

## Sequences Used in Minigenome:

### Full-length Sequences

#### Normal

atgtctgttacagtcaagagaatcattgacaacacagtcatagttccaaaacttctgcaaatgaggatccagtggaataccggcagattact  
tcagaaaatcaaaggagattcctctttacatcaataactacaaaaagttgtcagatctaagaggatgtctaccaaggcctcaaatccgaaa  
tgtatcaatcatacatgtcaacagctacttgtatggagcattaaaggacatccggggtaagttggataaagattggcaagtttcggaataaac  
atcgggaaagcaggggatacaatcggaatatttgacctgtatccttgaagccctggacggcgtacttccagatggagatcggatgcttc  
agaaccagcgcagatgacaaatggttgcctttgatctacttggcttatacagatgggcagAACACAAATGCTGAATACAGAAAAAGCT  
catggatgggctgacaaatcaatgcaaatgatcaatgaacagttgaacctctgtgccagaaggtcgtgacattttgatgtgtgggaaat  
gacagtaattacacaaaaattgtcgtcagtgacatgttctccacatgttcaaaaaacatgaatgtgctcgttcagatacggaaactattgtt  
tcagattcaagattgtgctgacattggcaacatttgacacctctgcaaaataaccggaatgtctacagaagatgaacgacctggatcttga  
accgagaagttgcagatgaaatggtcAAATGATGCTCCAGGCCAAGAAATGACAAGCCGATCATACTGCTTATTGATCGACTTGG  
attgtcttaagtctccatattctccgtcaaaaacctgccttccactctgggggcaattgacagctcttctgctcagatccaccagagcaag  
gaatgcccagacgctgatgacattgagtatacatcttactacagcaggtttgtgtacgcttatgagtaggatcctctgccacttggcAC  
aacagtttgtgttgagataacaaatacactccagatgatagtagccggaggattgacgactaatgcaccgccacaaggcagagatgtggtc  
gaatggctcggatggttgaagatcaaaacagaaaaccgactcctgatatgatgcagatgcgaaaagagcagtcattgctactgcaaggcc  
taagagagaagacaattggcaagatgctaagtcaagaattgacaaatga

#### High Codon

atgtgatgatgagtcaaaagaatcattgataatacagtcatagttccaaaacttctgcaaatgaagatccagtgaataccggcagattactt  
cagaaaatcaaagaaattcctctttacatcaataactacaaaaagttgtcagatctaagaggatgtctaccaaggcctcaaatccgaaat  
gtatcaatcatacatgtcaattcttacttgtatggagcattaaagatacagaggtaaattggataaagattggcaagtttcggaataaatatcg  
ggaaagcaggggatacaatcggaatatttgatcttctgtatccttgaagcattggatggcgtacttccagatggagatcggatgcttccagaa  
catctgcagatgataaatggttgcctttgatctacttggcttatacagatcggcagAACACAAATGCTGAATACAGAAAAAGCTGAATAC  
tgggttgacaaatcaatgtaaatgatcaatgaacaattgaacctctgtcccagaaggtcgtgatattttgatgtctggggaatgatagtaa  
ttacacaaaaattgtcgtcagtcgatatgttctccacatgttcaaaaaacatgaatgtgcatcgttcagatacggaaactattgttccagattc  
aaagattgtgctgacattggcaacatttgacacctctgtaaaataacaggaatgtctacagaagatgaacgacatggatcttgaatcgagaa  
gttgcagatgaaatggtccaaatgatgcttccaggccaagaattgataaagcagattctacatgccttatttgatcgatttggattgtcttcta  
aatctccatattctccgtcaaaaactcgtcattccactctggggacaattgacagctcttttctcagatccacaagagcaaggaatgcacga  
caacctgatgatattgaatatacatcttactacagcaggtttgtgtacgcttatgagtaggatcctctgcagatttggcacaacaatttgtgt  
tggagataataaatacactccagatgatagtagcaggaggattgacgactaatgcaccgccacaaggcagagatgctgtgaatggctcggga  
tggttcgaagatcaaaatagaaaaccgactcctgatatgatgcaaatatgcgaaaagagcagtcattgcaaggcctaagagaaaaaac  
aattggcaaatatgctaaatcagaatttgataaatga

#### Low Codon

atgtgatgatgagtcaagcgcacattgacaacaccgcatagttccaaagcttccgccaacgaggaccagtggaataccggccgact  
acttccgcaagtcaaaggagattccccctttacatcaacactaccaagagtctgtcagacctacgcgggtatgtctaccagggcctcaagtc  
gggaacgtatcaatcatacatgtcaacagctacctgtatggggccttaaggacatccggggtaagctggacaaggactggtcaagtttcg  
ggataaacatcgggaaggccggggacaccatcgggatatttgacctgtatccctgaagccctggacggcgtacttccagacgggggtat  
cggacgcttcccaccagcggcagacaagtgttgccttctacttggcttataaccgctggggccgaccagatgcccagatgcccagatg  
ccgcaagaagctcatggacgggctgaccaaccagtgaagatgatcaacgagcagttttagcccccttgtccagagggtcgtgacatttt

gacgtgtgggggaacgacagtaactacaccaagattgtcgtcgcctggacatgttcttccacatgttcaagaagcatgagtgcgcctcgtt  
ccgctacgggactattgttcccgcttcaaggactgcgctgccctggccaccttggggcacctctgcaagataaccgggatgtctaccgagg  
acgtaacgacctggatcctgaaccgagagggtccgacgagatggccagatgatgcttccaggccaggagattgacaaggccgactcat  
acatgccctatctgatcacttgggctgtcttctaagtctccctattctcctcaagaacccccgcttccacttctgggggagctgaccgct  
cttctgctccgctccaccgcccaggaaccccgacagcccacgacattgagtatacctctcttactaccgccgttctgctgtacgctt  
gccgtagggtcctctgccgacctggcccagcagtttgcgttggggacaacaagtactcccacgacagtaccggggggctgacgact  
aacccccgccacaggccgcccgacgtggtgaatggctcgatggttcgaggaccagaaccgcaagccgactcccacatgatgcagt  
atgcgaagcgcgccgctcatgtcactgcagggcctacgcgagaagaccattggcaagtatgctaagtacagatttgacaagtga

## Chimeric Sequences

### NH1

Atgtgatgatgagtcaagagaatcattgacaacacagtcatagttccaaaacttctgcaaatgaggatccagtggaataaccggcagatta  
cttcagaaaatcaaaggagattcctctttacatcaatactacaaaaagtttgcagatctaagaggatattgtctaccaaggcctcaaatccgga  
aatgtatcaatcatacatgtcaacagctacttgtatggagcattaaaggacatccggggtaagttggataaagattggtaagtttcggaataa  
acatcgggaaagcaggggataacaatcggaatattgacctgtatccttgaaaacctggacggcgtacttccagatggagtatcggatgctt  
ccagaaccagcgcagatgacaaatggttgccttctatctacttggcttatacagagtgggcagaaacacaaatgcctgaatacagaaaaag  
ctcatggatgggctgacaaatcaatgcaaatgatcaatgaacagtttgaacctcttgtccagaaggctcgtgacattttgatgtgtggggaa  
atgacagtaattacaaaaatgtcgtcagtgacatgttctccacatgttcaaaaaacatgaatgtgcctcgttcagatacggaaactatt  
gtttccagattcaaagattgtgctgcattggcaacatttggacacctctgcaaaaataaccggaatgtctacagaagatgtaacgacctggatctt  
gaaccgagaagttgcagatgaaatggtccaaatgAtgcttccaggccaagaattgataaagcagattcttacctccttattgatcatttt  
ggattgtcttcaaatctccatattctccgcaaaaactctgacattccacttctggggacaattgacagctcttttctcagatccacaagagcaa  
ggaatgcacgacaacctgatgatattgaatatacatcttactacagcaggtttgtgtacgcttatgcagtaggacacctcgcagatttggcac  
aacaattttgtgttgagataataatacactccagatgatagfacaggaggattgacgactaatgcaccgccacaaggcagagatgctgtg  
aatggctcggatggtcgaagatcaaaatagaaaaccgactcctgatatgatcaatatgcgaaaagagcagtcattgcaaggccta  
agagaaaaaacaattggcaaatatgctaaatcagaatttgataaatga

### NL1

Atgtgatgatgagtcaagagaatcattgacaacacagtcatagttccaaaacttctgcaaatgaggatccagtggaataaccggcagatta  
cttcagaaaatcaaaggagattcctctttacatcaatactacaaaaagtttgcagatctaagaggatattgtctaccaaggcctcaaatccgga  
aatgtatcaatcatacatgtcaacagctacttgtatggagcattaaaggacatccggggtaagttggataaagattggtaagtttcggaataa  
acatcgggaaagcaggggataacaatcggaatattgacctgtatccttgaaaacctggacggcgtacttccagatggagtatcggatgctt  
ccagaaccagcgcagatgacaaatggttgccttctatctacttggcttatacagagtgggcagaaacacaaatgcctgaatacagaaaaag  
ctcatggatgggctgacaaatcaatgcaaatgatcaatgaacagtttgaacctcttgtccagaaggctcgtgacattttgatgtgtggggaa  
atgacagtaattacaaaaatgtcgtcagtgacatgttctccacatgttcaaaaaacatgaatgtgcctcgttcagatacggaaactatt  
gtttccagattcaaagattgtgctgcattggcaacatttggacacctctgcaaaaataaccggaatgtctacagaagatgtaacgacctggatctt  
gaaccgagaagttgcagatgaaatggtccaaatgAtgcttccaggccaggagattgacaaggccgactacatgcctatctgatcgcac  
tttgggctgtcttcaagtctccctattctccgcaagaacccccgcttccacttctggggcagctgaccgctcttctgctccgctccaccgg  
cgccaggaacgcccacagcccacgacattgagtatacctcttactaccgcccgtctgctgtacgcttatgccgtagggtcctctgccg  
acctggcccagcagtttgcgttggggacaacaagtactcccacgacagfaccggggggctgacgactaacccccgccacaggg  
ccgacgacgtggtgaatggctcggatggttcgaggaccagaaccgcaagccgactcccacatgatgcagtatgcgaagcgcgccgta  
tgtcactgcagggcctacgcgagaagaccattggcaagtatgctaagtacagatttgacaagtga

## NH2

Atgtgatgatgagtcaagagaatcattgacaacacagtcatagttccaaaacttctgcaaatgaggatccagtggaataccggcagatta  
cttcagaaaatcaaaggagattcctctttacatcaatactacaaaaagttgtcagatctaagaggatatgtctaccaaggcctcaaatccgga  
aatgtatcaatcatacatgtcaacagctacttgtatggagcattaaaggacatccggggtaagttggataaagattggtcaagttcggataa  
acatcgggaaagcaggggatacaatcggaatatttgaccttgatccttgaaaagcctggacggcgtactccagatggagtatcggatgctt  
ccagaaccagcgcagatgacaaatggttgcctttgatctacttggcttatacagagtgggcagaacacaaatgcctgaatacagaaaaag  
ctcatggatgggctgacaaatCaatgtaaaatgatcaatgaacaattgaaccttgtcccagaaggctgctgatattttgatgtctggggaaa  
tgatagtaattacacaaaaattgctgctgcagtcgatatttccacatgttcaaaaaacatgaatgtgcatcgttcagatacggaaactattgt  
tcagattcaagattgtgctgcattggcaacattggacacctctgtaaaatacaggaatgtctacagaagatgaacgacatggatcttga  
atcagagaagttgcagatgaaatggtccaaatgatgcttccaggccaagaaattgataaagcagattctacatgccttatttgatcgatttggat  
tgtcttctaaatctccatattctccgtcaaaaatcctgcattccacttctggggacaattgacagctcttttgcagatccacaagagcaagga  
atgcacgacaacctgatgatattgaatatacatcttactacagcaggttggtagccttatgcagtaggacacctgacagattggcacaac  
aattttgttggagataaaatatacactccagatgatagtacaggaggattgacgactaatgcaccgccacaaggcagagatgctggtgaat  
ggctcggatggttcgaagatcaaaatagaaaaccgactcctgatgatgcaaatgacgaaaagagcagtcattgcaaggcctaaga  
gaaaaacaattggcaaatatgctaaatcagaatttgataaatga

## NL2

Atgtgatgatgagtcaagagaatcattgacaacacagtcatagttccaaaacttctgcaaatgaggatccagtggaataccggcagatta  
cttcagaaaatcaaaggagattcctctttacatcaatactacaaaaagttgtcagatctaagaggatatgtctaccaaggcctcaaatccgga  
aatgtatcaatcatacatgtcaacagctacttgtatggagcattaaaggacatccggggtaagttggataaagattggtcaagttcggataa  
acatcgggaaagcaggggatacaatcggaatatttgaccttgatccttgaaaagcctggacggcgtactccagatggagtatcggatgctt  
ccagaaccagcgcagatgacaaatggttgcctttgatctacttggcttatacagagtgggcagaacacaaatgcctgaatacagaaaaag  
ctcatggatgggctgacaaatCagtgcaagatgatcaacgagcagtttgagccccttggccagagggctgacattttgacgtgtgggg  
gaacgacagtaactacaccaagattgctgctgcccgtggacatgttctccacatgttcaagaagcatgagtgccctcgtccgctacggga  
ctattgttcccgttcaaggactgcgctgcccgtgccaccttggcaccctgcaagataaccgggatgtctaccaggacgtaacgacct  
ggatcctgaaccgagaggtgccgacgagatggtccagatgatgcttccaggccaggagattgacaaggccgactacatgcctatct  
gatcgacttgggctgtcttetaagtccttattctccgtcaagaacccccttccacttctggggcagctgaccgcttctgctccgctc  
caccgcgccaggaacgcccgacagcccgacgacattgagtatacctcttactaccggctgctgtacgcttatgccgtagggctct  
ctgccgacctggcccagcagtttgcgttggggacaacaagtacactcccgacgacgtaccggggggctgacgactaaccccccca  
cagggccgacgtggttgaatggctcggatggttcgaggaccagaaccgcaagccgactcccacatgatgcagatgcgaagcgcg  
ccgtcatgctactgcagggcctacgcgagaagaccattggcaagatgctaagtcagagtttgacaagtga

## NH3

Atgtgatgatgagtcaaaagaatcattgataatacagtcatagttccaaaacttctgcaaatgaagatccagtgaataccggcagattact  
tcagaaaatcaaagaaattcctctttacatcaatactacaaaaagttgtcagatctaagaggatatgtctaccaaggcctcaaatccggaat  
gtatcaatcatacatgtcaattcttacttgtatggagcattaaagatacagaggtaaattggataaagattggtcaagttcggataaataatcg  
ggaaagcaggggatacaatcggaatatttgatcttgccttgaagcattggatggcgtactccagatggagtatcggatgcttccagaa  
catctgcagatgataaatggttgcctttgatctacttggcttatacagagtcggcagaacacaaatgcctgaatacagaaaaaactcatgga  
tgggtgacaaat  
caatgcaaaatgatcaatgaacagtttgaaccttgtgccagaaggctgacattttgatgtgtggggaaatgacagtaattacacaaaa  
ttgtcgtcagtgacatgttctccacatgttcaaaaaacatgaatgtgctcgttcagatacggaaactattgttccagattcaagattgtg  
ctgattggcaacatttggacaccttgcataaataaccggaatgtctacagaagatgaacgacctggatctgaaccgagaagttgcagat

gaaatggccaatgatgctccaggccaagaattgacaaggccgattcatacatgccttattgatcgactttggattgtcttctaagtccca  
tattctccgtcaaaaacctgcctccacttctgggggcaattgacagctctctgctcagatccaccagagcaaggaatgcccgacagcct  
gatgacattgagatatactcttactacagcagggttgggttacgcttatgcagtaggatctctgccgacttggcacaacagtttgggttga  
gatacaaaatacactccagatgatagtaccggaggattgacgactaatgcaccgccacaaggcagagatgtggttgaatggctcggatgg  
tcgaagatcaaaacagaaaaccgactcctgatatgatgcagatgcgaaaagagcagtcactgcaaggcctaagagagaagacaa  
ttggcaagtatgctaagtcagaattgacaaatga

### NL3

Atgtgatgatgagcaagcgcacatcattgacaacaccgcatagttccaaagcttcccgccaacgaggaccagtggaataccggccgac  
tactccgcaagtcaaggagattcccctttacatcaactaccaagagtctgacagctacgcgggtatgtctaccagggcctcaagtc  
gggaacgtatcaatcatacatgtcaacagctacctgtatggggcctaaaggacatccggggtaagctggacaaggactggtaagtttcg  
ggataaacatcgggaaggccggggacaccatcgggatatttgacctgtatccctgaagccctggacggcgtacttccagacggggat  
cggacgctcccgcaccagcggcagcacaagtgggttccccctgtatctacttggcttataaccgctggccgcaccagatcccagat  
ccgcaagaagctcatggacgggctgaccaaccaatgcaaaatgatcaatgaacagtttgaaccttggccagaaggtcgtgacattttg  
atgtgtggggaaatgacagtaattacaaaaattgtcgtgcagtgagatgttctccacatgttcaaaaaatgaatgtcctcgttcag  
atacggaaactattgttccagattcaaaagattgtgctgattggcaacatttggacacctctgcaaaataaccggaatgtctacagaagatgaa  
cgacctggatcttgaaccgagaagttgcagatgaaatgttccaaatgatgctccaggccaagaattgacaaggccgattcatacatgcct  
tatttgatcgactttggattgtcttctaagtctccatattctccgcaaaaacctgccttccacttctgggggcaattgacagctcttctgctcag  
atccaccagagcaaggaatgcccgacagcctgatgacattgagatatacatcttactacagcagggttgggttacgcttatgcagtaggatcc  
tctgccgacttggcacaacagtttgggttggagataacaaatacactccagatgatagtaccggaggattgacgactaatgcaccgccaca  
ggcagagatgtggttgaatggctcggatgggtcgaagatcaaaacagaaaaccgactcctgatatgatgcagatgcgaaaagagcagtc  
gtcactgcaaggcctaagagagaagacaattggcaagtatgctaagtcagaattgacaaatga

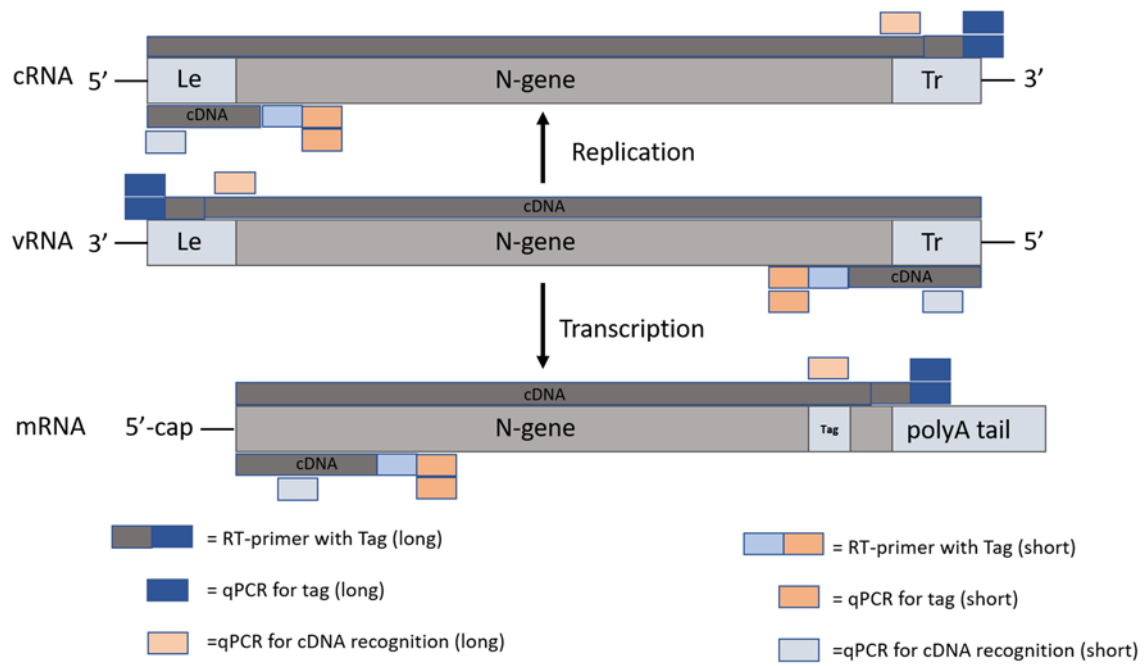
### NH4

Atgtgatgatgagcaagagaatcattgacaacacagtcacatagttccaaaacttctgcaaatgaggatccagtggaataccggcagatta  
cttcagaaaaatcaaggagattcctctttacatcaatactacaaaaagtttgcagatctaagaggatgtctaccaaggcctcaaatccgga  
aatgtatcaatcatacatgtcaacagctacttgcagcattaaaggacatcAgaggtaaattggataaagattggtaagtttccggaata  
atatcgggaaagcaggggatacaatcggaaatattgatctgtatccttgaagcattggatggcgtacttccagatggagatcggatgctc  
cagaacatctgcagatgataaattgggttgccttgccttacttggcttatacagagtcggcagaacacaaatgcctgaatacagaaaaaactc  
atggatgggttgacaaatcaatgtaaaatgatcaatgaacaatttgaaccttctgcccagaaggtcgtgatattttgatgtctgggaaatgat  
agtaattacacaaaaattgcgctgcagtcgatatttctccacatgttcaaaaaatgaatgtgcatcgttcagatacggaaactattgttcca  
gattcaaaagattgtcgtcattggcaacatttggacacctctgtaaaataacaggaatgtctacagaagatgtaacacatggatcttgaatc  
agaagttgcagatgaaatggccaatgatgctccaggccaagaattgataaagcagattcttacatgccttatttgatcattttggattgc  
ttctaattctcatattctccgtcaaaaatcctgcattccacttctggggacaattgacagctcttttgcagatccacaagagcaaggaatgc  
acgacaacctgatgatattgaatatacatcttactacagcagggttgggttacgcttatgcagtaggatctctgcagatttggcacaacagtt  
tgtgttggagataacaaatacactccagatgatagtaccggaggattgacgactaatgcaccgccacaaggcagagatgtggttgaatggct  
cggatgggtcgaagatcaaaacagaaaaccgactcctgatatgatgcagatgcgaaaagagcagtcactgcaaggcctaagaga  
gaagacaattggcaagtatgctaagtcagaattgacaaatga

### NL4

Atgtgatgatgagcaagagaatcattgacaacacagtcacatagttccaaaacttctgcaaatgaggatccagtggaataccggcagatta  
cttcagaaaaatcaaggagattcctctttacatcaatactacaaaaagtttgcagatctaagaggatgtctaccaaggcctcaaatccgga  
aatgtatcaatcatacatgtcaacagctacttgcagcattaaaggacatccggggtaagctggacaaggactggtaagtttccgggata

aacatcgggaaggccggggacaccatcgggatatttgacctgtatccctgaaggccctggacggcgtacttccagacggggtatcggac  
gcttcccaccagcgcggacgacaagtgggtgccctgtatctacttggcttataccgcgtgggcccaccagatgcccgagtaccgca  
agaagctcatggacgggctgaccaaccagtgaagatgatcaacgagcagtttgagccccttgtgccagaggctcgtgacattttgacgt  
gtgggggaacgacagtaactacccaagattgtcgtgccgtggacatgttctccacatgtcaagaagcatgagtgcgcctcgtccgct  
acgggactattgttcccgttcaaggactgcgctgccctggccaccttgggcacctctgcaagataaccgggatgtctaccgaggacgta  
acgacctggatcctgaaccgagagggtgccgacgagatgggtccagatgatgcttccaggccaggagattgacaaggccgactcatatg  
ccctatctgacgacttgggctgtcttetaagtctccctattcttccgtcaagaaccccgccttccacttctgggggcagctgaccgctcttg  
ctccgctcaccgcgccagggaacgcccgacagcccgacgacattgagtatacctcttactaccgccggtctgctgtacgcttatgccgt  
agggtcctctgccgacttggcacaacagtttgggtggagataacaaatacactccagatgatagtagcggaggattgacgactaatgcacc  
gccacaaggcagagatgtggttgaatggctcggatgggtcgaagatcaaaacagaaaaccgactcctgatatgatgcagtatgcgaaaag  
agcagtcatgtcactgcaaggcctaagagagaagacaattggcaagtatgctaagtcagaattgacaaatga



**Figure S1** Diagram of the primers and how they are used for qPCR.