGTGCTGGTGGTGGCCAAAGTGAAAAAGGGCAAGTCCAAGAACTGAAGAGTGTGAAGAGCTGCTGG
GGATCACCATCATGGAAAGAAGCAGCTTCGAGAAGAATCCCATCGACTTTCTGGAAGCCAAGGGCTACAAAGAAGTGAA
AAAGGACCTGATCATCAAGCTGCCTAAGTACTCCCTGTTTCGAGCTGGAAAACGGCCGGAAGAGAATGCTGGCCTCTGC
CGGCGAACTGCAGAAGGGAAACGAACTGGCCCTGCCCTCCAAATATGTGAACCTCCTGTACCTGGCCAGCCACTATGA
GAAGCTGAAGGGCTCCCCGAGGATAATGAGCAGAAACAGCTGTTTGTGGAACAGCACAAACACTACCTGGACGAGAT

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

[illegible]

AGCAGCGCGGCGGCAGCGAGGTGAAGCTGCTGGAGAGCGGCGGCGCCTGGTGCAGCCCGCGGCAGCCTGAAG
CTGAGCTGCGCCGTGAGCGGCTTCAGCCTGACCGACTACGGCGTGAAGTGGTGCGCCAGGCCCCGGCCGCGGCC
TGGAGTGGATCGGCGTGATCTGGGGCGACGGCATCACCGACTACAACAGCGCCCTGAAGGACCGCTTCATCATCAGCA
AGGACAACGGCAAGAACACCGTGTACCTGCAGATGAGCAAGGTGCGCAGCGACGACACCGCCCTGTACTACTGCGTGA
CCGGCCTGTTCTGACTACTGGGGCCAGGGCACCTGGTGACCGTGAGCAGCTACCCATACGATGTTCCAGATTACGCTG
GTGGAGGCGGAGGTTCTGGGGGAGGAGGTAGTGGCGGTGGTGGTTCAGGAGGCGGCGGAAGCCCTAAGAAAAAGAG
GAAGGTGGCGGCCGCTGGATCCCTTCAGGGCAGATCAGCAACCAGGCCCTGGCTCTGGCCCCCTAGCTCCGCTCCAG
TGCTGGCCCCAGACTATGGTGCCCTCTAGTGCTATGGTGCCCTCTGGCCCAGCCACCTGCTCCAGCCCCCTGTGCTGACCC
CAGGACCACCCCAGTCACTGAGCGCTCCAGTGCCCAAGTCTACACAGGCCGGCGAGGGGACTCTGAGTGAAGCTCTG
CTGCACCTGCAGTTCGACGCTGATGAGGACCTGGGAGCTCTGCTGGGGAACAGCACCGATCCCGGAGTGTTACAGAT
CTGGCCTCCGTGGACAACTCTGAGTTTCAGCAGCTGCTGAATCAGGGCGTGTCATGTCTCATAGTACAGCCGAACCA
TGCTGATGGAGTACCCGAAGCCATTACCCGGCTGGTGACCGGCAGCCAGCGGCCCCCCGACCCCGCTCCAACCTCCC
CTGGGAACCAGCGGCCCTGCCTAATGGGCTGTCCGGAGATGAAGACTTCTCAAGCATCGCTGATATGGACTTTAGTGCC
CTGCTGTACAGATTTCTCTAGTGGGCAGGAGGAGGTGGAAGCGGCTTCAGCGTGAGACACCACTGCTGCTGGA
CCTGTTAGCCCCCTCGGTGACCGTGCCCCGACATGAGCCTGCCTGACCTTGACAGCAGCCTGGCCAGTATCCAAGAGCT
CCTGTCTCCCCAGGAGCCCCCAGGCCTCCCGAGGCAGAGAACAGCAGCCCGGATTACAGGAAGCAGCTGGTGCACT
ACACAGCGCAGCCGCTGTTCTGCTGGACCCCGGCTCCGTGGACACCGGGAGCAACGACCTGCCGGTGCTGTTTGAG
CTGGGAGAGGGCTCCTACTTCTCCGAAGGGGACGGCTTCGCCGAGGACCCCACTCTCCCTGCTGACAGGCTCGGA
GCCTCCCAAAGCCAAGGACCCCACTGTCTCCGCTAGCGGCAGTGGAGAGGGCAGAGGAAGTCTGCTAACATGCGGTG
ACGTCGAGGAGAATCCTGGCCAGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGCCCATCCTGGTTCGAGCTG
GACGGCGACGTAAACGGCCACAAGTTCAGCGTGTCGGCGGAGGGCGAGGGCGATGCCACCTACGGCAAGCTGACCT
GAAGTTCATCTGCACCACCGCAAGCTGCCCCGTGCCCTGGCCCACCCTCGTGACCACCCTGACCTACGGCGTGCACTG
CTTCAGCCGCTACCCCGACCACATGAAGCAGCAGCACTTCTTCAAGTCCGCCATGCCCCAAGGCTACGTCCAGGAGCG
CACCATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCGGAGGTGAAGTTCGAGGGCGACACCCTGGTGAACCG
CATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGAGTACAACCTACAACAGCCA
CAACGTCTATATCATGGCCGACAAGCAGAAGAAGCGCATCAAGGTGAAGTTCAGATCCGCCACAACATCGAGGACGG
CAGCGTGCACTCGCCGACCACTACCAGCAGAACACCCCATCGCGGACGGCCCCGTGCTGCTGCCCGACAACCACT
ACCTGAGCACCCAGTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCTGCTGGAGTTCGTGACCG
CCGCCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAAGAATTCGATATCAAGCTTATCGATAATCAACCTCTGGA
TTACAAAATTTGTAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTACGCTATGTGGATACGCTGCTTTATGCCT
TTGTATCATGCTATTGCTTCCGTATGGCTTTTCAATTTCTCCTCCTTGATAAATCCTGGTTGCTGTCTCTTTATGAGGAGT
TGTGGCCCGTTGTACGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCCA
CCACCTGTGAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCTGCCTTGC
CCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAAATCATGTCCTTTCTTG
GCTGCTCGCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGA
CCTTCCTTCCCGCGGCCCTGCTGCCGGCTCTGCGGCCTCTCCGCGCTTTCGCTTCGCCCTCAGACGAGTCGGATCTC
CCTTTGGGCGCCCTCCCCGCATCGATACCGTCGACCTCGAGACCTAGAAAAACATGGAGCAATCACAAAGTAGCAATACA
GCAGCTACCAATGCTGATTGTGCCTGGCTAGAAGCACAAGAGGAGGAGGAGGTGGGTTTTCCAGTCACACCTCAGGTA
CCTTTAAGACCAATGACTTACAAGGCAGCTGTAGATCTTAGCCACTTTTTAAAAGAAAAGGGGGGACTGGAAGGGCTAAT
TCACTCCCAACGAAGACAAGATATCCTTGATCTGTGGATCTACCACACACAAGGCTACTTCCCTGATTGGCAGAACTACA
CACCAGGGCCAGGGATCAGATATCCACTGACCTTTGGATGGTGCTACAAGCTAGTACCAGTTGAGCAAGAGAAGGTAG
AAGAAGCCAATGAAGGAGAGAACACCCGCTTGTTACACCCTGTGAGCCTGCATGGGATGGATGACCCGAGAGAGAAG
TATTAGAGTGGAGGTTTGACAGCCGCCTAGCATTTTCATCACATGGCCGAGAGCTGCATCCGGACTGTACTGGGTCTCT
CTGGTTAGACCAGATCTGAGCCTGGGAGCTCTCTGGCTAACTAGGGAACCCACTGCTTAAGCCTCAATAAAGCTTGCCT

TGAGTGCTTCAAGTAGTGTGTGCCCCTCTGTTGTGTGACTCTGGTAACTAGAGATCCCTCAGACCCTTTTAGTCAGTGTG
GAAAATCTCTAGCAGGGCCCGTTTAAACCCGCTGATCAGCCTCGACTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTG
CCCCTCCCCCGTGCCTTCCTTGACCCTGGAAGGTGCCACTCCCCTGTCCCTTCCTAATAAAATGAGGAAATTGCATCG
CATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAAT
AGCAGGCATGCTGGGGATGCGGTGGGCTCTATGG