

SUPPLEMENTARY TABLES

Supplementary Table 1: Oligos used for plasmid construction.

Primer name	Sequence (5' to 3')
hA3A_PCR_F	CACTATAGGGAGAGCCGCCACCATGGAAGCC AGCCCAGCATCCGGGC
hA3A_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTGTTTCCCTGATTCTGGAGAATGGC
hA3B_PCR_F	CTATAGGGAGAGCCGCCACCATGAATCCACAG ATCAGAAATCCGATG
hA3B_PCR_R	GGTGTGGCGGACTCTGAGGTCCCGGGAGTCTC GCTGCCGCTGTTTCCCTGATTCTGG
hA3C_PCR_F	CACTATAGGGAGAGCCGCCACCATGAATCCAC AGATCAGAAACCCG
hA3C_PCR_R	GGTGTGGCGGACTCTGAGGTCCCGGGAGTCTC GCTGCCGCTCTGGAGACTCTCCCGTAGCCTTC
hA3D_PCR_F	CTATAGGGAGAGCCGCCACCATGAATCCACAG ATCAGAAATCCGATG
hA3D_PCR_R	GGTGTGGCGGACTCTGAGGTCCCGGGAGTCTC GCTGCCGCTCTGGAGAATCTCCCGTAGCCTTC
hA3F_PCR_F	CACTATAGGGAGAGCCGCCACCATGAAGCCTC ACTTCAGAAACAC
hA3F_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTCTCGAGAATCTCCTGC
hA3G_PCR_F	CTATAGGGAGAGCCGCCACCATGAAGCCTCAC TTCAGAAACACAG
hA3G_PCR_R	GGTGTGGCGGACTCTGAGGTCCCGGGAGTCTC GCTGCCGCTGTTTTCTGATTCTGGAGAATGG
hA3H_PCR_F	CTATAGGGAGAGCCGCCACCATGGCTCTGTTA ACAGCCGAAACAT
hA3H_PCR_R	GGTGTGGCGGACTCTGAGGTCCCGGGAGTCTC GCTGCCGCTCACAATATATCCATGTAACGAC
hAID_PCR_F	CTATAGGGAGAGCCGCCACCATGGACAGCCTC TTGATGAACCG
hAID_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTAAGTCCCAAAGTACGAAATGCGT

hA1_PCR_F	CTATAGGGAGAGCCGCCACCATGACTTCTGAG AAAGGTCCTTC
hA1_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTTCTCCAAGCCACAGAAGGATGTA
cAICDA_PCR_F	CTATAGGGAGAGCCGCCACCATGAGCAAGCT GGACAGTGTGCT
cAICDA_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTAAGGCCAGCAGAGCGAAGCCAT
mAID_PCR_F	CTATAGGGAGAGCCGCCACCATGGACAGCCTT CTGATGAAGCA
mAID_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTAAATCCCAACATACGAAATGCAT
mA1_PCR_F	CTATAGGGAGAGCCGCCACCATGAGTTCCGAG ACAGGCCCTGT
mA1_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTTTTCAACCCTGTAGCCCAAAGGA
mA3_PCR_F	CTATAGGGAGAGCCGCCACCATGGGACCATTC TGTCTGGGATG
mA3_PCR_R	GTGTGGCGGACTCTGAGGTCCCGGGAGTCTCG CTGCCGCTAGACATCGGGGGTCCAAGCTGTA
hA3A_Y130F_PCR_F	TATCTTCGCTGCCCGCATCTTTGATTACGACCC CCTATAT
hA3A_Y130F_PCR_R	ATATAGGGGGTCGTAATCAAAGATGCGGGCA GCGAAGATA
hA3A_Y132D_PCR_F	CGCTGCCCCGCATCTATGATGATGACCCCCTAT ATAAGGAG
hA3A_Y132D_PCR_R	CTCCTTATATAGGGGGTCATCATCATAGATGC GGGCAGCG
hA3A_D131Y_PCR_F	CGCTGCCCCGCATCTATTATTACGACCCCCTATA TAAGGAG
hA3A_D131Y_PCR_R	CTCCTTATATAGGGGGTCGTAATAATAGATGC GGGCAGCG
hA3A_C101S_PCR_F	GTTTCATCTCCTGGAGCCCCAGCTTCTCCTGGG GCTGTGCC
hA3A_C101S_PCR_R	GGCACAGCCCCAGGAGAAGCTGGGGCTCCAG GAGATGAAC
hA3A_C106S_PCR_F	CCTGCTTCTCCTGGGGCAGTGCCGGGGAAGTG CGTGCGTT

hA3A_C106S_PCR_R	AACGCACGCACTTCCCCGGCACTGCCCCAGGA GAAGCAGG
SupF_PCR_F	GAATTCTGTTGACAATTAAT
SupF_PCR_R	GACCCGAATTGAGCTTGCTA
SupF_sg1_FOR	ACCGTCTGCCGTCATCGACTTCGA
SupF_sg1_REV	AAACTCGAAGTCGATGACGGCAGA
SupF_sg2_FOR	ACCGCGAACCTTCGAAGTCGATGA
SupF_sg2_REV	AAACTCATCGACTTCGAAGGTTTCG
EMX1_FOR	ACCGGAGTCCGAGCAGAAGAAGAA
EMX1_REV	AAACTTCTTCTTCTGCTCGGACTC
RNF2_FOR	ACCGGTCATCTTAGTCATTACCTG
RNF2_REV	AAACCAGGTAATGACTAAGATGAC
HEK_Site2_FOR	ACCGGAACACAAAGCATAGACTGC
HEK_Site2_REV	AAACGCAGTCTATGCTTTGTGTTC
HEK_Site3_FOR	ACCGGGCCCAGACTGAGCACGTGA
HEK_Site3_REV	AAACTCACGTGCTCAGTCTGGGCC
HEK_Site4_FOR	ACCGGGCACTGCGGCTGGAGGTGG
HEK_Site4_REV	AAACCCACCTCCAGCCGCAGTGCC
FANCF-M-a_FOR	ACCGGCGCACGGTGGCGGGGTCCC
FANCF-M-a_REV	AAACGGGACCCCGCCACCGTGCGC
FANCF-M-b_FOR	ACCGAAGTTCGCTAATCCCGGAAC
FANCF-M-b_REV	AAACGTTCCGGGATTAGCGAACTT
FANCF-M-c_FOR	ACCGGTAACGAGCTGCATCCCCGA
FANCF-M-c_REV	AAACTCGGGGATGCAGCTCGTTAC
FANCF-M-d_FOR	ACCGCGAGGGCCCGGTTCTCCAGC
FANCF-M-d_REV	AAACGCTGGAGAACCGGGCCCTCG
MSSK1-M-a_FOR	ACCGACCCACGGCGGGGATCAGGG
MSSK1-M-a_REV	AAACCCCTGATCCCCGCCGTGGGT
MSSK1-M-b_FOR	ACCGAATGCGGGTGCAAGGCCTGC
MSSK1-M-b_REV	AAACGCAGGCCTTGCACCCGCATT
MSSK1-M-c_FOR	ACCGCGTCGCCGATCTTCACAGGG
MSSK1-M-c_REV	AAACCCCTGTGAAGATCGGCGACG
MAGEA1-M-a_FOR	ACCGTCCCGCGGGTGGGCCAGGGC
MAGEA1-M-a_REV	AAACGCCCTGGCCCACCCGCGGGA
MAGEA1-M-b_FOR	ACCGGCTGGCAGCAAGGGCGGCGC
MAGEA1-M-b_REV	AAACGCGCCGCCCTTGCTGCCAGC
PDL1-M-a_FOR	ACCGCTGGCGCAACGCTGAGCAGC
PDL1-M-a_REV	AAACGCTGCTCAGCGTTGCGCCAG

PDL1-M-b_FOR	ACCGCAGGCGGACAGAAGCGCGGC
PDL1-M-b_REV	AAACGCCGCGCTTCTGTCCGCCTG
PDL1-M-c_FOR	ACCGAGGCAGCAAATCCAGTTTGC
PDL1-M-c_REV	AAACGCAAACCTGGATTTGCTGCCT
VEGFA-M-a_FOR	ACCGGGTCAGCGGACTCACCGGCC
VEGFA-M-a_REV	AAACGGCCGGTGAGTCCGCTGACC
VEGFA-M-b_FOR	ACCGTAGCTCGGAGGTCGTGGCGC
VEGFA-M-b_REV	AAACGCGCCACGACCTCCGAGCTA
VEGFA-M-c_FOR	ACCGGGCTAGCACCGAGCGCTCTGT
VEGFA-M-c_REV	AAACACAGAGCGCTGGTGCTAGCC

Supplementary Table 2: sgRNA target sequences, PCR primers for amplifying genomic

DNA and the bisulfite (BS)-PCR primers for BS sequencing.

Name	Sequence(5' to 3')
sgEMX1	GAGTCCGAGCAGAAGAAGAAGGG
EMX1_G2F	CTGCCATCCCCTTCTGTGAA
EMX1_G2R	AAGGGAGATTGGAGACACGGA
sgRNF2	GTCATCTTAGTCATTACCTGAGG
RNF2_G2F	AGGAGGACTTGCCCAACTTT
RNF2_G2R	CTGTGTCAGAACATGCTGGAA
sgSITE2	GAACACAAAGCATAGACTGCGGG
HEK293-Site2_G2F	TCTTCACAGGCTACCCCCTA
HEK293-Site2_G2R	AATCCACAGCAACACCCTCT
sgSITE3	GGCCCAGACTGAGCACGTGATGG
HEK293-Site3_G1F	CTACGCCTGTGATGGGCTAA
HEK293-Site3_G1R	CCATCACTTTCTGGCCTCAGT
sgSITE4	GGCACTGCGGCTGGAGGTGGGGG
HEK293-Site4_G2F	TGAGCATCTACTGAGATCCT
HEK293-Site4_G1R	GCCGCAGCCACTCAGAT
sgFANCF-M-a	GCGCACGGTGGCGGGGTCCCAGG
sgFANCF-M-b	AAGTTCGCTAATCCCGGAACTGG
sgFANCF-M-c	GTAACGAGCTGCATCCCCGAGGG
sgFANCF-M-d	CGAGGGCCCGGTTCTCCAGCAGG
FANCF_G1F	GCATTGCAGAGAGGCGTATCAT
FANCF_G1R	ATAGCCATTGAAGCGCAGCATG
FANCF_BS_OF	AAGTATTAGGGTTTTTAAGTTGTTTAGAGT
FANCF_BS_OR	GATGAGGAGATATTTTAAGAGAGTTTGGT
FANCF_BS_IF	GATTAATAGTATTGTAGAGAGG
FANCF_BS_IR	AGTTCGTTATTATTTGGTGTAG
sgMSSK1-M-a	ACCCACGGCGGGGATCAGGGTGG
sgMSSK1-M-b	AATGCGGGTGCAAGGCCTGCCGG

sgMSSK1-M-c	CGTCGCCGATCTTCACAGGGTGG
MSSK1_G1F	CAATGGGGCCGAGGTGTTCG
MSSK1_G1R	GGAAGAAAGGCCGCCAACCC
MSSK1_BS_OF_up	GGGTTTCGAATTAGTTTTTG
MSSK1_BS_IF_up	AGATGTTGTAGGGTTTTTTGGG
MSSK1_BS_R_up	CTATAACCCTAACAAAACCCAC
MSSK1_BS_F_down	GGGTTTGTTTGGGGTTATTTTG
MSSK1_BS_OR_down	CCCGAACCTAAAACAAAACCA
MSSK1_BS_IR_down	AAAACCCACAACCTCCCTTCAAT
sgMAGEA1-M-a	TCCCGCGGGTGGGCCAGGGCTGG
sgMAGEA1-M-b	GCTGGCAGCAAGGGCGGCGCTGG
MAGEA1_G1F	CCATTCTGAGGGACGGCGTA
MAGEA1_G1R	GTGAGGGTGAGGTGGCAGAA
MAGEA1_BS_F	GAGAGAAGCGAGGTTTTTAT
MAGEA1_BS_OR	CAATCTTAAAAACCCACAACCC
MAGEA1_BS_IR	TAACAAAACCTATACCCTACCC
sgPDL1-M-a	CTGGCGCAACGCTGAGCAGCTGG
sgPDL1-M-b	CAGGCGGACAGAAGCGCGGCTGG
sgPDL1-M-c	AGGCAGCAAATCCAGTTTGCCGG
PDL1_G1F	CGAAACTCTTCCCGGTGAAA
PDL1_G1R	AGGAAGGCCAGATGCATTGC
PDL1_BS_OF	TATTAAATGTGGATTTGTTT
PDL1_BS_OR	ACCAAATACATTACCTATTCTT
PDL1_BS_IF	ATAAGAAAATTGGATTGATATG
PDL1_BS_IR	ACAAATAATTAACCTACTACC
sgVEGFA-M-a	GGTCAGCGGACTCACCGGCCAGG
sgVEGFA-M-b	TAGCTCGGAGGTCTGTGGCGCTGG
sgVEGFA-M-c	GGCTAGCACCGAGCGCTCTGTCGG
VEGFA_G1F	GCGGATGGGTAATTTTCAGG
VEGFA_G1R	GGGGAAGTAGAGCAATCTCC
VEGFA_BS_OF	CGCGTGTTTTTGGATAGAGTTT
VEGFA_BS_IF	TTAGGTTGTGAATTTTGGTGGG

VEGFA_BS_R	CTCTTACTACCTCTTTCCTCTT
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SUPPLEMENTARY NOTES

Supplementary Note 1: Plasmid DNA sequences:

hA3A-BE3 expression vector (pCMV-hAPOBEC3A-XTEN-D10A-SGGS-UGI-SGGS-NLS)

ATGGAAGCCAGCCCAGCATCCGGGCCCAGACACTTGATGGATCCACACATATTC
ACTTCCAACCTTTAACAATGGCATTGGAAGGCATAAGACCTACCTGTGCTACGAAG
TGGAGCGCCTGGACAATGGCACCTCGGTCAAGATGGACCAGCACAGGGGGCTTTC
TACACAACCAGGCTAAGAATCTTCTCTGTGGCTTTTACGGCCGCCATGCGGAGCT
GCGCTTCTTGGACCTGGTTCCTTCTTTGCAGTTGGACCCGGCCCAGATCTACAGG
GTCACTTGGTTCATCTCCTGGAGCCCCTGCTTCTCCTGGGGCTGTGCCGGGGGAAG
TGCGTGCGTTCCTTCAGGAGAACACACACGTGAGACTGCGTATCTTCGCTGCCCCG
CATCTATGATTACGACCCCCTATATAAGGAGGCACTGCAAATGCTGCGGGATGCT
GGGGCCCAAGTCTCCATCATGACCTACGATGAATTTAAGCACTGCTGGGACACCT
TTGTGGACCACCAGGGATGTCCCTTCCAGCCCTGGGATGGACTAGATGAGCACA
GCCAAGCCCTGAGTGGGAGGCTGCGGGCCATTCTCCAGAATCAGGGAAACAGCG
GCAGCGAGACTCCCGGGACCTCAGAGTCCGCCACACCCGAAAGTGATAAAAAGT
ATTCTATTGGTTTAGCCATCGGCACTAATTCCGTTGGATGGGCTGTCATAACCGA

TGAATACAAAGTACCTTCAAAGAAATTTAAGGTGTTGGGGAACACAGACCGTCA
TTCGATTAAAAAGAATCTTATCGGTGCCCTCCTATTTCGATAGTGGCGAAACGGCA
GAGGCGACTCGCCTGAAACGAACCGCTCGGAGAAGGTATACACGTCGCAAGAAC
CGAATATGTTACTTACAAGAAATTTTTAGCAATGAGATGGCCAAAGTTGACGATT
CTTTCTTTCACCGTTTGGAAGAGTCCTTCCTTGTCGAAGAGGACAAGAAACATGA
ACGGCACCCCATCTTTGGAAACATAGTAGATGAGGTGGCATATCATGAAAAGTA
CCCAACGATTTATCACCTCAGAAAAAAGCTAGTTGACTCAACTGATAAAGCGGA
CCTGAGGTTAATCTACTTGGCTCTTGCCCATATGATAAAGTTCCGTGGGCACTTTC
TCATTGAGGGTGATCTAAATCCGGACAACCTCGGATGTCGACAAACTGTTTCATCCA
GTTAGTACAAACCTATAATCAGTTGTTTGAAGAGAACCCTATAAATGCAAGTGGC
GTGGATGCGAAGGCTATTCTTAGCGCCCGCCTCTCTAAATCCCGACGGCTAGAAA
ACCTGATCGCACAATTACCCGGAGAGAAGAAAAATGGGTTGTTTCGGTAACCTTA
TAGCGCTCTCACTAGGCCTGACACCAAATTTTAAGTCGAACTTCGACTTAGCTGA
AGATGCCAAATTGCAGCTTAGTAAGGACACGTACGATGACGATCTCGACAATCT
ACTGGCACAAATTGGAGATCAGTATGCGGACTTATTTTTGGCTGCCAAAAACCTT
AGCGATGCAATCCTCCTATCTGACATACTGAGAGTTAATACTGAGATTACCAAGG

CGCCGTTATCCGCTTCAATGATCAAAAGGTACGATGAACATCACCAAGACTTGAC
ACTTCTCAAGGCCCTAGTCCGTCAGCAACTGCCTGAGAAATATAAGGAAATATTC
TTTGATCAGTCGAAAAACGGGTACGCAGGTTATATTGACGGCGGAGCGAGTCAA
GAGGAATTCTACAAGTTTATCAAACCCATATTAGAGAAGATGGATGGGACGGAA
GAGTTGCTTGTA AAACTCAATCGCGAAGATCTACTGCGAAAGCAGCGGACTTTC
GACAACGGTAGCATTCCACATCAAATCCACTTAGGCGAATTGCATGCTATACTTA
GAAGGCAGGAGGATTTTTATCCG TTCCTCAAAGACAATCGTGAAAAGATTGAGA
AAATCCTAACCTTTTCGCATACCTTACTATGTGGGACCCCTGGCCCGAGGGAACTC
TCGGTTCGCATGGATGACAAGAAAGTCCGAAGAAACGATTACTCCATGGAATTT
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CAACTTTGACAAGAATTTACCGAACGAAAAAGTATTGCCTAAGCACAGTTTACTT
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CCCTCTTTGAAGATCGGGAAATGATTGAGGAAAGACTAAAAACATACGCTCACC
TGTTGACGATAAGGTTATGAAACAGTTAAAGAGGCGTCGCTATACGGGCTGGG
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CCAATTGCAGAACGAGAACTTTACCTCTATTACCTACAAAATGGAAGGGACAT
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GTTGCACAGATACTAGATTCCCGAATGAATACGAAATACGACGAGAACGATAAG
CTGATTCTGGGAAGTCAAAGTAATCACTTTAAAGTCAAATTGGTGTCGGACTTCA
GAAAGGATTTTCAATTCTATAAAGTTAGGGAGATAAATAACTACCACCATGCGC
ACGACGCTTATCTTAATGCCGTCGTAGGGACCGCACTCATTAAGAAATACCCGAA
GCTAGAAAGTGAGTTTGTGTATGGTGATTACAAAGTTTATGACGTCCGTAAGATG
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GCAAACGACCTTTAATTGAAACCAATGGGGAGACAGGTGAAATCGTATGGGATA
AGGGCCGGGACTTCGCGACGGTGAGAAAAGTTTTGTCCATGCCCCAAGTCAACA
TAGTAAAGAAAACCTGAGGTGCAGACCGGAGGGTTTTCAAAGGAATCGATTCTTC
CAAAAAGGAATAGTGATAAGCTCATCGCTCGTAAAAAGGACTGGGACCCGAAAA
AGTACGGTGGCTTCGATAGCCCTACAGTTGCCTATTCTGTCCTAGTAGTGGCAAA
AGTTGAGAAGGGAAAATCCAAGAACTGAAGTCAGTCAAAGAATTATTGGGGAT
AACGATTATGGAGCGCTCGTCTTTTGAAAAGAACCCCATCGACTTCCTTGAGGCG

AAAGGTTACAAGGAAGTAAAAAAGGATCTCATAATTAACTACCAAAGTATAGT
CTGTTTGAGTTAGAAAATGGCCGAAAACGGATGTTGGCTAGCGCCGGAGAGCTT
CAAAAGGGGAACGAACTCGCACTACCGTCTAAATACGTGAATTCCTGTATTTAG
CGTCCCATTACGAGAAGTTGAAAGGTTACCTGAAGATAACGAACAGAAGCAAC
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ATACAACAAGCACAGGGATAAACCATACGTGAGCAGGCGGAAAATATTATCCA
TTTGTTTACTCTTACCAACCTCGGCGCTCCAGCCGCATTCAAGTATTTTGACACAA
CGATAGATCGCAAACGATACACTTCTACCAAGGAGGTGCTAGACGCGACACTGA
TTCACCAATCCATCACGGGATTATATGAAACTCGGATAGATTTGTACAGCTTGG
GGGTGACTCTGGTGGTTCTACTAATCTGTCAGATATTATTGAAAAGGAGACCGGT
AAGCAACTGGTTATCCAGGAATCCATCCTCATGCTCCCAGAGGAGGTGGAAGAA
GTCATTGGGAACAAGCCGGAAGCGATATACTCGTGCACACCGCCTACGACGAG
AGCACCGACGAGAATGTCATGCTTCTGACTAGCGACGCCCTGAATACAAGCCTT
GGGCTCTGGTCATACAGGATAGCAACGGTGAGAACAAGATTAAGATGCTCTCTG
GTGGTTCTCCCAAGAAGAAGAGGAAAGTCTAA

hA3B-BE3 expression vector (pCMV-hAPOBEC3B-XTEN-D10A-SGGS-UGI-SGGS-NLS)

ATGAATCCACAGATCAGAAATCCGATGGAGCGGATGTATCGAGACACATTCTAC
GACAACTTTGAAAACGAACCCATCCTCTATGGTCGGAGCTACACTTGGCTGTGCT
ATGAAGTGAAAATAAAGAGGGGGCCGCTCAAATCTCCTTTGGGACACAGGGGTCT
TTCGAGGCCAGGTGTATTTCAAGCCTCAGTACCACGCAGAAATGTGCTTCCTCTC
TTGGTTCTGTGGCAACCAGCTGCCTGCTTACAAGTGTTTCCAGATCACCTGGTTTG
TATCCTGGACCCCCTGCCCCGGACTGTGTGGCGAAGCTGGCCGAATTCCTGTCTGA
GCACCCCAATGTCACCCTGACCATCTCCGCCGCCCGCCTCTACTACTACTGGGAA
AGAGATTACCGAAGGGCGCTCTGCAGGCTGAGTCAGGCAGGAGCCCGCGTGAAG
ATCATGGACTATGAAGAATTTGCATACTGCTGGGAAAACCTTTGTGTACAATGAAG
GTCAGCAATTCATGCCTTGGTACAAATTCGATGAAAATTATGCATTCCTGCACCG
CACGCTAAAGGAGATTCTCAGATACCTGATGGATCCAGACACATTCACTTTCAAC
TTTAATAATGACCCTTTGGTCCTTCGACGGCGCCAGACCTACTTGTGCTATGAGG
TGGAGCGCCTGGACAATGGCACCTGGGTCTGATGGACCAGCACATGGGCTTTCT
ATGCAACGAGGCTAAGAATCTTCTCTGTGGCTTTTACGGCCGCCATGCGGAGCTG

CGCTTCTTGGACCTGGTTCCTTCTTTGCAGTTGGACCCGGCCCAGATCTACAGGG
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GCGTGCGTTCCTTCAGGAGAACACACACGTGAGACTGCGCATCTTCGCTGCCCCG
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GGGCCCAAGTCTCCATCATGACCTACGATGAGTTTGAGTACTGCTGGGACACCTT
TGTGTACCGCCAGGGATGTCCCTTCCAGCCCTGGGATGGACTAGAGGAGCACAG
CCAAGCCCTGAGTGGGAGGCTGCGGGCCATTCTCCAGAATCAGGGAAACAGCGG
CAGCGAGACTCCCGGGACCTCAGAGTCCGCCACACCCGAAAGTGATAAAAAGTA
TTCTATTGGTTTAGCCATCGGCACTAATTCCGTTGGATGGGCTGTCATAACCGAT
GAATACAAAGTACCTTCAAAGAAATTTAAGGTGTTGGGGAACACAGACCGTCAT
TCGATTAAAAAGAATCTTATCGGTGCCCTCCTATTCGATAGTGGCGAAACGGCAG
AGGCGACTCGCCTGAAACGAACCGCTCGGAGAAGGTATACACGTGCAAGAACC
GAATATGTTACTTACAAGAAATTTTTAGCAATGAGATGGCCAAAGTTGACGATTC
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CGGCACCCCATCTTTGGAAACATAGTAGATGAGGTGGCATATCATGAAAAGTAC
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CTGAGGTTAATCTACTTGGCTCTTGCCCATATGATAAAGTTCCGTGGGCACTTTCT
CATTGAGGGTGATCTAAATCCGGACAACCTCGGATGTCGACAAACTGTTTCATCCAG
TTAGTACAAACCTATAATCAGTTGTTTGAAGAGAACCCTATAAATGCAAGTGGCG
TGGATGCGAAGGCTATTCTTAGCGCCCGCCTCTCTAAATCCCGACGGCTAGAAAA
CCTGATCGCACAATTACCCGGAGAGAAGAAAAATGGGTTGTTTCGGTAACCTTAT
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CTGGCACAAATTGGAGATCAGTATGCGGACTTATTTTTGGCTGCCAAAAACCTTA
GCGATGCAATCCTCCTATCTGACATACTGAGAGTTAATACTGAGATTACCAAGGC
GCCGTTATCCGCTTCAATGATCAAAAGGTACGATGAACATCACCAAGACTTGAC
ACTTCTCAAGGCCCTAGTCCGTCAGCAACTGCCTGAGAAATATAAGGAAATATTC
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GAGTTGCTTGTAAAACTCAATCGCGAAGATCTACTGCGAAAGCAGCGGACTTTC
GACAACGGTAGCATTCCACATCAAATCCACTTAGGCGAATTGCATGCTATACTTA
GAAGGCAGGAGGATTTTTATCCGTTCCCTCAAAGACAATCGTGAAAAGATTGAGA

AAATCCTAACCTTTTCGCATACCTTACTATGTGGGACCCCTGGCCCGAGGGAACTC
TCGGTTCGCATGGATGACAAGAAAGTCCGAAGAAACGATTACTCCATGGAATTT
TGAGGAAGTTGTCGATAAAGGTGCGTCAGCTCAATCGTTCATCGAGAGGATGAC
CAACTTTGACAAGAATTTACCGAACGAAAAAGTATTGCCTAAGCACAGTTTACTT
TACGAGTATTTACAGTGTACAATGAACTCACGAAAGTTAAGTATGTCACTGAGG
GCATGCGTAAACCCGCCTTTCTAAGCGGAGAACAGAAGAAAGCAATAGTAGATC
TGTTATTCAAGACCAACCGCAAAGTGACAGTTAAGCAATTGAAAGAGGACTACT
TTAAGAAAATTGAATGCTTCGATTCTGTGCGAGATCTCCGGGGTAGAAGATCGATT
TAATGCGTCACTTGGTACGTATCATGACCTCCTAAAGATAATTAAAGATAAGGAC
TTCCTGGATAACGAAGAGAATGAAGATATCTTAGAAGATATAGTGTTGACTCTTA
CCCTCTTTGAAGATCGGGAAATGATTGAGGAAAGACTAAAAACATACGCTCACC
TGTTGACGATAAGGTTATGAAACAGTTAAAGAGGCGTCGCTATACGGGCTGGG
GACGATTGTCGCGGAACTTATCAACGGGATAAGAGACAAGCAAAGTGGTAAAA
CTATTCTCGATTTTCTAAAGAGCGACGGCTTCGCCAATAGGAACTTTATGCAGCT
GATCCATGATGACTCTTTAACCTTCAAAGAGGATATACAAAAGGCACAGGTTTCC
GGACAAGGGGACTCATTGCACGAACATATTGCGAATCTTGCTGGTTCGCCAGCC

ATCAAAAAGGGCATACTCCAGACAGTCAAAGTAGTGGATGAGCTAGTTAAGGTC
ATGGGACGTCACAAACCGGAAAACATTGTAATCGAGATGGCACGCGAAAATCAA
ACGACTCAGAAGGGGCAAAAAACAGTCGAGAGCGGATGAAGAGAATAGAAGA
GGGTATTAAAGAACTGGGCAGCCAGATCTTAAAGGAGCATCCTGTGGAAAATAC
CCAATTGCAGAACGAGAACTTTACCTCTATTACCTACAAAATGGAAGGGACAT
GTATGTTGATCAGGAACTGGACATAAACCGTTTATCTGATTACGACGTCGATCAC
ATTGTACCCCAATCCTTTTTGAAGGACGATTCAATCGACAATAAAGTGCTTACAC
GCTCGGATAAGAACCGAGGGAAAAGTGACAATGTTCCAAGCGAGGAAGTCGTA
AAGAAAATGAAGAACTATTGGCGGCAGCTCCTAAATGCGAAACTGATAACGCAA
AGAAAGTTCGATAACTTAACTAAAGCTGAGAGGGGTGGCTTGTCTGAACTTGAC
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hA3C-BE3 expression vector (pCMV-hAPOBEC3C-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3D-BE3 expression vector (pCMV-hAPOBEC3D-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3G-BE3 expression vector (pCMV-hAPOBEC3G-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3H-BE3 expression vector (pCMV-hAPOBEC3H-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hAID-BE3 expression vector (pCMV-hAICDA-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA1-BE3 expression vector (pCMV-hAPOBEC1-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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mA3-BE3 expression vector (pCMV-mAPOBEC3-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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mAID-BE3 expression vector (pCMV-mAICDA-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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mA1-BE3 expression vector (pCMV-mAPOBEC1-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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cAICDA-BE3 expression vector (pCMV-cAICDA-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3A-BE3-Y130F expression vector (pCMV-hAPOBEC3A_Y130F-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3A-BE3-D131Y expression vector (pCMV-hAPOBEC3A_D131Y-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3A-BE3-Y132D expression vector (pCMV-hAPOBEC3A_Y132D-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3A-BE3-C101S expression vector (pCMV-hAPOBEC3A_C101S-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3A-BE3-C106S expression vector (pCMV-hAPOBEC3A_C106S-XTEN-D10A-SGGS-UGI-SGGS-NLS)

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hA3A-eBE-Y130F expression vector (pCMV-hAPOBEC3A_Y130F-XTEN-D10A-SGGS-
UGI-SGGS-NLS-T2A-UGI-NLS-P2A-UGI-NLS-T2A-UGI-NLS)

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hA3A-eBE-Y132D expression vector (pCMV-hAPOBEC3A_Y132D-XTEN-D10A-SGGS-
UGI-SGGS-NLS-T2A-UGI-NLS-P2A-UGI-NLS-T2A-UGI-NLS)

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Sequences for APOBEC/AID, nCas9 (D10A), UGI, NLS, 2A and linker (XTEN and SGGS)

are labeled in red, brown, blue, purple, orange and green, respectively. The initiation and stop

codons are highlighted in bold and sequences for linker peptides are indicated in lower case.