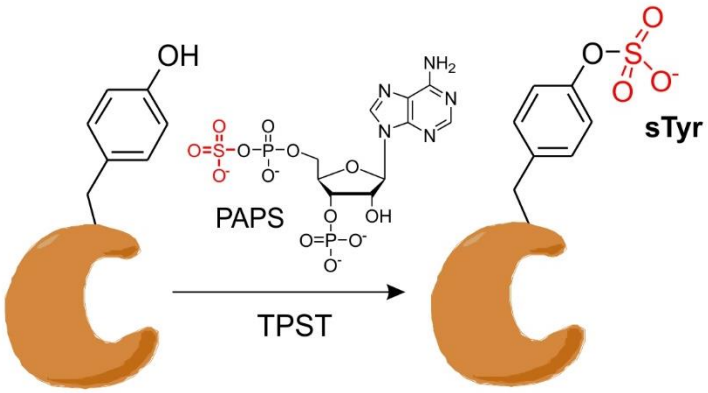
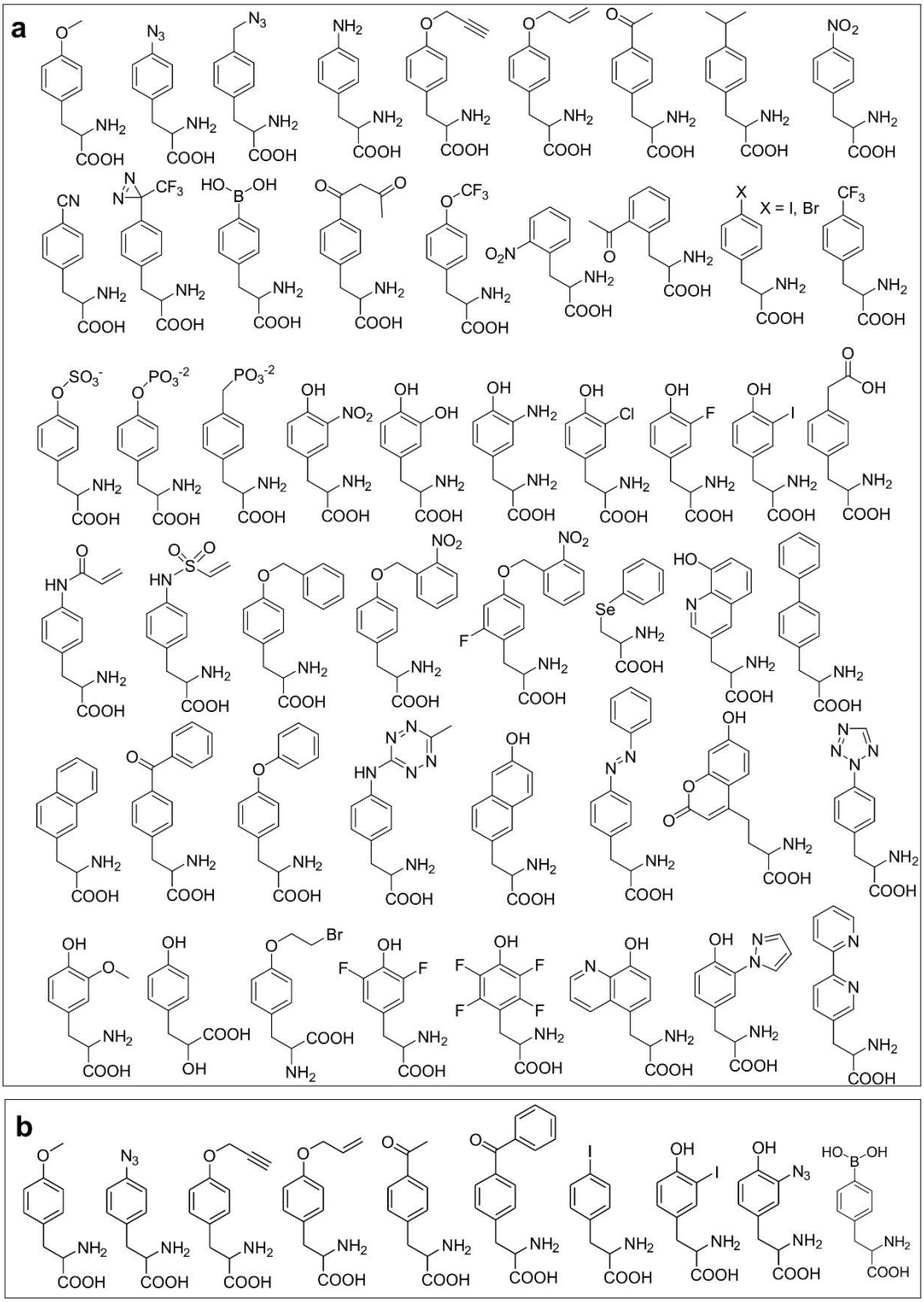
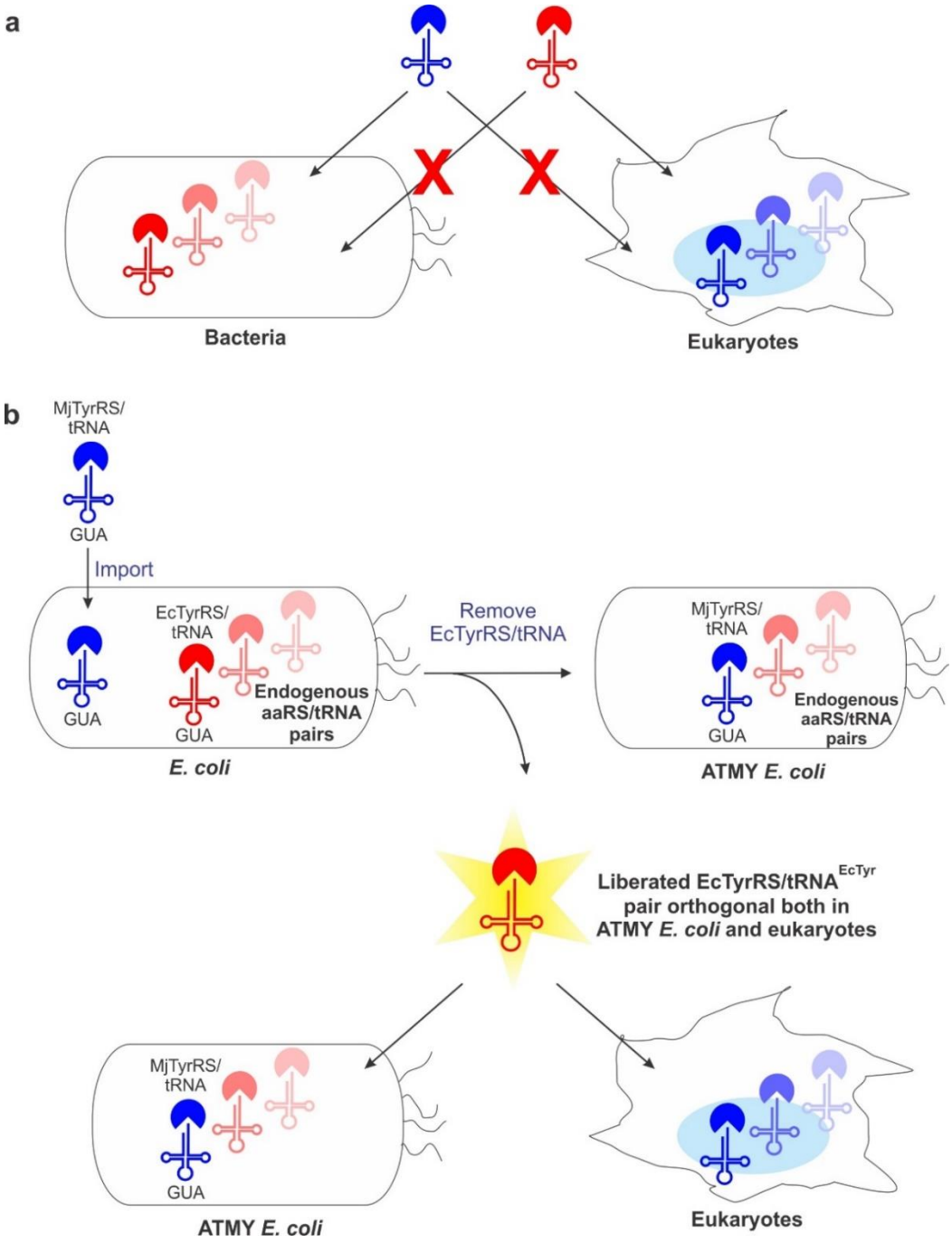


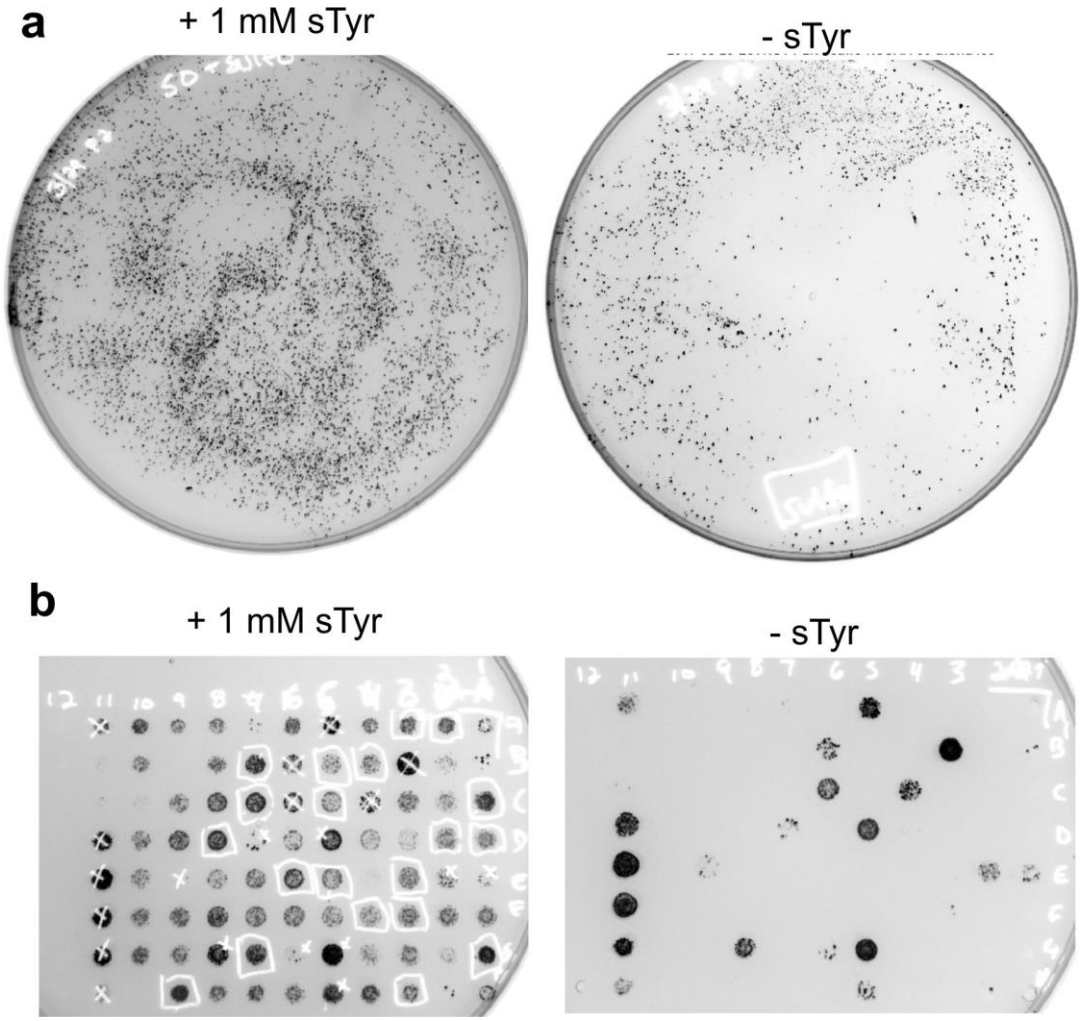
Supplementary Figure 1. Proteins processed through the trans-Golgi network in multicellular eukaryotes are subjected to tyrosine sulfation by two Tyrosylprotein Sulfotransferase (TPST) enzymes that use PAPS as the cofactor.



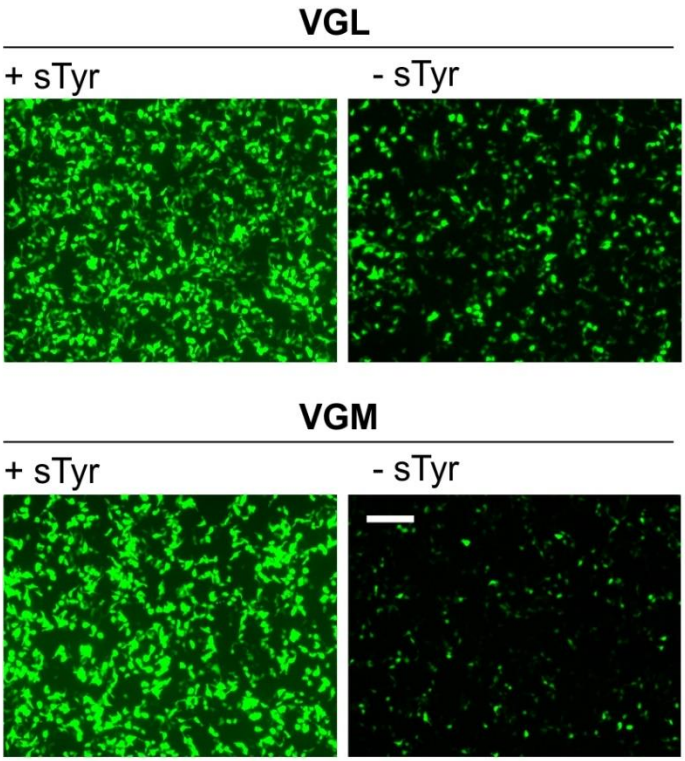
Supplementary Figure 2. Many more ncAAs have been genetically encoded in *E. coli* using the MjTyrRS/tRNA pair (**a**) than in eukaryotes using the EcTyrRS/tRNA pair (**b**).



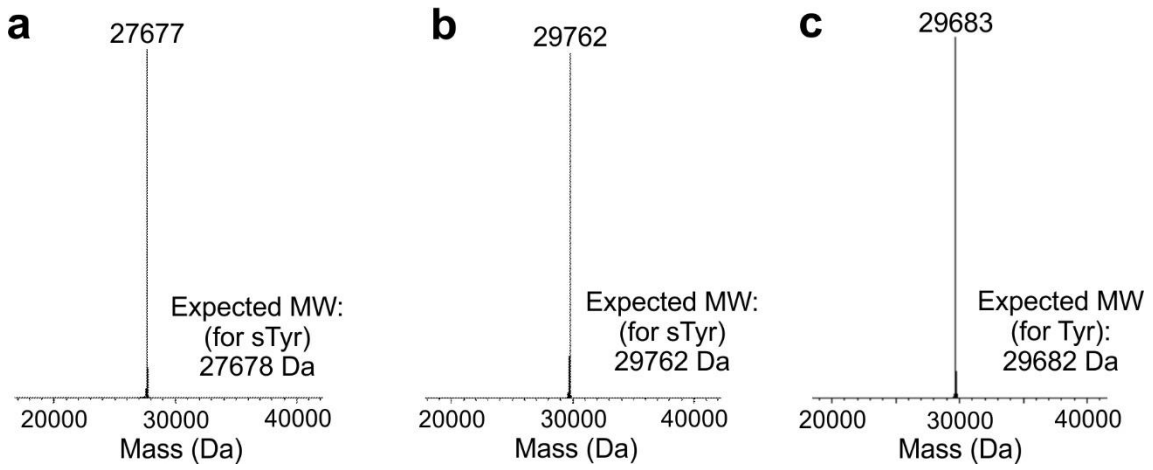
Supplementary Figure 3. **a**, Typically, the bacteria-derived aaRS/tRNA pairs (color-coded red) are orthogonal in eukaryotes and can be used for eukaryotic genetic code expansion, while eukaryote or archaea derived pairs (color-coded blue) are orthogonal in bacteria and are useful for bacterial genetic code expansion. **b**, Functionally substituting the EcTyrRS/tRNA pair in *E. coli* with the archaea derived MjTyrRS/tRNA pair creates an engineered ATMY strain. The 'liberated' EcTyrRS/tRNA pair can be established as an orthogonal nonsense suppressor in ATMY *E. coli*, and engineered in this strain for altering its substrate specificity.



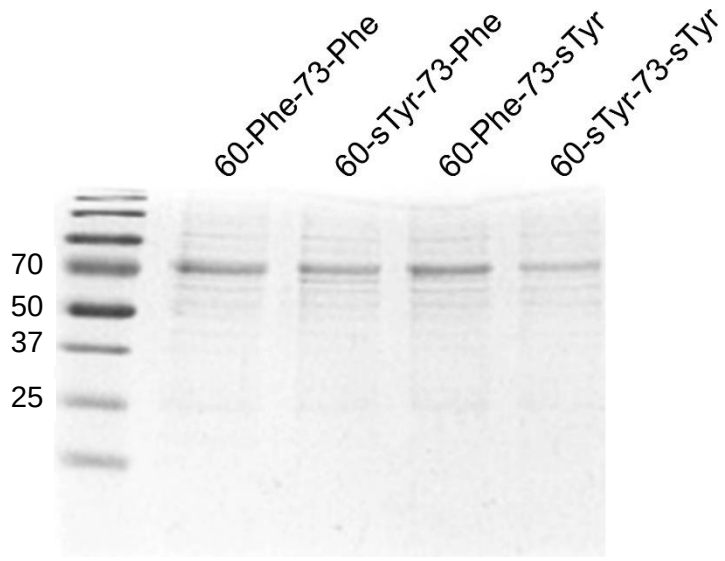
Supplementary Figure 4. **a**, The pool of EcTyrRS library of mutants selected through a single round each of positive and negative selection show substantial sTyr-dependent survival in a subsequent round of positive selection. **b**, Many individual clones isolated from these plates also show the same phenotype. These experiments were performed once.



Supplementary Figure 5. Fluorescence images of HEK293T cells expressing EGFP-39-TAG reporter using VGL- or VGM-EcTyrRS mutant in the presence or absence of sTyr (1 mM). These experiments were performed at least three times with similar results.

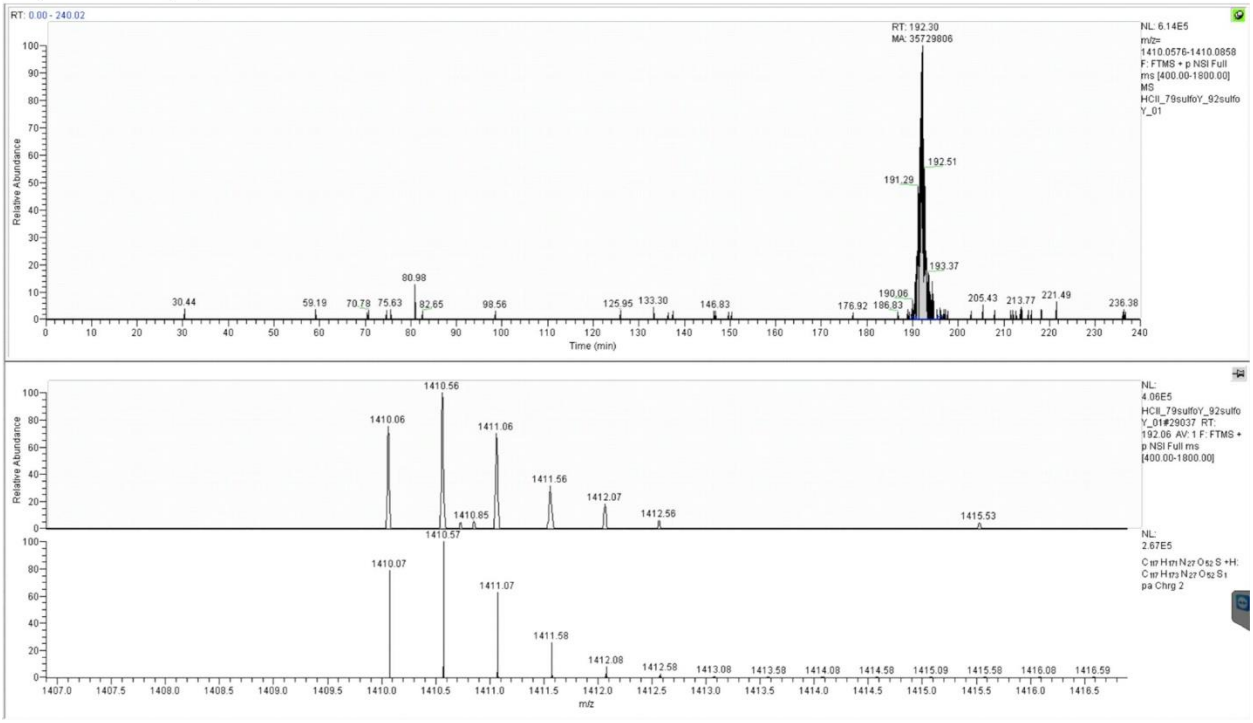


Supplementary Figure 6. ESI-MS analysis of the purified GFP reporter proteins. **a**, Deconvoluted mass of sfGFP-151-TAG reporter expressed in ATMY *E. coli* support incorporation of sTyr. **b**, EGFP-39-TAG reporter expressed in the presence of sTyr in mammalian cells show incorporation of sTyr; **c**, the same reporter expressed in the absence of sTyr show the incorporation of tyrosine. These MS analyses were performed at least twice with similar results.



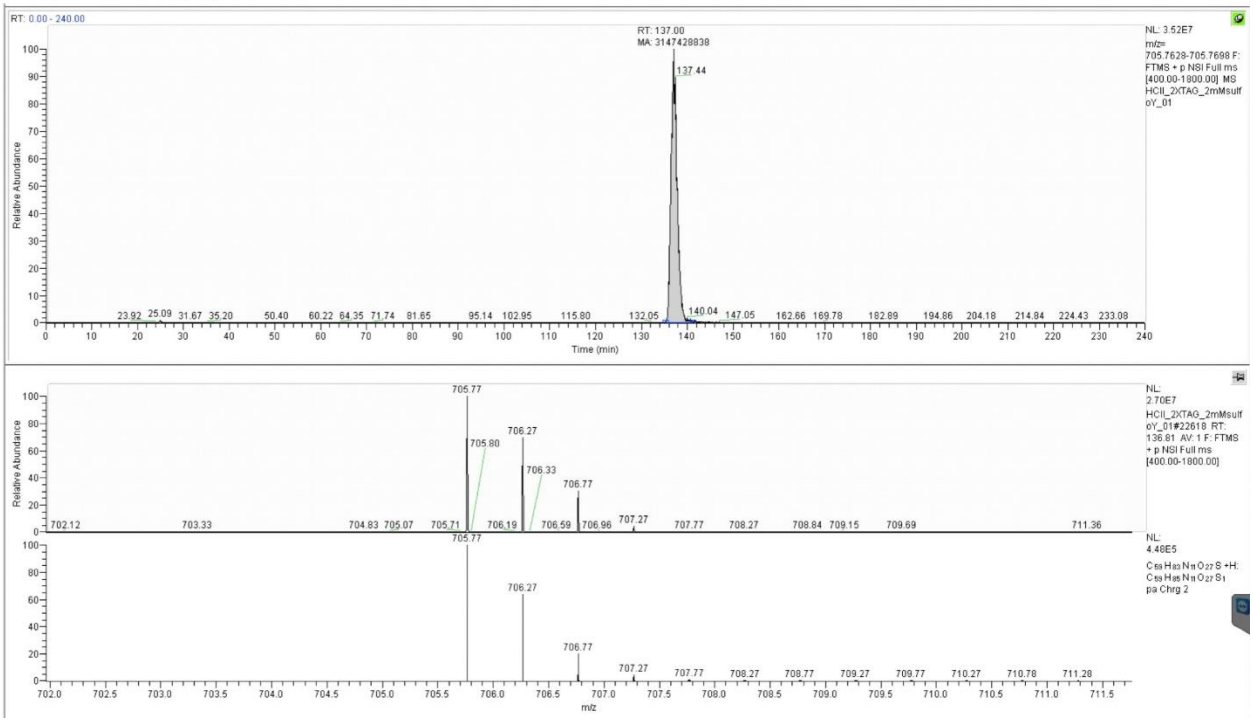
Supplementary Figure 7. SDS-PAGE analysis of secreted HCII mutants expressed in HEK293T cells and isolated from the culture media using a C-terminal polyhistidine tag. Due to well-established glycosylations, the observed molecular weight is significantly larger than what is predicted from the primary sequence (~57 kDa). SDS-PAGE analyses of various HCII preparations were performed at least three times with similar results.

Peptide harboring 60-sTyr
ENTVTNDWIPEGEEDDDY*LDLEK
Expected m/z (+2): 1410.07

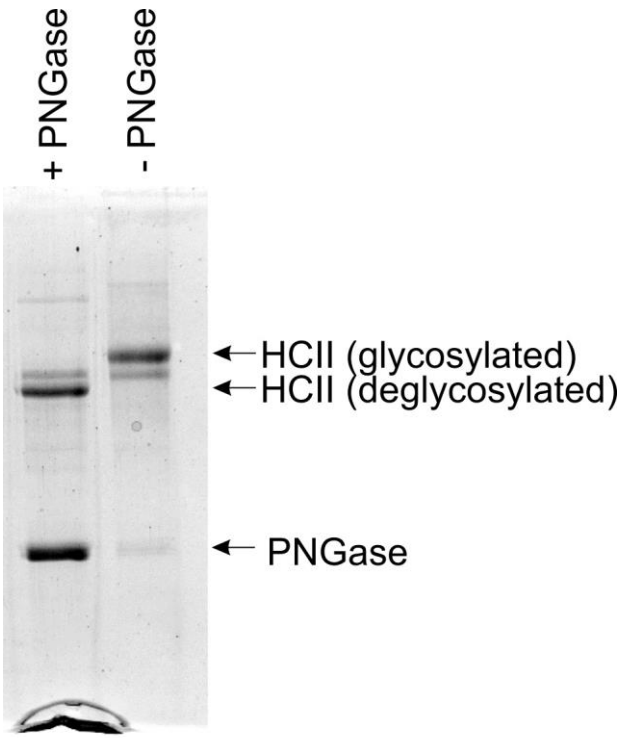


Supplementary Figure 8. Trypsin digestion followed by LC-MS analysis of HCII-60-sTyr-73-sTyr isolated from HEK293T cells identifies the presence of the peptide harboring 60-sTyr. These experiments were performed twice with similar results.

Peptide harboring 73-sTyr
FSEDDDY*IDIV
Expected m/z (+2): 705.77

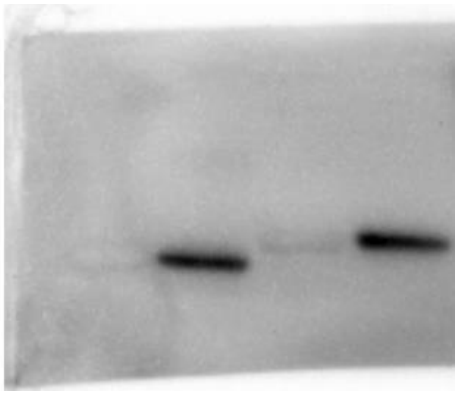


Supplementary Figure 9. Trypsin + elastase double digestion followed by LC-MS analysis of HCII-60-sTyr-73-sTyr isolated from HEK293T cells identifies the presence of the peptide harboring 73-sTyr. We were unable to find the HCII fragment harboring the 73 residue through trypsin digestion alone, likely due to its large predicted size. These experiments were performed twice with similar results.

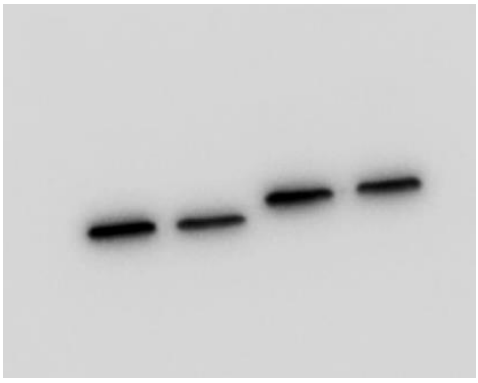


Supplementary Figure 10. PNGase F treatment of purified HCII-60-sTyr-73-sTyr substantially reduces its molecular weight by removing N-linked glycans. This experiment was performed only once.

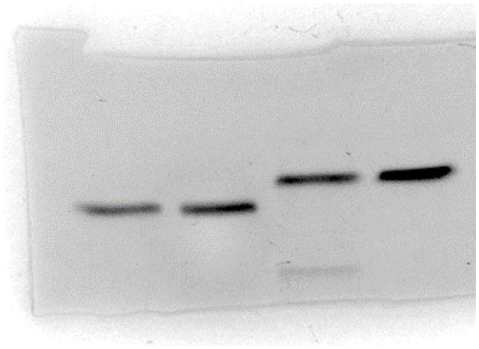
Anti-sTyr WB:



Anti-polyhistidine WB:



Coomassie:



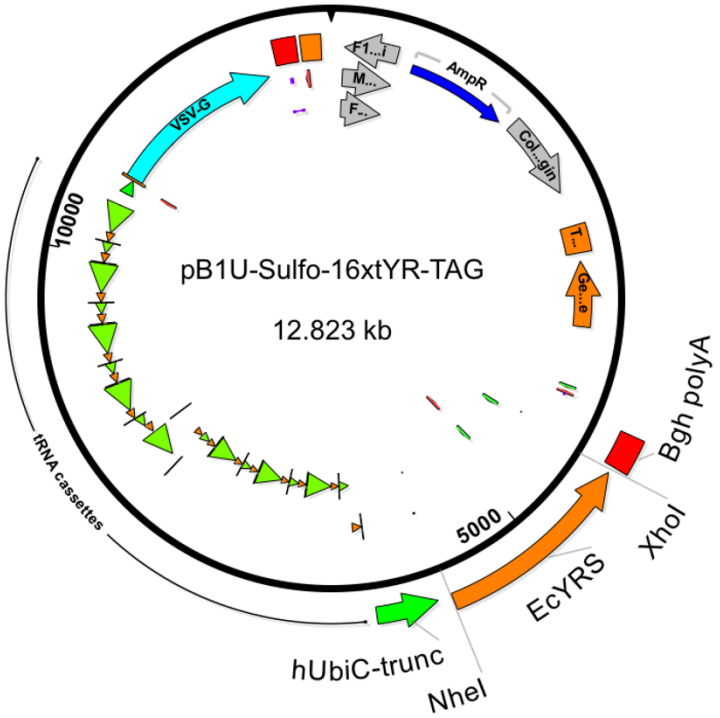
Supplementary Figure 11. Picture of full gels associated with Figure 1d.

Supplementary Table 1: List of oligonucleotides

Primer Name	Sequence
pBK seqT-F	ATTACGCTGACTTGACGGGACGG
EcYRS-L71-oR	CGCAACCGGCTTGTGGCCCGCCTGC
EcYRS-L71-NBT-F	GCAGGCGGGCCACAAGCCGGTTGCGnbtGTAGGCGGCGCGACGGGTCTGATTG
EcYRS-N126-oR	GTTCGCCGCGATAGCAGAGTTTTC
EcYRS-N126x-F	GAAAACTCTGCTATCGCGGCGAACnnnTATGACTGGTTCGGCAATATGAATGTGCTGAC
pBK MCS JIsqR	GAGATCATGTAGGCCTGATAAGCGTAGC
EcYRS-NheI-F	GCTAGCGCCACCATGGCAAGCA
EcYRS-XhoI-R	aataatCTCGAGTTATTTCCAGCAAATCAGACAGTAATTCTTTTTACC
HCII-SfiI-F	TGGCAAAGAATTGGCCAAGGAGGCCACCATGAAACACTCATTAAACGCACTTC
10xHis-TGA-SfiI-R	TGGCGGCCGGCCAGGCCTCAATGATGGTGGTGATGATGATGGTGATGATG
HCII-79-Phe-R	GTCGTCGTCTTCACTGAATATCTTCTCCAGGTCCAGaaaGTCGTCGTCCTCCTCCCCC
HCII-79-TAG-R	GTCGTCGTCTTCACTGAATATCTTCTCCAGGTCCAGctaGTCGTCGTCCTCCTCCCCC
HCII-92-Phe-F	CTGGACCTGGAGAAGATATTCAGTGAAGACGACGACtttATCGACATCGTCGACAGTCTG
HCII-92-TAG-F	CTGGACCTGGAGAAGATATTCAGTGAAGACGACGACtagATCGACATCGTCGACAGTCTG
HCII-80-iF	CTGGACCTGGAGAAGATATTCAGTGAAGACGACGAC
HCII-80-iR	GTCGTCGTCTTCACTGAATATCTTCTCCAGGTCCAG

Supplementary note: Plasmid maps and sequences

pB1U-Sulfo-16xtYR-TAG:



ttctctgtcacagaatgaaaatttttctgtcatctcttcgttattaatgtttgtaattgactgaatatcaacgcttatttgcagcctgaatggcgaatgg
gacgcgccctgtagcggcgcattaagcgcggcgggtgtggtggttacgcgcagcgtgaccgctacacttgccagcgccctagcgcccgc
tcctttcgctttcttcccttcctttctcgccacgttcgccggctttccccgtcaagctctaaatcgggggctccctttagggttccgatttagtgcttt
acggcacctcgaccccaaaaaacttgattagggtgatggttcacgtagtgggccatcgccctgatagacggtttttcgccctttgacgttgga
gtccacgttctttaatagtggactcttgttccaaactggaacaacactcaaccctatctcggtctattcttttgatttataagggattttgccgatttc
ggcctattggttaaaaaatgagctgatttaacaaaaatttaacgcgaattttaacaaaatattaacgtttacaatttcaggtggcacttttcgggga
aatgtgcgcggaacccctatttgtttatttttctaaatacattcaaatatgtatccgctcatgagacaataaccctgataaatgcttcaataatattg
aaaaaggaagagtatgagtattcaacatttccgtgtcgcccttattccctttttgcggcattttgccttcctgtttttgctcacccagaaacgctgg
tgaaagtaaaagatgctgaagatcagttgggtgcacgagtgggttacatcgaactggatctcaacagcggtaagatccttgagagttttcgcc
ccgaagaacgttttccaatgatgagcacttttaaagttctgctatgtggcgcggtattatcccgtattgacgccgggcaagagcaactcggtcg
ccgcatacactattctcagaatgacttggttgagtactcaccagtcacagaaaagcatcttacggatggcatgacagtaagagaattatgcag
tgctgccataaccatgagtgataacactgcggccaacttacttctgacaacgatcggaggaccgaaggagctaaccgcttttttgcacaacat
gggggatcatgtaactcgccttgatcgttgggaaccggagctgaatgaagccataccaaacgacgagcgtgacaccacgatgcctgtagc
aatggcaacaacgttgcgcaaactattaactggcgaactacttactctagcttcccggcaacaattaatagactggatggaggcggataaagt
tgcaggaccacttctgcgctcggcccttccggctggctggtttattgctgataaatctggagccggtgagcgtgggtctcgcggtatcattgc
agcactggggccagatggtaagccctcccgtatcgtagttatctacacgacggggagtcaggcaactatggatgaacgaaatagacagat
cgctgagataggtgcctcactgattaagcattggtaactgtcagaccaagtttactcatatatactttagattgatttaaaacttcatttttaatttaa
aaggatctaggtgaagatccttttgataatctcatgaccaaaatcccttaacgtgagttttcgttccactgagcgtcagaccccgtagaaaaga
tcaaaggatcttcttgagatcctttttttctgcgcgtaatctgctgcttgcaaacaaaaaaaccaccgctaccagcggtggtttgtttgccggatc
aagagctaccaactctttttccgaaggtaactggcttcagcagagcgcagataccaaatactgtccttctagtgtagccgtagttaggccacc
acttcaagaactctgtagcaccgcctacatacctcgctctgctaatcctgttaccagtggctgctgccagtggcgataagtcgtgtcttaccgg

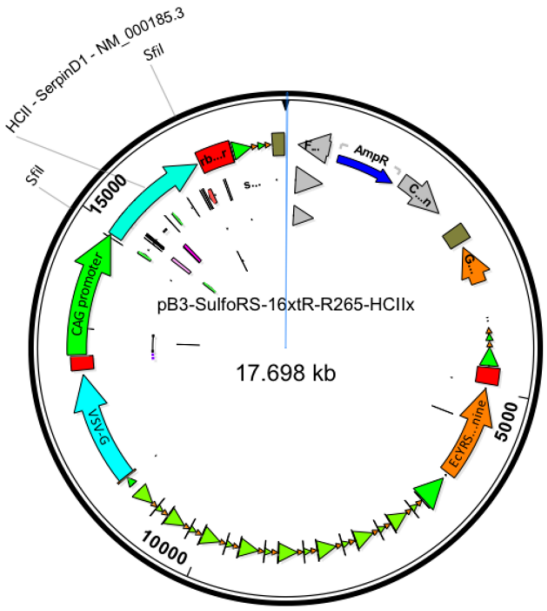
gttggactcaagacgatagttaccggataaggcgcagcggtcgggctgaacgggggttcgtgcacacagcccagcttggagcgaacg
acctacaccgaactgagatacctacagcgtgagcattgagaaagcgccacgcttcccgaagggagaaaggcggacaggtatccggtaag
cggcagggtcggaacaggagagcgcacgagggagcttccagggggaaacgcctggtatctttatagtcctgtcgggtttcgccacctctg
acttgagcgtcgatttttgtgatgctcgtcaggggggcggagcctatggaaaaacgccagcaacgcggccttttacggttcctggccttttg
ctggccttttgctcacatgttctttcctgcgttatcccctgattctgtggataaccgtattaccgcctttgagtgagctgataccgctcgccgcagc
cgaacgaccgagcgcagcgagtcagtgagcgaggaagcggaagagcgcctgatgcggtattttctccttacgcatctgtgcggtatttcac
accgcagaccagccgcgtaacctggcaaaatcggttacggttgagtaataaatggatgccctgcgtaagcgggtgtgggcggacaataaa
gtcttaaactgaacaaaatagatctaaactatgacaataaagtcttaaactagacagaatagttgtaaactgaaatcagtccagttatgctgtga
aaaagcatactggacttttgttatggctaaagcaaactcttcattttctgaagtgcaaattgcccgtcgtattaaagaggggcgtggccaaggg
catggtaaagactatattcgcggcgttgtgacaatttaccgaacaactccgcggccgggaagccgatctcggcttgaacgaattgttaggtg
gcggtacttgggtcgatatcaaagtgcatcacttcttcccgtatgcccaactttgtatagagagccactgcgggatcgtcaccgtaatctgcttg
cacgtagatcacataagcaccaagcgcgttggcctcatgcttgaggagattgatgagcgcggtggcaatgccctgcctccggtgctcgccg
gagactgcgagatcatagatatagatctcactacgcggctgctcaaacctgggcagaacgtaagccgcgagagcgccaacaaccgcttct
tggtcgaaggcagcaagcgcgatgaatgtcttactacggagcaagttcccgaggtaatcggagtccggctgatgttgggagtaggtggcta
cgtctccgaactcacgaccgaaaagatcaagagcagcccgcatggatttgacttggtcagggccgagcctacatgtgcgaatgatgcccat
acttgagccacctaactttgttttagggcgactgccctgctgcgtaacatcgttgctgctgcgtaacatcgttgctgctccataacatcaaacat
cgacccacggcgtaacgcgcttgctgcttggatgcccgaggcatagactgtacaaaaaaacagtcataacaagccatgaaaaccgccact
gcgccgttaccaccgctgcgttcggtcaaggttctggaccagttgcgtgagcgcatacgctacttgcattacagtttacgaaccgaacaggc
ttatgtcaactgggttcgtgccttcatccgtttccacggtgtgcgtcacccggcaaccttgggcagcagcgaagtcgaggcatttctgtcctgg
ctggcgaacgagcgcaaggtttcggtctccacgcatcgtcaggcattggcggccttgctgttcttctacggcaaggtgctgtgcacggatct
gccctggcttcaggagatcggtagacctcggccgtcgcggcgcttgccggtggtgctgaccccggatgaagtggttcgcatcctcggttttc
tggaaggcgagcatcgtttgttcgcccaggactctagctatagttctagtggttggctacgtacccgtagtggctatggcagggcttgcgctta
atgcgccgctacagggcgcgtggggataccccctagagccccagctggttctttccgcctcagaagccatagagcccaccgcatccccag
catgcctgctattgtcttcccaatcctccccccttgctgtcctgccccaccccaccccccagaatagaatgacacctactcagacaatgcgatgc
aatttcctcattttattaggaaaggacagtgggagtggcaccttccagggtcaaggaaggcacgggggaggggcaaacaacagatggctg
gcaactagaaggcacagtcgaggctgatcagcgggtttaaacgggccctctagactcgagttatttccagcaaatcagacagtaattcttttta
ccgcgacgcagtaaggtaaaacgaccaaacagacgatcttcttctttaaagaagtattcaggatcggactgtttttcaccgttaatggtgatgg
cattggaggcgatagttttacgtgcctgaccacgggaaggttgcagttcagaatcgaccagtgcctgcatcaggtctgcgccctttccatctc
aaccatcggtacgccgtcctgcgccagctgttcgaagtccgcttcactcagcgcactcaaagaaccgctgaacaggcattcggtaatacgtt
ttgccgcctgtaaaccttcttcaccgtgaaccagacgagtcacctgctccgccagtacatactgggcgcgcggtgctttaccgctgtttttatct
tcttcttccagggcgttgatctcttcaatgctcataaaggtgaagaacttcaggaagcggtaaacgtcggcatccgcagtgttgatccagaact
ggtagaatttgtacgggctggttttcttcggatccaaccagactgcgccgccttcagttttaccaaatttggtgccatctgctttagtgatcagcg
gaacggtcaggccaaacacctgattctgatgcagacgacgggtcaggtcgataccagaagtgatgttaccccactggtcagaaccaccaa
tttgcagcaccacaccgtactgtttgttCAAacaggccatacTataaccctgCagcaggttgtaggaaaactcagtgaacgaaatcccct
gaTcttcacggttgagacgctgcttaaccgcttctttgttgatcatctggttaacggagaagtgtttgccaatatcgcgcaggaaggtcagcac
attcatattgccgaaccagtcataattattggccgcgatagcagagttttctccacagtcgaaatcgaggaacggggcaacctgcttacggatt
ttgtccacccactcctgaacagtttcttcggtgttcagcttacgctcggcagctttgaagctcgggtcgccaatcagacccgtcgcgccgccta
ccagcgcaaccggcttgtggcccgcctgctggaagcgtttcaggcataacaatggaacaagatgccccaaatgcaagctgtcagcggtag
gatcgaagccacaCACgagtgcgatcgggccttgcgccagtcgctctgctaacgcttcctcgtccgtcacctgggctaccagcccccgc
tcttgcaattgtttaatcaagttactgcttgccatGGTGGCgctagccagcttgggtctccctatagtgagtcgtattaatttcgataagcca
gtaagcagtgggttctctagttagccagagagctCtagaccaagtgacgatcacagcgatccacaaacaagaaccgcgacccaaatccc
ggctgcgacggaactagctgtgccacacccggcgcgtccttatataatcatcggcgttcaccgccccacggagatccctccgcagaatcg
ccgagaagggactacttttcctcgcctgttccgctctctggaaagaaaaccagtgccctagagtcacccaagtcccgtcctaaaatgtccttct

gctgatactggggttctaaggccgagtcttatgagcagcgggccgctgtcctgagcgtccgggcggaaggatcaggacgctcgctgcgc
ccttcgtctgacgtggcagcgctcgccgtgaggaggggggcgcccgcgggaggcgccaaaacccggcgcggaggccttcgaacggC
CACTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAGCGG
ATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACTGAT
AGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTCCCA
GAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACCTTC
GAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCCACC
GGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCAAGT
TACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTACCC
AAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACAGTC
AAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAGGA
ATCATGGGAAATAGGCCCTCTTCCTGCCCGAcCTAGCAAAAAATGGAGGGGGACGG
ATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCACT
TCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACTGA
TAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATTAA
AAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAGTC
TGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATATAT
AAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTTTA
AAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACGTA
TTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACAG
CCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGCC
CGACCTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAGC
GGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACTG
ATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTCCC
AGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACCTT
CGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCCAC
CGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCAAG
TTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTACC
CAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACAGT
CAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAGG
AATCATGGGAAATAGGCCCTCTTCCTGCCCGAcCTAGCAAAAAATGGAGGGGGACG
GATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCAC
TTCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACTG
ATAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATTA
AAAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAGT
CTGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATATA
TAAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTTT
AAAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACGT
ATTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACA
GCCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGC
CCGACCTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAG
CGGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACT
GATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTC

CCAGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACC
TTCGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCC
ACCGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCA
AGTTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTA
CCCAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACA
GTCAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAG
GAATCATGGGAAATAGGCCCTCTTCCTGCCCGAcCTAGCAAAAAATGGAGGGGGAC
GGATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCA
CTTCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACT
GATAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATT
AAAAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAG
TCTGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATAT
ATAAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTT
TAAAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACG
TATTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACA
GCCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGC
CCGACCTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAG
CGGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACT
GATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTC
CCAGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACC
TTCGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCC
ACCGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCA
AGTTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTA
CCCAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACA
GTCAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAG
GAATCATGGGAAATAGGCCCTCTTCCTGCCCGAcCTAGCAAAAAATGGAGGGGGAC
GGATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCA
CTTCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACT
GATAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATT
AAAAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAG
TCTGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATAT
ATAAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTT
TAAAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACG
TATTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACA
GCCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGC
CCGACctagtcaataatcaatgtcaacgcgtatatctggcccgtacatcgcgaagcagcgcaaaacGGATCCtgcaggtatttGC
GGCCGCggtccgtatactccggaatattaatagatcatggagataattaaaatgataaccatctcgcaaataaataagtattttactgttttc
gtaacagttttgtaataaaaaaacctataaatattccggattattcataccgtcccaccatcgggcgcgAACTCCTAAAAAACC
GCCACCatgaagtgccttttgtacttagccttttattcattggggtgaattgcaagttcaccatagtttttccacacaaccaaaaaggaaac
tggaaaaatgttccttctaattaccattattgcccgtcaagctcagatttaaattggcataatgacttaataggcacagccttacaagtcaaaatg
cccaagagtcacaaggctattcaagcagacggttggatgtgtcatgcttccaaatgggtcactacttgtgatttccgctggtatggaccgaagt
atataacacattccatccgatccttcactccatctgtagaacaatgcaaggaaagcattgaacaaacgaaacaaggaacttggctgaatccag
gcttccctcctcaaagttgtggatatgcaactgtgacggatgccgaagcagtgattgtccaggtgactcctcaccatgtgctggttgatgaata

cacaggagaatgggttgattcacagttcatcaacggaaaatgcagcaattacatatgccccactgtccataactctacaacctggcattctga
ctataaggtcaaagggctatgtgattctaacctcatttccatggacatcaccttcttctcagaggacggagagctatcatccctgggaaaggag
ggcacagggttcagaagtaactactttgcttatgaaactggaggcaaggcctgcaaaatgcaatactgcaagcattggggagtcagactcc
catcaggtgtctggttcgagatggctgataaggatctctttgctgcagccagattccctgaatgcccagaagggtcaagtatctctgctccatc
tcagacctcagtggatgtaagtctaattcaggacgttgagaggatcttggattattccctctgccaagaaacctggagcaaaatcagagcgg
gtcttccaatctctccagtggatctcagctatcttgctcctaaaaacccaggaaccggtcctgctttcaccataatcaatggtaccctaaaatact
ttgagaccagatacatcagagtcgatattgctgctccaatcctctcaagaatggtcggaatgatcagtggaactaccacagaaagggaactg
tgggatgactgggcaccatatgaagacgtggaaattggacccaatggagttctgaggaccagttcaggatataagtttcctttatacatgattg
gacatggtatgttggactccgatcttcatcttagctcaaaggctcaggtgttcgaacatcctcacattcaagacgctgcttcgcaacttcctgat
gatgagagtttatttttggtgatactgggctatccaaaaatccaatcgagcttgtagaaggttggttcagtagttggaaaagctctattgcctctt
ttttctttatcatagggttaatcattggactattcttggttctccgagttggtatccatctttgcattaaattaaagcacaccaagaaaagacagattt
atacagacatagagatgaaccgacttggaaagtgataaggccaggccggccaagcttgtcgagaagtactagaggatcataatcagccat
accacatttgtagaggttttacttgctttaaaaaacctcccacacctccccctgaacctgaaacataaaatgaatgcaattgttgttgttaacttgtt
tattgcagcttataatggttacaaataaagcaatagcatcacaaatttcacaaataaagcatttttttcactgcattctagttgtggtttgtccaaact
catcaatgtatcttatcatgtctggatctgatcactgcttgagcctaggagatccgaaccagataagtgaaatctagttccaaactattttgtcattt
ttaattttcgtattagcttacgacgctacacccagttcccatctattttgtcactcttccctaaataatccttaaaaactccatttccacccctcccagt
tcccaactattttgtccgcccacagcggggcatttttcttcctgttatgtttttaatcaaacatcctgccaactccatgtgacaaaccgtcatcttcg
gctacttt

pB3-SulfoRS-16xYtR-TAG-HCII: pAcBac3 OMeYRS was used as a starting vector to construct this plasmid.[1] pB3 (abbreviated pAcBac3) is identical to pB1u except it contains a CAG promoter upstream from an SfiI site as well as 4 additional tRNA cassette copies. OMeYRS was replaced with SulfoRS via NheI/XhoI as previously described in pB1U cloning description. The SfiI site was used to insert HCII. HCII-SfiI-F and 10xHis-TGA-SfiI-R were used to amplify HCII from pCMV-SerpinD1 (Origene, SC120039). Mutations were introduced via overlap extension (see primer list for 79, 92, and 80 overlap primers – 79 and 92 correspond to 60 and 73 sites, respectively).



cctgttatgtttttaatcaaacatcctgccaactccatgtgacaaaccgtcatcttcggctacttttttctctgtcacagaatgaaaatttttctgtcatc
tcttcgttattaatgtttgtaattgactgaatatcaacgcttatttgcagcctgaatggcgaatgggacgcgccctgtagcggcgcattaagcgc
ggcgggtgtggtggttacgcgcagcgtgaccgctacacttgccagcgccctagcgcccgctcctttcgctttcttcccttcctttctcgccacg
ttcgccggctttccccgtcaagctctaaatcgggggctccctttagggttccgatttagtgctttacggcacctcgaccccaaaaaacttgatta
gggtgatggttcacgtagtgggccatcgccctgatagacggtttttcgccctttgacgttggagtccacgttctttaatagtggactcttgttcca
aactggaacaacactcaaccctatctcggtctattcttttgatttataagggattttgccgatttcggcctattggttaaaaaatgagctgatttaac
aaaaatttaacgcgaattttaacaaaatattaacgtttacaatttcaggtggcacttttcggggaaatgtgcgcggaacccctatttgtttatttttct
aaatacattcaaatatgtatccgctcatgagacaataaccctgataaatgcttcaataatattgaaaaaggaagagtatgagtattcaacatttcc
gtgtcgcccttattcccttttttgcggcattttgccttcctgtttttgctcacccagaaacgctggtgaaagtaaaagatgctgaagatcagttggg
tgcacgagtgggttacatcgaactggatctcaacagcggtaagatccttgagagttttcgccccgaagaacgttttccaatgatgagcactttt
aaagttctgctatgtggcgcggtattatcccgtattgacgccgggcaagagcaactcggtcgccgcatacactattctcagaatgacttggttg
agtactcaccagtcacagaaaagcatcttacggatggcatgacagtaagagaattatgcagtgctgccataaccatgagtgataacactgcg
gccaacttacttctgacaacgatcggaggaccgaaggagctaaccgcttttttgcacaacatgggggatcatgtaactcgccttgatcgttgg
gaaccggagctgaatgaagccataccaaacgacgagcgtgacaccacgatgcctgtagcaatggcaacaacgttgcgcaaactattaact
ggcgaactacttactctagcttcccggcaacaattaatagactggatggaggcggataaagttgcaggaccacttctgcgctcggcccttcc
ggctggctggtttattgctgataaatctggagccggtgagcgtgggtctcgcggtatcattgcagcactggggccagatggtaagccctccc
gtatcgtagttatctacacgacggggagtcaggcaactatggatgaacgaaatagacagatcgctgagataggtgcctcactgattaagcat
tggtaactgtcagaccaagtttactcatatatactttagattgatttaaaacttcatttttaatttaaaaggatctaggtgaagatccttttgataatct

catgaccaaaatcccttaacgtgagttttcgttccactgagcgtcagaccccgtagaaaagatcaaaggatcttcttgagatccttttttttctgcg
cgtaatctgctgcttgcaaacaaaaaaaccaccgctaccagcggtggtttgtttgccggatcaagagctaccaactctttttccgaaggtaact
ggcttcagcagagcgcagataccaaatactgtccttctagtgtagccgtagttaggccaccacttcaagaactctgtagcaccgcctacatac
ctcgctctgctaatcctgttaccagtggctgctgccagtggcgataagtcgtgtcttaccgggttggactcaagacgatagttaccggataag
gcgcagcggtcgggctgaacgggggggttcgtgcacacagcccagcttggagcgaacgacctacaccgaactgagatacctacagcgtg
agcattgagaaagcgccacgcttcccgaagggagaaaggcggacaggtatccggtaagcggcagggtcggaacaggagagcgcacg
agggagcttccagggggaaacgcctggtatctttatagtcctgtcgggtttcgccacctctgacttgagcgtcgatttttgtgatgctcgtcagg
ggggcggagcctatggaaaaacgccagcaacgcggccttttacggttcctggccttttgctggccttttgctcacatgttctttcctgcgttat
cccctgattctgtggataaccgtattaccgcctttgagtgagctgataccgctcgccgcagccgaacgaccgagcgcagcgagtcagtgag
cgaggaagcggaagagcgcctgatgcggtattttctccttacgcatctgtgcggtatttcacaccgcagaccagccgcgtaacctggcaaa
atcggttacggttgagtaataaatggatgcccctgcgtaagcgggtgtgggcggacaataaagtcttaaactgaacaaaatagatctaaactat
gacaataaagtcttaaactagacagaatagttgtaaactgaaatcagtccagttatgctgtgaaaaagcatactggacttttgttatggctaaag
caaactcttcattttctgaagtgcaaattgcccgtcgtattaaagaggggcgtggccaagggcatggtaaagactatattcgcggcgttgtga
caatttaccgaacaactccgcggccgggaagccgatctcggcttgaacgaattgttaggtggcggtacttgggtcgatatcaaagtgcatca
cttcttcccgtatgcccaactttgtatagagagccactgcgggatcgtcaccgtaatctgcttgcacgtagatcacataagcaccaagcgcgtt
ggcctcatgcttgaggagattgatgagcgcggtggcaatgccctgcctccggtgctcgccggagactgcgagatcatagatatagatctca
ctacgcggctgctcaaacctgggcagaacgtaagccgcgagagcgccaacaaccgcttcttggtcgaaggcagcaagcgcgatgaatgt
cttactacggagcaagttcccgaggtaatcggagtccggctgatgttgggagtaggtggctacgtctccgaactcacgaccgaaaagatca
agagcagcccgcatggatttgacttggtcagggccgagcctacatgtgcgaatgatgcccatacttgagccacctaactttgttttagggcga
ctgccctgctgcgtaacatcgttgctgctgcgtaacatcgttgctgctccataacatcaaacatcgacccacggcgtaacgcgcttgctgcttg
gatgcccgaggcatagactgtacaaaaaaacagtcataacaagccatgaaaaccgccactgcgccgttaccaccgctgcgttcggtcaag
gttctggaccagttgcgtgagcgcatacgctacttgcattacagtttacgaaccgaacaggcttatgtcaactgggttcgtgccttcatccgttt
ccacggtgtgcgtcacccggcaaccttgggcagcagcgaagtcgaggcatttctgtcctggctggcgaacgagcgcaaggtttcggtctc
cacgcatcgtcaggcattggcggccttgctgttcttctacggcaaggtgctgtgcacggatctgccctggcttcaggagatcggtagacctc
ggccgtcgcggcgcttgccggtggtgctgaccccggatgaagtggttcgcatcctcggttttctggaaggcgagcatcgtttgttcgcccag
gactctagctatagttctagtggttggctacgtacccgtagtggctatggcagggcttgcgcttaatgcgccgctacagggcgcgtggggat
acccccctagagccccagctgAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGG
AGCGGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATC
ACTGATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGAT
TTCCCAGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGA
ACCTTCGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAAC
CCCACCGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTT
TCAAGTTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAA
CTACCCAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTT
ACAGTCAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATG
AAGGAATCATGGGAAATAGGCCCTCTTCCTGCCCGAGATCTGgttctttccgcctcagaagccatag
agcccaccgcatccccagcatgcctgctattgtcttcccaatcctccccccttgctgtcctgccccaccccacccccccagaatagaatgacacc
tactcagacaatgcgatgcaatttcctcattttattaggaaaggacagtgggagtggcaccttccagggtcaaggaaggcacgggggaggg
gcaaacaacagatggctggcaactagaaggcacagtcgaggctgatcagcgggtttaaacgggccctctagactcgagttaaagtcgact
taacgcgttgaattcttaaacgggccctttccagcaaatcagacagtaattcttttttaccgcgacgcagtaaggtaaaacgaccaaacagacg
atcttcttctttaaagaagtattcaggatcggactgtttttcaccgttaatggtgatggcattggaggcgatagttttacgtgcctgaccacggga
aggttgcagttcagaatcgaccagtgcctgcatcaggtctgcgcccttttccatctcaaccatcggtacgccgtcctgcgccagctgttcgaa
gtccgcttcactcagcgcactcaaagaaccgctgaacaggcattcggtaatacgttttgccgcctgtaaaccttcttcaccgtgaaccagacg

agtcacctgctccgccagtacatactgggcgcgcggtgctttaccgctgtttttatcttcttcttccagggcgttgatctcttcaatgctcataaag
gtgaagaacttcaggaagcggtaaacgtcggcatccgcagtgttgatccagaactggtagaatttgtacgggctggttttcttcgggtccaac
cagactgcgccgccttcagttttaccaaatttggtgccatctgctttagtgatcagcggaacggtcaggccaaacacctgattctgatgcagac
gacgggtcaggtcgataccagaagtgatgttaccccattggtcagaaccaccaatttgcagcaccacaccgtactgtttgttagcacaggcc
ataccataaccctggagcaggttgtaggaaaactcagtgaacgaaatcccctgaccttcacggttgagacgctgcttaaccgcttctttgttga
tcatctggttaacggagaagtgtttgccaatatcgcgcaggaaggtcagcacattcatattgccgaaccagtcataattattggccgcgatag
cagagttttctccacagtcgaaatcgaggaacggggcaacctgcttacggattttgtccacccactcctgaacagtttcttcggtgttcagctta
cgctcggcagctttgaagctcgggtcgccaatcagacccgtcgcgccgcctaccagcgcaaccggcttgtggcccgcctgctggaagcg
tttcaggcataacaatggaacaagatgccccaaatgcaagctgtcagcggtaggatcgaagccacaaatgagtgcgatcgggccttgcgc
cagtcgctctgctaacgcttcctcgtccgtcacctgggctaccagcccccgctcttgcaattgtttaatcaagttactgcttgccatGGTGG
CgctagccagcttgggtctccctatagtgagtcgtattaatttcgataagccagtaagcagtgggttctctagttagccagagagctCtagac
caagtgacgatcacagcgatccacaaacaagaaccgcgacccaaatcccggctgcgacggaactagctgtgccacacccggcgcgtcc
ttatataatcatcggcgttcaccgccccacggagatccctccgcagaatcgccgagaagggactactttcctcgcctgttccgctctctgga
aagaaaaccagtgccctagagtcacccaagtcccgtcctaaaatgtccttctgctgatactggggttctaaggccgagtcttatgagcagcg
ggccgctgtcctgagcgtccgggcggaaggatcaggacgctcgctgcgcccttcgtctgacgtggcagcgctcgccgtgaggaggggg
gcgcccgcgggaggcgccaaaacccggcgcggaggccttcgaacggCCACTAGCAAAAAATGGAGGGGGAC
GGATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCA
CTTCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACT
GATAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATT
AAAAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAG
TCTGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATAT
ATAAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTT
TAAAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACG
TATTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACA
GCCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGC
CCGAcCTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAGC
GGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACTG
ATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTCCC
AGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACCTT
CGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCCAC
CGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCAAG
TTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTACC
CAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACAGT
CAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAGG
AATCATGGGAAATAGGCCCTCTTCCTGCCCGACCTAGCAAAAAATGGAGGGGGACG
GATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCAC
TTCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACTG
ATAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATTA
AAAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAGT
CTGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATATA
TAAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTTT
AAAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACGT
ATTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACA

GCCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGC
CCGAcCTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAGC
GGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACTG
ATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTCCC
AGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACCTT
CGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCCAC
CGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCAAG
TTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTACC
CAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACAGT
CAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAGG
AATCATGGGAAATAGGCCCTCTTCCTGCCCGACCTAGCAAAAAATGGAGGGGGACG
GATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCAC
TTCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACTG
ATAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATTA
AAAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAGT
CTGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATATA
TAAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTTT
AAAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACGT
ATTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACA
GCCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGC
CCGAcCTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAGC
GGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACTG
ATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTCCC
AGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACCTT
CGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCCAC
CGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCAAG
TTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTACC
CAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACAGT
CAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAGG
AATCATGGGAAATAGGCCCTCTTCCTGCCCGACCTAGCAAAAAATGGAGGGGGACG
GATTCGAACCGCCGAACCCAAAGGGAGCGGATTTAGAGTCCGCCGCGTTTAGCCAC
TTCGCTACCCCTCCGGTGTCTCTATCACTGATAGGGAACTTATAAGTCTCTATCACTG
ATAGGGATTTCACGTTTATGGTGATTTCCCAGAACACATAGCGACATGCAAATATTA
AAAAATGGTGGGGGAAGGATTCGAACCTTCGAAGTCTGTGACGGCAGATTTAGAGT
CTGCTCCCTTTGGCCGCTCGGGAACCCCACCGGTGTTTCGTCCTTTCCACAAGATATA
TAAAGCCAAGAAATCGAAATACTTTCAAGTTACGGTAAGCATATGATAGTCCATTTT
AAAACATAATTTTAAAACTGCAAACTACCCAAGAAATTATTACTTTCTACGTCACGT
ATTTTGTACTAATATCTTTGTGTTTACAGTCAAATTAATTCTAATTATCTCTCTAACA
GCCTTGTATCGTATATGCAAATATGAAGGAATCATGGGAAATAGGCCCTCTTCCTGC
CCGAcCTAGCAAAAAATGGAGGGGGACGGATTCGAACCGCCGAACCCAAAGGGAGC
GGATTTAGAGTCCGCCGCGTTTAGCCACTTCGCTACCCCTCCGGTGTCTCTATCACTG
ATAGGGAACTTATAAGTCTCTATCACTGATAGGGATTTCACGTTTATGGTGATTTCCC
AGAACACATAGCGACATGCAAATATTAAAAAATGGTGGGGGAAGGATTCGAACCTT

CGAAGTCTGTGACGGCAGATTTAGAGTCTGCTCCCTTTGGCCGCTCGGGAACCCCAC
CGGTGTTTCGTCCTTTCCACAAGATATATAAAGCCAAGAAATCGAAATACTTTCAAG
TTACGGTAAGCATATGATAGTCCATTTTAAAACATAATTTTAAAACTGCAAACTACC
CAAGAAATTATTACTTTCTACGTCACGTATTTTGTACTAATATCTTTGTGTTTACAGT
CAAATTAATTCTAATTATCTCTCTAACAGCCTTGTATCGTATATGCAAATATGAAGG
AATCATGGGAAATAGGCCCTCTTCCTGCCCGACctagtcaataatcaatgtcaacgcgtatatctggcccgta
catcgcgaagcagcgcaaaacGGATCCtgcaggtatttGCGGCCGCggtccgtatactccggaatattaatagatcatggagat
aattaaaatgataaccatctcgcaaataaataagtattttactgttttcgtaacagttttgtaataaaaaaacctataaatattccggattattcatac
cgtcccaccatcgggcgcgAACTCCTAAAAAACCGCCACCatgaagtgccttttgtacttagccttttattcattggggtg
aattgcaagttcaccatagtttttccacacaaccaaaaaggaaactggaaaaatgttccttctaattaccattattgcccgtcaagctcagattta
aattggcataatgacttaataggcacagccttacaagtcaaaatgcccaagagtcacaaggctattcaagcagacggttggatgtgtcatgct
tccaaatgggtcactacttgtgatttccgctggtatggaccgaagtatataacacattccatccgatccttcactccatctgtagaacaatgcaa
ggaaagcattgaacaaacgaaacaaggaacttggctgaatccaggcttccctcctcaaagttgtggatatgcaactgtgacggatgccgaa
gcagtgattgtccaggtgactcctcaccatgtgctggttgatgaatacacaggagaatgggttgattcacagttcatcaacggaaaatgcagc
aattacatatgccccactgtccataactctacaacctggcattctgactataaggtcaaagggctatgtgattctaacctcatttccatggacatc
accttcttctcagaggacggagagctatcatccctgggaaaggagggcacagggttcagaagtaactactttgcttatgaaactggaggcaa
ggcctgcaaaatgcaatactgcaagcattggggagtcagactcccatcaggtgtctggttcgagatggctgataaggatctctttgctgcagc
cagattccctgaatgcccagaagggtcaagtatctctgctccatctcagacctcagtggatgtaagtctaattcaggacgttgagaggatcttg
gattattccctctgccaagaaacctggagcaaaatcagagcgggtcttccaatctctccagtggatctcagctatcttgctcctaaaaacccag
gaaccggtcctgctttcaccataatcaatggtaccctaaaatactttgagaccagatacatcagagtcgatattgctgctccaatcctctcaaga
atggtcggaatgatcagtggaactaccacagaaagggaactgtgggatgactgggcaccatatgaagacgtggaaattggacccaatgga
gttctgaggaccagttcaggatataagtttcctttatacatgattggacatggtatgttggactccgatcttcatcttagctcaaaggctcaggtgt
tcgaacatcctcacattcaagacgctgcttcgcaacttcctgatgatgagagtttatttttggtgatactgggctatccaaaaatccaatcgagc
ttgtagaaggttggttcagtagttggaaaagctctattgcctctttttctttatcatagggttaatcattggactattcttggttctccgagttggtatc
catctttgcattaaattaaagcacaccaagaaaagacagatttatacagacatagagatgaaccgacttggaaagtgataagtcgagaagtac
tagaggatcataatcagccataccacatttgtagaggttttacttgctttaaaaaacctcccacacctccccctgaacctgaaacataaaatgaa
tgcaattgttgttgttaacttgtttattgcagcttataatggttacaaataaagcaatagcatcacaaatttcacaaataaagcatttttttcactgcat
tctagttgtggtttgtccaaactcatcaatgtatcttatcatgtctggatctgatcactgcttgagcCTAGTTATTAATAGTAAT
CAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTTA
CGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATA
ATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATTGACGTCAATGGGTG
GAgTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGT
ACGCCCCCTATTGACGTCAATGACGGTAAATGGCCCGCCTGGCATTATGCCCAGTAC
ATGACCTTATGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTA
CCATGGTCGAGGTGAGCCCCACGTTCTGCTTCACTCTCCCCATCTCCCCCCCCTCCCC
ACCCCCAATTTTGTATTTATTTATTTTTTAATTATTTTGTGCAGCGATGGGGGCGGGG
GGGGGGGGGGCGCGCGCCAGGCGGGGCGGGGCGGGGCGAGGGGCGGGGCGGGGC
GAGGCGGAGAGGTGCGGCGGCAGCCAATCAGAGCGGCGCGCTCCGAAAGTTTCCTT
TTATGGCGAGGCGGCGGCGGCGGCGGCCCTATAAAAAGCGAAGCGCGCGGCGGGC
GGGAGTCGCTGCGTTGCCTTCGCCCCGTGCCCCGCTCCGCGCCGCCTCGCGCCGCCC
GCCCCGGCTCTGACTGACCGCGTTACTCCCACAGGTGAGCGGGCGGGACGGCCCTTC
TCCTCCGGGCTGTAATTAGCGCTTGGTTTAATGACGGCTCGTTTCTTTTCTGTGGCTG
CGTGAAAGCCTTAAAGGGCTCCGGGAGGGCCCTTTGTGCGGGGGGGAGCGGCTCGG

GGGGTGCGTGCGTGTGTGTGTGCGTGGGGAGCGCCGCGTGCGGCCCGCGCTGCCCG
GCGGCTGTGAGCGCTGCGGGCGCGGCGCGGGGCTTTGTGCGCTCCGCGTGTGCGCG
AGGGGAGCGCGGCCGGGGGCGGTGCCCCGCGGTGCGGGGGGGCTGCGAGGGGAAC
AAAGGCTGCGTGCGGGGTGTGTGCGTGGGGGGGTGAGCAGGGGGTGTGGGCGCGGC
GGTCGGGCTGTAACCCCCCCCTGCACCCCCCTCCCCGAGTTGCTGAGCACGGCCCGG
CTTCGGGTGCGGGGCTCCGTGCGGGGCGTGGCGCGGGGCTCGCCGTGCCGGGCGGG
GGGTGGCGGCAGGTGGGGGTGCCGGGCGGGGCGGGGCCGCCTCGGGCCGGGGAGG
GCTCGGGGGAGGGGCGCGGCGGCCCCGGAGCGCCGGCGGCTGTCGAGGCGCGGCG
AGCCGCAGCCATTGCCTTTTATGGTAATCGTGCGAGAGGGCGCAGGGACTTCCTTTG
TCCCAAATCTGGCGGAGCCGAAATCTGGGAGGCGCCGCCGCACCCCCTCTAGCGGG
CGCGGGCGAAGCGGTGCGGCGCCGGCAGGAAGGAAATGGGCGGGGAGGGCCTTCG
TGCGTCGCCGCGCCGCCGTCCCCTTCTCCATCTCCAGCCTCGGGGCTGCCGCAGGGG
GACGGCTGCCTTCGGGGGGGACGGGGCAGGGCGGGGTTCGGCTTCTGGCGTGTGAC
CGGCGGCTCTAGAGCCTCTGCTAACCATGTTCATGCCTTCTTCTTTTTCCTACAGCTC
CTGGGCAACGTGCTGGTTaTTGTGCTGTCTCATCATTTTGGCAAAGAATTGGCCAAGG
AGGCCACCatgaaacactcattaaacgcacttctcattttcctcatcataacatctgcgtggggtgggagcaaaggcccgctggatca
gctagagaaaggaggggaaactgctcagtctgcagatccccagtgggagcagttaaataacaaaaacctgagcatgcctcttctccctgcc
gacttccacaaggaaaacaccgtcaccaacgactggattccagagggggaggaggacgacgactatctggacctggagaagatattcag
tgaagacgacgactacatcgacatcgtcgacagtctgtcagtttccccgacagactctgatgtgagtgctgggaacatcctccagcttttcat
ggcaagagccggatccagcgtcttaacatcctcaacgccaagttcgctttcaacctctaccgagtgctgaaagaccaggtcaacactttcga
taacatcttcatagcacccgttggcatttctactgcgatgggtatgatttccttaggtctgaagggagagacccatgaacaagtgcactcgattt
tgcattttaaagactttgttaatgccagcagcaagtatgaaatcacgaccattcataatctcttccgtaagctgactcatcgcctcttcaggagga
attttgggtacacactgcggtcagtcaatgacctttatatccagaagcagtttccaatcctgcttgacttcaaaactaaagtaagagagtattact
ttgctgaggcccagatagctgacttctcagaccctgccttcatatcaaaaaccaacaaccacatcatgaagctcaccaagggcctcataaaa
gatgctctggagaatatagaccctgctacccagatgatgattctcaactgcatctacttcaaaggatcctgggtgaataaattcccagtggaaa
tgacacacaaccacaacttccggctgaatgagagagaggtagttaaggtttccatgatgcagaccaaggggaacttcctcgcagcaaatga
ccaggagctggactgcgacatcctccagctggaatacgtgggggggcatcagcatgctaattgtggtcccacacaagatgtctgggatgaa
gaccctcgaagcgcaactgacaccccgggtggtggagagatggcaaaaaagcatgacaaacagaactcgagaagtgcttctgccgaaat
tcaagctggagaagaactacaatctagtggagtccctgaagttgatggggatcaggatgctgtttgacaaaaatggcaacatggcaggcat
ctcagaccaaaggatcgccatcgacctgttcaagcaccaaggcacgatcacagtgaacgaggaaggcacccaagccaccactgtgacca
cggtggggttcatgccgctgtccacccaagtccgcttcactgtcgaccgccccttttcttttcctcatctacgagcaCcgcaccagctgcctgc
tcttcatgggaagagtggccaaccccagcaggtccCATCATCACCATCATCATCACCACCATCATtGAggcc
tggccggccgccagcacagtggtcgatcgaCCAATGCCCTGGCTCACAAATACCACTGAGATCTTTTT
CCCTCTGCCAAAAATTATGGGGACATCATGAAGCCCCTTGAGCATCTGACTTCTGGC
TAATAAAGGAAATTTATTTTCATTGCAATAGTGTGTTGGAATTTTTTGTGTCTCTCAC
TCGGAAGGACATATGGGAGGGCAAATCATTTAAAACATCAGAATGAGTATTTGGTT
TAGAGTTTGGCAACATATGCCcATATGCTGGCTGCCATGAACAAAGGTtGGCTATAA
AGAGGTCATCAGTATATGAAACAGCCCCCTGCTGTCCATTCCTTATTCCATAGAAAA
GCCTTGACTTGAGGTTAGATTTTTTTTATATTTTGTTTTGTGTTATTTTTTTCTTTAAC
ATCCCTAAAATTTTCCTTACATGTTTTACTAGCCAGATTTTTCCTCCTCTCCTGACTAC
TCCCAGTCATAGCTGTCCCTCTTCTCTTATGgAGATCCCTCGACCTGCcctaggTCGGGC
AGGAAGAGGGCCTATTTCCCATGATTCCTTCATATTTGCATATACGATACAAGGCTG
TTAGAGAGATAATTAGAATTAATTTGACTGTAAACACAAAGATATTAGTACAAAAT

ACGTGACGTAGAAAGTAATAATTTCTTGGGTAGTTTGCAGTTTTAAAATTATGTTTTA
AAATGGACTATCATATGCTTACCGTAACTTGAAAGTATTTCGATTTCTTGGCTTTATA
TATCTTGTGGAAAGGACGAAACACCGGTGGGGTTCCCGAGCGGCCAAAGGGAGCAG
ACTCTAAATCTGCCGTCACAGACTTCGAAGGTTCGAATCCTTCCCCCACCATTTTTTA
ATATTTGCATGTCGCTATGTGTTCTGGGAAATCACCATAAACGTGAAATCCCTATCA
GTGATAGAGACTTATAAGTTCCCTATCAGTGATAGAGACACCGGAGGGGTAGCGAA
GTGGCTAAACGCGGCGGACTCTAAATCCGCTCCCTTTGGGTTCGGCGGTTCGAATCC
GTCCCCcTCCATTTTTTgctaggagatccgaaccagataagtgaaatctagttccaaactattttgtcatttttaattttcgtattag
cttacgacgctacacccagttcccatctattttgtcactcttccctaaataatccttaaaaactccatttccacccctcccagttcccaactattttgt
ccgcccacagcggggcatttttct