5T4 (GC)-muag-A64-C30

GGGAGAAAGCUUACCAUGCCCGGCGGGUGCAGCCGGGGCCCGGCCGCCGGGGACGGCCGC
CUGCGGCUCGCGCGCCUGGCCCUGGUGCUCCUGGGGUGGGUCUCCAGCUCCAGCCCCACC
UCCAGCGCCUCCAGCUUCUCCAGCUCCGCCCCCUUCCUGGCCAGCGCGGUGUCCGCCCAG
CCCCCGCUCCCCGACCAGUGCCCCGCCCUGUGCGAGUGCAGCGAGGCCGCGCGGACCGUG
AAGUGCGUCAACCGCAACCUGACGGAGGUGCCCACCGACCUCCCGGCCUACGUGCGGAAC
CUGUUCCUGACCGGCAACCAGCUCGCCGUCCUGCCCGCCGGCGCCUUCGCGCGCCGGCCG
CCCCUGGCCGAGCUCGCCGCCCUGAACCUGUCCGGGAGCCGCCUCGACGAGGUGCGGGCC
GGCGCGUUCGAGCACCUGCCGUCCCUGCGCCAGCUCGACCUGAGCCACAACCCCCUGGCC
GACCUCUCCCCCUUCGCCUUCAGCGGGAGCAACGCCUCCGUGAGCGCCCCCUCCCCGCUG
GUCGAGCUGAUCCUCAACCACAUCGUGCCCCCCGAGGACGAGCGGCAGAACCGCAGCUUC
GAGGGCAUGGUGGUCGCGGCCCUGCUGGCCGGGCGGGCCCUCCAGGGCCUGCGCCGGCUG
GAGCUCGCCUCCAACCACUUCCUGUACCUGCCCCGCGACGUGCUCGCGCAGCUGCCGAGC
CUGCGGCACCUCGACCUGUCCAACAACAGCCUGGUGUCCCUCACCUACGUCAGCUUCCGC
AACCUGACGCACCUGGAGUCCCUCCACCUGGAGGACAACGCCCUGAAGGUGCUGCACAAC
GGCACCCUCGCCGAGCUGCAGGGGCUGCCCCACAUCCGGGUGUUCCUCGACAACAACCCC
UGGGUCUGCGACUGCCACAUGGCCGACAUGGUGACCUGGCUGAAGGAGACCGAGGUGGUC
CAGGGCAAGGACCGCCUGACGUGCGCGUACCCCGAGAAGAUGCGGAACCGGGUGCUCCUG
GAGCUGAACAGCGCCGACCUCGACUGCGACCCGAUCCUGCCCCCCUCCCUGCAGACCAGC
UACGUGUUCCUCGGGAUCGUCCUGGCCCUGAUCGGCGCCAUCUUCCUCCUGGUGCUGUAC
CUCAACCGCAAGGGCAUCAAGAAGUGGAUGCACAACAUCCGGGACGCCUGCCGCGACCAC
AUGGAGGGGUACCACUACCGGUACGAGAUCAACGCGGACCCCCGCCUGACCAACCUGUCC
AGCAACUCCGACGUCUGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACG
GGCCCUCCUCCCCCUCCUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUAUUCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCUCUAGACAAUUGGAAUU

Fig. 1

5T4 (GC)-muag-A64-C30-HistoneSL

GGGAGAAAGCUUACCAUGCCCGGCGGGUGCAGCCGGGGCCCGGCCGCCGGGGACGGCCGC
CUGCGGCUCGCGCGCCUGGCCCUGGUGCUCCUGGGGUGGGUCUCCAGCUCCAGCCCCACC
UCCAGCGCCUCCAGCUUCUCCAGCUCCGCCCCCUUCCUGGCCAGCGCGGUGUCCGCCCAG
CCCCCGCUCCCCGACCAGUGCCCCGCCCUGUGCGAGUGCAGCGAGGCCGCGCGGACCGUG
AAGUGCGUCAACCGCAACCUGACGGAGGUGCCCACCGACCUCCCGGCCUACGUGCGGAAC
CUGUUCCUGACCGGCAACCAGCUCGCCGUCCUGCCCGCCGGCGCCUUCGCGCGCCGGCCG
CCCCUGGCCGAGCUCGCCGCCCUGAACCUGUCCGGGAGCCGCCUCGACGAGGUGCGGGCC
GGCGCGUUCGAGCACCUGCCGUCCCUGCGCCAGCUCGACCUGAGCCACAACCCCCUGGCC
GACCUCUCCCCCUUCGCCUUCAGCGGGAGCAACGCCUCCGUGAGCGCCCCCUCCCCGCUG
GUCGAGCUGAUCCUCAACCACAUCGUGCCCCCCGAGGACGAGCGGCAGAACCGCAGCUUC
GAGGGCAUGGUGGUCGCGGCCCUGCUGGCCGGGCGGGCCCUCCAGGGCCUGCGCCGGCUG
GAGCUCGCCUCCAACCACUUCCUGUACCUGCCCCGCGACGUGCUCGCGCAGCUGCCGAGC
CUGCGGCACCUCGACCUGUCCAACAACAGCCUGGUGUCCCUCACCUACGUCAGCUUCCGC
AACCUGACGCACCUGGAGUCCCUCCACCUGGAGGACAACGCCCUGAAGGUGCUGCACAAC
GGCACCCUCGCCGAGCUGCAGGGGCUGCCCCACAUCCGGGUGUUCCUCGACAACAACCCC
UGGGUCUGCGACUGCCACAUGGCCGACAUGGUGACCUGGCUGAAGGAGACCGAGGUGGUC
CAGGGCAAGGACCGCCUGACGUGCGCGUACCCCGAGAAGAUGCGGAACCGGGUGCUCCUG
GAGCUGAACAGCGCCGACCUCGACUGCGACCCGAUCCUGCCCCCCUCCCUGCAGACCAGC
UACGUGUUCCUCGGGAUCGUCCUGGCCCUGAUCGGCGCCAUCUUCCUCCUGGUGCUGUAC
CUCAACCGCAAGGGCAUCAAGAAGUGGAUGCACAACAUCCGGGACGCCUGCCGCGACCAC
AUGGAGGGGUACCACUACCGGUACGAGAUCAACGCGGACCCCCGCCUGACCAACCUGUCC
AGCAACUCCGACGUCUGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACG
GGCCCUCCUCCCCCUCCUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUGCAUCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCAAAGGCUCUUUUCAGAGCCACCAGAAUU

Fig. 2

5T4 CDS wild type

AUGCCUGGGGGGUGCUCCCGGGGCCCCGCCGCCGGGGACGGGCGUCUGCGGCUGGCGCGA
CUAGCGCUGGUACUCCUGGGCUGGGUCUCCUCGUCUUCUCCCACCUCCUCGGCAUCCUCC
UUCUCCUCCUCGGCGCCGUUCCUGGCUUCCGCCGUGUCCGCCCAGCCCCCGCUGCCGGAC
CAGUGCCCCGCGCUGUGCGAGUGCUCCGAGGCAGCGCGCACAGUCAAGUGCGUUAACCGC
AAUCUGACCGAGGUGCCCACGGACCUGCCCGCCUACGUGCGCAACCUCUUCCUUACCGGC
AACCAGCUGGCCGUGCUCCCUGCCGGCGCCUUCGCCCGCCGGCCGCCGCUGGCGGAGCUG
GCCGCGCUCAACCUCAGCGGCAGCCGCCUGGACGAGGUGCGCGCGGGCGCCUUCGAGCAU
CUGCCCAGCCUGCGCCAGCUCGACCUCAGCCACAACCCACUGGCCGACCUCAGUCCCUUC
GCUUUCUCGGGCAGCAAUGCCAGCGUCUCGGCCCCCAGUCCCCUUGUGGAACUGAUCCUG
AACCACAUCGUGCCCCCUGAAGAUGAGCGGCAGAACCGGAGCUUCGAGGGCAUGGUGGUG
GCGGCCCUGCUGGCGGGCCGUGCACUGCAGGGGCUCCGCCGCUUGGAGCUGGCCAGCAAC
CACUUCCUUUACCUGCCGCGGGAUGUGCUGGCCCAACUGCCCAGCCUCAGGCACCUGGAC
UUAAGUAAUAAUUCGCUGGUGAGCCUGACCUACGUGUCCUUCCGCAACCUGACACAUCUA
GAAAGCCUCCACCUGGAGGACAAUGCCCUCAAGGUCCUUCACAAUGGCACCCUGGCUGAG
UUGCAAGGUCUACCCCACAUUAGGGUUUUCCUGGACAACAAUCCCUGGGUCUGCGACUGC
CACAUGGCAGACAUGGUGACCUGGCUCAAGGAAACAGAGGUAGUGCAGGGCAAAGACCGG
CUCACCUGUGCAUAUCCGGAAAAAAUGAGGAAUCGGGUCCUCUUGGAACUCAACAGUGCU
GACCUGGACUGUGACCCGAUUCUUCCCCCAUCCCUGCAAACCUCUUAUGUCUUCCUGGGU
AUUGUUUUAGCCCUGAUAGGCGCUAUUUUCCUCCUGGUUUUGUAUUUGAACCGCAAGGGG
AUAAAAAAGUGGAUGCAUAACAUCAGAGAUGCCUGCAGGGAUCACAUGGAAGGGUAUCAU
UACAGAUAUGAAAUCAAUGCGGACCCCAGAUUAACGAACCUCAGUUCUAACUCGGAUGUC
UGA

Fig. 3

5T4 CDS GC-optimized

AUGCCCGGCGGGUGCAGCCGGGGCCCGGCCGCCGGGGACGGCCGCCUGCGGCUCGCGCGC
CUGGCCCUGGUGCUCCUGGGGUGGGUCUCCAGCUCCAGCCCCACCUCCAGCGCCUCCAGC
UUCUCCAGCUCCGCCCCCUUCCUGGCCAGCGCGGUGUCCGCCCAGCCCCCGCUCCCCGAC
CAGUGCCCCGCCCUGUGCGAGUGCAGCGAGGCCGCGCGGACCGUGAAGUGCGUCAACCGC
AACCUGACGGAGGUGCCCACCGACCUCCCGGCCUACGUGCGGAACCUGUUCCUGACCGGC
AACCAGCUCGCCGUCCUGCCCGCCGGCGCCUUCGCGCGCCGGCCGCCCCUGGCCGAGCUC
GCCGCCCUGAACCUGUCCGGGAGCCGCCUCGACGAGGUGCGGGCCGGCGCGUUCGAGCAC
CUGCCGUCCCUGCGCCAGCUCGACCUGAGCCACAACCCCCUGGCCGACCUCUCCCCCUUC
GCCUUCAGCGGGAGCAACGCCUCCGUGAGCGCCCCCUCCCCGCUGGUCGAGCUGAUCCUC
AACCACAUCGUGCCCCCCGAGGACGAGCGGCAGAACCGCAGCUUCGAGGGCAUGGUGGUC
GCGGCCCUGCUGGCCGGGCGGGCCCUCCAGGGCCUGCGCCGGCUGGAGCUCGCCUCCAAC
CACUUCCUGUACCUGCCCCGCGACGUGCUCGCGCAGCUGCCGAGCCUGCGGCACCUCGAC
CUGUCCAACAACAGCCUGGUGUCCCUCACCUACGUCAGCUUCCGCAACCUGACGCACCUG
GAGUCCCUCCACCUGGAGGACAACGCCCUGAAGGUGCUGCACAACGGCACCCUCGCCGAG
CUGCAGGGGCUGCCCCACAUCCGGGUGUUCCUCGACAACAACCCCUGGGUCUGCGACUGC
CACAUGGCCGACAUGGUGACCUGGCUGAAGGAGACCGAGGUGGUCCAGGGCAAGGACCGC
CUGACGUGCGCGUACCCCGAGAAGAUGCGGAACCGGGUGCUCCUGGAGCUGAACAGCGCC
GACCUCGACUGCGACCCGAUCCUGCCCCCCUCCCUGCAGACCAGCUACGUGUUCCUCGGG
AUCGUCCUGGCCCUGAUCGGCGCCAUCUUCCUCCUGGUGCUGUACCUCAACCGCAAGGGC
AUCAAGAAGUGGAUGCACAACAUCCGGGACGCCUGCCGCGACCACAUGGAGGGGUACCAC
UACCGGUACGAGAUCAACGCGGACCCCCGCCUGACCAACCUGUCCAGCAACUCCGACGUC
UGA

Fig. 4

Survivin (GC)-muag-A64-C30

GGGAGAAAGCUUACCAUGGGCGCCCCCACCCUGCCGCCGGCCUGGCAGCCGUUCCUCAAG
GACCACCGCAUCUCGACCUUCAAGAACUGGCCGUUCCUGGAGGGCUGCGCGUGCACCCCG
GAGCGGAUGGCCGAGGCCGGCUUCAUCCACUGCCCCACCGAGAACGAGCCGGACCUGGCC
CAGUGCUUCUUCUGCUUCAAGGAGCUGGAGGGCUGGGAGCCGGACGACGACCCGAUCGAG
GAGCACAAGAAGCACAGCAGCGGCUGCGCCUUCCUGAGCGUGAAGAAGCAGUUCGAGGAG
CUGACGCUCGGGGAGUUCCUGAAGCUGGACCGGGAGCGGGCCAAGAACAAGAUCGCGAAG
GAGACCAACAACAAGAAGAAGGAGUUCGAGGAGACCGCCAAGAAGGUGCGGCGGGCCAUC
GAGCAGCUGGCCGCCAUGGACUGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUC
CCAACGGGCCCUCCUCCCCCUCCUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUAUUCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCUCUAGACAAUUGGAAUU

Fig. 5

Survivin (GC)-muag-A64-C30-HistoneSL

GGGAGAAAGCUUACCAUGGGCGCCCCCACCCUGCCGCCGGCCUGGCAGCCGUUCCUCAAG
GACCACCGCAUCUCGACCUUCAAGAACUGGCCGUUCCUGGAGGGCUGCGCGUGCACCCCG
GAGCGGAUGGCCGAGGCCGGCUUCAUCCACUGCCCCACCGAGAACGAGCCGGACCUGGCC
CAGUGCUUCUUCUGCUUCAAGGAGCUGGAGGGCUGGGAGCCGGACGACGACCCGAUCGAG
GAGCACAAGAAGCACAGCAGCGGCUGCGCCUUCCUGAGCGUGAAGAAGCAGUUCGAGGAG
CUGACGCUCGGGGAGUUCCUGAAGCUGGACCGGGAGCGGGCCAAGAACAAGAUCGCGAAG
GAGACCAACAACAAGAAGAAGGAGUUCGAGGAGACCGCCAAGAAGGUGCGGCGGGCCAUC
GAGCAGCUGGCCGCCAUGGACUGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUC
CCAACGGGCCCUCCUCCCCCUCCUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUGCAUCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCAAAGGCUCUUUUCAGAGCCACCAGAAUU

Fig. 6

Survivin CDS wild type

AUGGGUGCCCCGACGUUGCCCCCUGCCUGGCAGCCCUUUCUCAAGGACCACCGCAUCUCUA
CAUUCAAGAACUGGCCCUUCUUGGAGGGCUGCGCCUGCACCCCGGAGCGGAUGGCCGAGGC
UGGCUUCAUCCACUGCCCCACUGAGAACGAGCCAGACUUGGCCCAGUGUUUCUUCUGCUUC
AAGGAGCUGGAAGGCUGGGAGCCAGAUGACGACCCCAUAGAGGAACAUAAAAAGCAUUCGU
CCGGUUGCGCUUUCCUUUCUGUCAAGAAGCAGUUUGAAGAAUUAACCCUUGGUGAAUUUUU
GAAACUGGACAGAGAAAGAGCCAAGAACAAAAUUGCAAAGGAAACCAACAAUAAGAAGAAA
GAAUUUGAGGAAACUGCGAAGAAAGUGCGCCGUGCCAUCGAGCAGCUGGCUGCCAUGGAUU
GA

Fig. 7

Survivin CDS GC-optimized

AUGGGCGCCCCCACCCUGCCGCCGGCCUGGCAGCCGUUCCUCAAGGACCACCGCAUCUCGA
CCUUCAAGAACUGGCCGUUCCUGGAGGGCUGCGCGUGCACCCCGGAGCGGAUGGCCGAGGC
CGGCUUCAUCCACUGCCCCACCGAGAACGAGCCGGACCUGGCCCAGUGCUUCUUCUGCUUC
AAGGAGCUGGAGGGCUGGGAGCCGGACGACGACCCGAUCGAGGAGCACAAGAAGCACAGCA
GCGGCUGCGCCUUCCUGAGCGUGAAGAAGCAGUUCGAGGAGCUGACGCUCGGGGAGUUCCU
GAAGCUGGACCGGGAGCGGGCCAAGAACAAGAUCGCGAAGGAGACCAACAACAAGAAGAAG
GAGUUCGAGGAGACCGCCAAGAAGGUGCGGCGGGCCAUCGAGCAGCUGGCCGCCAUGGACU
GA

Fig. 8

NY-ESO-1 (GC)-MUAG-A64-C30

GGGAGAAAGCUUACCAUGCAGGCCGAGGGCCGCGGCACCGGCGGCUCGACCGGCGACGCC
GACGGGCCCGGCGGCCCGGGCAUCCCGGACGGCCCGGGCGGGAACGCGGGCGGCCCGGGC
GAGGCCGGCGCCACCGGCGGGCGGGGCCCGCGGGGCGCCGGCGCCGCCCGGGCGAGCGGC
CCCGGCGGGGGCGCCCCGCGGGGCCCGCACGGCGGCGCCGCCAGCGGCCUGAACGGGUGC
UGCCGGUGCGGCGCCCGCGGCCCGGAGAGCCGGCUCCUGGAGUUCUACCUGGCCAUGCCG
UUCGCGACCCCGAUGGAGGCCGAGCUGGCCCGGCGGAGCCUGGCCCAGGACGCCCCGCCG
CUGCCCGUGCCGGGCGUGCUCCUGAAGGAGUUCACGGUGAGCGGCAACAUCCUGACCAUC
CGGCUGACCGCCGCGGACCACCGGCAGCUGCAGCUGUCGAUCAGCAGCUGCCUCCAGCAG
CUGAGCCUGCUGAUGUGGAUCACCCAGUGCUUCCUGCCGGUGUUCCUGGCCCAGCCGCCC
AGCGGCCAGCGCCGGUGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACG
GGCCCUCCUCCCCCUCCUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUAUUCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCUCUAGACAAUUGGAAUU

Fig. 9

NY-ESO-1 (GC)-muag-A64-C30-histone SL

GGGAGAAAGCUUACCAUGCAGGCCGAGGGCCGCGGCACCGGCGGCUCGACCGGCGACGCC
GACGGGCCCGGCGGCCCGGGCAUCCCGGACGGCCCGGGCGGGAACGCGGGCGGCCCGGGC
GAGGCCGGCGCCACCGGCGGGCGGGGCCCGCGGGGCGCCGGCGCCGCCCGGGCGAGCGGC
CCCGGCGGGGGCGCCCCGCGGGGCCCGCACGGCGGCGCCGCCAGCGGCCUGAACGGGUGC
UGCCGGUGCGGCGCCCGCGGCCCGGAGAGCCGGCUCCUGGAGUUCUACCUGGCCAUGCCG
UUCGCGACCCCGAUGGAGGCCGAGCUGGCCCGGCGGAGCCUGGCCCAGGACGCCCCGCCG
CUGCCCGUGCCGGGCGUGCUCCUGAAGGAGUUCACGGUGAGCGGCAACAUCCUGACCAUC
CGGCUGACCGCCGCGGACCACCGGCAGCUGCAGCUGUCGAUCAGCAGCUGCCUCCAGCAG
CUGAGCCUGCUGAUGUGGAUCACCCAGUGCUUCCUGCCGGUGUUCCUGGCCCAGCCGCCC
AGCGGCCAGCGCCGGUGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACG
GGCCCUCCUCCCCCUCCUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUGCAUCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCAAAGGCUCUUUUCAGAGCCACCAGAAUU

Fig. 10

NY-ESO-1 CDS wild type

AUGCAGGCCGAAGGCCGGGGCACAGGGGGUUCGACGGGCGAUGCUGAUGGCCCAGGAGGC
CCUGGCAUUCCUGAUGGCCCAGGGGGCAAUGCUGGCGGCCCAGGAGAGGCGGGUGCCACG
GGCGGCAGAGGUCCCCGGGGCGCAGGGGCAGCAAGGGCCUCGGGGCCGGGAGGAGGCGCC
CCGCGGGGUCCGCAUGGCGGCGCGGCUUCAGGGCUGAAUGGAUGCUGCAGAUGCGGGGCC
AGGGGGCCGGAGAGCCGCCUGCUUGAGUUCUACCUCGCCAUGCCUUUCGCGACACCCAUG
GAAGCAGAGCUGGCCCGCAGGAGCCUGGCCCAGGAUGCCCCACCGCUUCCCGUGCCAGGG
GUGCUUCUGAAGGAGUUCACUGUGUCCGGCAACAUACUGACUAUCCGACUGACUGCUGCA
GACCACCGCCAACUGCAGCUCUCCAUCAGCUCCUGUCUCCAGCAGCUUUCCCUGUUGAUG
UGGAUCACGCAGUGCUUUCUGCCCGUGUUUUUGGCUCAGCCUCCCUCAGGGCAGAGGCGC
UAA

Fig. 11

NY-ESO-1 CDS GC-optimized

AUGCAGGCCGAGGGCCGCGGCACCGGCGGCUCGACCGGCGACGCCGACGGGCCCGGCGGC
CCGGGCAUCCCGGACGGCCCGGGCGGGAACGCGGGCGGCCCGGGCGAGGCCGGCGCCACC
GGCGGGCGGGGCCCGCGGGGCGCCGGCGCCGCCCGGGCGAGCGGCCCCGGCGGGGGCGCC
CCGCGGGGCCCGCACGGCGGCGCCGCCAGCGGCCUGAACGGGUGCUGCCGGUGCGGCGCC
CGCGGCCCGGAGAGCCGGCUCCUGGAGUUCUACCUGGCCAUGCCGUUCGCGACCCCGAUG
GAGGCCGAGCUGGCCCGGCGGAGCCUGGCCCAGGACGCCCCGCCGCUGCCCGUGCCGGGC
GUGCUCCUGAAGGAGUUCACGGUGAGCGGCAACAUCCUGACCAUCCGGCUGACCGCCGCG
GACCACCGGCAGCUGCAGCUGUCGAUCAGCAGCUGCCUCCAGCAGCUGAGCCUGCUGAUG
UGGAUCACCCAGUGCUUCCUGCCGGUGUUCCUGGCCCAGCCGCCCAGCGGCCAGCGCCGG
UGA

Fig. 12

MAGE-C1 (aa 613-1142) (GC)-muag-A64-C30

GGGAGAAAGCUUACCAUGCAGUCCCCGCUGCAGGGCGAGGAGUUCCAGAGCUCCCUGCAG
AGCCCCGUGUCCAUCUGCAGCUCCAGCACCCCCUCCAGCCUCCCGCAGAGCUUCCCCGAG
UCCAGCCAGUCCCCCCCCGAGGGCCCGGUCCAGAGCCCCCUGCACUCCCCGCAGAGCCCC
CCGGAGGGGAUGCACUCCCAGAGCCCCCUGCAGUCCCCCGAGAGCGCCCCCGAGGGCGAG
GACUCCCUCAGCCCGCUGCAGAUCCCCCAGUCCCCGCUGGAGGGGGAGGACAGCCUCUCC
AGCCUGCACUUCCCCCAGUCCCCGCCCGAGUGGGAGGACAGCCUGAGCCCCCUCCACUUC
CCCCAGUUCCCGCCCCAGGGCGAGGACUUCCAGUCCAGCCUGCAGUCCCCCGUGAGCAUC
UGCUCCAGCUCCACGAGCCUGUCCCUCCCCCAGAGCUUCCCGGAGUCCCCCCAGAGCCCG
CCCGAGGGGCCGGCGCAGUCCCCCCUGCAGCGCCCCGUGAGCUCCUUCUUCAGCUACACC
CUGGCCUCCCUCCUGCAGAGCUCCCACGAGAGCCCGCAGAGCCCGCCCGAGGGCCCCGCC
CAGUCCCCGCUGCAGAGCCCCGUCUCCAGCUUCCCCUCCAGCACCUCCAGCUCCCUCAGC
CAGUCCAGCCCCGUGUCCAGCUUCCCGUCCAGCACCUCCAGCUCCCUGAGCAAGAGCUCC
CCCGAGAGCCCCCUGCAGUCCCCCGUGAUCAGCUUCUCCAGCUCCACGAGCCUCUCCCCG
UUCAGCGAGGAGUCCAGCUCCCCCGUCGACGAGUACACCAGCUCCAGCGACACCCUGCUG
GAGUCCGACAGCCUCACCGACUCCGAGAGCCUGAUCGAGAGCGAGCCCCUGUUCACCUAC
ACGCUCGACGAGAAGGUGGACGAGCUGGCCCGGUUCCUGCUCCUGAAGUACCAGGUGAAG
CAGCCCAUCACCAAGGCCGAGAUGCUGACCAACGUCAUCUCCCGCUACACCGGCUACUUC
CCGGUGAUCUUCCGGAAGGCGCGCGAGUUCAUCGAGAUCCUCUUCGGGAUCAGCCUGCGG
GAGGUGGACCCCGACGACUCCUACGUCUUCGUGAACACGCUGGACCUCACCAGCGAGGGC
UGCCUGUCCGACGAGCAGGGGAUGAGCCAGAACCGCCUGCUCAUCCUGAUCCUGUCCAUC
AUCUUCAUCAAGGGCACCUACGCCAGCGAGGAGGUCAUCUGGGACGUGCUCUCCGGGAUC
GGCGUGCGGGCCGGCCGCGAGCACUUCGCCUUCGGGGAGCCCCGGGAGCUGCUGACCAAG
GUCUGGGUGCAGGAGCACUACCUCGAGUACCGCGAGGUGCCCAACAGCUCCCCGCCCCGG
UACGAGUUCCUGUGGGGCCCCCGCGCCCACAGCGAGGUCAUCAAGCGGAAGGUGGUGGAG
UUCCUGGCGAUGCUCAAGAACACGGUCCCCAUCACCUUCCCGUCCAGCUACAAGGACGCC
CUGAAGGACGUGGAGGAGCGGGCCCAGGCCAUCAUCGACACCACCGACGACUCCACGGCC
ACCGAGAGCGCGUCCAGCUCCGUGAUGAGCCCCAGCUUCUCCAGCGAGUGACCACUAGUU
AUAAGACUGACUAGCCCGAUGGGCCUCCCAACGGGCCCUCCUCCCCCUCCUUGCACCGAGA
UUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAUAUUCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCUCUAGACAAUUGGAAUU

Fig. 13

MAGE-C1 (aa 613-1142) (GC)-muag-A64-C30-histoneSL

GGGAGAAAGCUUACCAUGCAGUCCCCGCUGCAGGGCGAGGAGUUCCAGAGCUCCCUGCAG
AGCCCCGUGUCCAUCUGCAGCUCCAGCACCCCCUCCAGCCUCCCGCAGAGCUUCCCCGAG
UCCAGCCAGUCCCCCCCCGAGGGCCCGGUCCAGAGCCCCCUGCACUCCCCGCAGAGCCCC
CCGGAGGGGAUGCACUCCCAGAGCCCCCUGCAGUCCCCCGAGAGCGCCCCCGAGGGCGAG
GACUCCCUCAGCCCGCUGCAGAUCCCCCAGUCCCCGCUGGAGGGGGAGGACAGCCUCUCC
AGCCUGCACUUCCCCCAGUCCCCGCCCGAGUGGGAGGACAGCCUGAGCCCCCUCCACUUC
CCCCAGUUCCCGCCCCAGGGCGAGGACUUCCAGUCCAGCCUGCAGUCCCCCGUGAGCAUC
UGCUCCAGCUCCACGAGCCUGUCCCUCCCCCAGAGCUUCCCGGAGUCCCCCCAGAGCCCG
CCCGAGGGGCCGGCGCAGUCCCCCCUGCAGCGCCCCGUGAGCUCCUUCUUCAGCUACACC
CUGGCCUCCCUCCUGCAGAGCUCCCACGAGAGCCCGCAGAGCCCGCCCGAGGGCCCCGCC
CAGUCCCCGCUGCAGAGCCCCGUCUCCAGCUUCCCCUCCAGCACCUCCAGCUCCCUCAGC
CAGUCCAGCCCCGUGUCCAGCUUCCCGUCCAGCACCUCCAGCUCCCUGAGCAAGAGCUCC
CCCGAGAGCCCCCUGCAGUCCCCCGUGAUCAGCUUCUCCAGCUCCACGAGCCUCUCCCCG
UUCAGCGAGGAGUCCAGCUCCCCCGUCGACGAGUACACCAGCUCCAGCGACACCCUGCUG
GAGUCCGACAGCCUCACCGACUCCGAGAGCCUGAUCGAGAGCGAGCCCCUGUUCACCUAC
ACGCUCGACGAGAAGGUGGACGAGCUGGCCCGGUUCCUGCUCCUGAAGUACCAGGUGAAG
CAGCCCAUCACCAAGGCCGAGAUGCUGACCAACGUCAUCUCCCGCUACACCGGCUACUUC
CCGGUGAUCUUCCGGAAGGCGCGCGAGUUCAUCGAGAUCCUCUUCGGGAUCAGCCUGCGG
GAGGUGGACCCCGACGACUCCUACGUCUUCGUGAACACGCUGGACCUCACCAGCGAGGGC
UGCCUGUCCGACGAGCAGGGGAUGAGCCAGAACCGCCUGCUCAUCCUGAUCCUGUCCAUC
AUCUUCAUCAAGGGCACCUACGCCAGCGAGGAGGUCAUCUGGGACGUGCUCUCCGGGAUC
GGCGUGCGGGCCGGCCGCGAGCACUUCGCCUUCGGGGAGCCCCGGGAGCUGCUGACCAAG
GUCUGGGUGCAGGAGCACUACCUCGAGUACCGCGAGGUGCCCAACAGCUCCCCGCCCCGG
UACGAGUUCCUGUGGGGCCCCCGCGCCCACAGCGAGGUCAUCAAGCGGAAGGUGGUGGAG
UUCCUGGCGAUGCUCAAGAACACGGUCCCCAUCACCUUCCCGUCCAGCUACAAGGACGCC
CUGAAGGACGUGGAGGAGCGGGCCCAGGCCAUCAUCGACACCACCGACGACUCCACGGCC
ACCGAGAGCGCGUCCAGCUCCGUGAUGAGCCCCAGCUUCUCCAGCGAGUGACCACUAGUU
AUAAGACUGACUAGCCCGAUGGGCCUCCCAACGGGCCCUCCUCCCCCUCCUUGCACCGAGA
UUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAUGCAUCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCAAAGGCUCUUUUCAG
AGCCACCAGAAUU

Fig. 14

MAGE-C1 full-length CDS wild type

AUGGGGGACAAGGAUAUGCCUACUGCUGGGAUGCCGAGUCUUCUCCAGAGUUCCUCUGAGAGUCCUCAGAGU
UGUCCUGAGGGGGAGGACUCCCAGUCUCCUCUCCAGAUUCCCCAGAGUUCUCCUGAGAGCGACGACACCCUG
UAUCCUCUCCAGAGUCCUCAGAGUCGUUCUGAGGGGGAGGACUCCUCGGAUCCUCUCCAGAGACCUCCUGAG
GGGAAGGACUCCCAGUCUCCUCUCCAGAUUCCCCAGAGUUCUCCUGAGGGCGACGACACCCAGUCUCCUCUC
CAGAAUUCUCAGAGUUCUCCUGAGGGGAAGGACUCCCUGUCUCCUCUAGAGAUUUCUCAGAGCCCUCCUGAG
GGUGAGGAUGUCCAGUCUCCUCUGCAGAAUCCUGCGAGUUCCUUCUUCUCCUCUGCUUUAUUGAGUAUUUUC
CAGAGUUCCCCUGAGAGUACUCAAAGUCCUUUUGAGGGUUUUCCCCAGUCUGUUCUCCAGAUUCCUGUGAGC
GCCGCCUCCUCCUCCACUUUAGUGAGUAUUUUCCAGAGUUCCCCUGAGAGUACUCAAAGUCCUUUUGAGGGU
UUUCCCCAGUCUCCACUCCAGAUUCCUGUGAGCCGCUCCUUCUCCUCCACUUUAUUGAGUAUUUUCCAGAGU
UCCCCUGAGAGAACUCAGAGUACUUUUGAGGGUUUUGCCCAGUCUCCUCUCCAGAUUCCUGUGAGCCCCUCC
UCCUCCUCCACUUUACUGAGUCUUUUCCAGAGUUUCUCUGAGAGAACUCAGAGUACUUUUGAGGGUUUUGCC
CAGUCUUCUCUCCAGAUUCCUGUGAGCCCCUCCUUCUCCUCCACUUUAGUGAGUCUUUUCCAGAGUUCCCCU
GAGAGAACUCAGAGUACUUUUGAGGGUUUUCCCCAGUCUCCUCUCCAGAUUCCUGUGAGCUCCUCCUCCUCC
UCCACUUUAUUGAGUCUUUUCCAGAGUUCCCCUGAGAGAACUCACAGUACUUUUGAGGGUUUUCCCCAGUCU
CUUCUCCAGAUUCCUAUGACCUCCUCCUUCUCCUCUACUUUAUUGAGUAUUUUCCAGAGUUCUCCUGAGAGU
GCUCAAAGUACUUUUGAGGGUUUUCCCCAGUCUCCUCUCCAGAUUCCUGGGAGCCCCUCCUUCUCCUCCACU
UUACUGAGUCUUUUCCAGAGUUCCCCUGAGAGAACUCACAGUACUUUUGAGGGUUUUCCCCAGUCUCCUCUC
CAGAUUCCUAUGACCUCCUCCUUCUCCUCUACUUUAUUGAGUAUUUUACAGAGUUCUCCUGAGAGUGCUCAA
AGUGCUUUUGAGGGUUUUCCCCAGUCUCCUCUCCAGAUUCCUGUGAGCUCCUCUUUCUCCUACACUUUAUUG
AGUCUUUUCCAGAGUUCCCCUGAGAGAACUCACAGUACUUUUGAGGGUUUUCCCCAGUCUCCUCUCCAGAUU
CCUGUGAGCUCCUCCUCCUCCUCCUCCACUUUAUUGAGUCUUUUCCAGAGUUCCCCUGAGUGUACUCAAAGU
ACUUUUGAGGGUUUUCCCCAGUCUCCUCUCCAGAUUCCUCAGAGUCCUCCUGAAGGGGAGAAUACCCAUUCU
CCUCUCCAGAUUGUUCCAAGUCUUCCUGAGUGGGAGGACUCCCUGUCUCCUCACUACUUUCCUCAGAGCCCU
CCUCAGGGGGAGGACUCCCUAUCUCCUCACUACUUUCCUCAGAGCCCUCCUCAGGGGGAGGACUCCCUGUCU
CCUCACUACUUUCCUCAGAGCCCUCAGGGGGAGGACUCCCUGUCUCCUCACUACUUUCCUCAGAGCCCUCCU
CAGGGGGAGGACUCCAUGUCUCCUCUCUACUUUCCUCAGAGUCCUCUUCAGGGGGAGGAAUUCCAGUCUUCU
CUCCAGAGCCCUGUGAGCAUCUGCUCCUCCUCCACUCCAUCCAGUCUUCCCCAGAGUUUCCCUGAGAGUUCU
CAGAGUCCUCCUGAGGGGCCUGUCCAGUCUCCUCUCCAUAGUCCUCAGAGCCCUCCUGAGGGGAUGCACUCC
CAAUCUCCUCUCCAGAGUCCUGAGAGUGCUCCUGAGGGGGAGGAUUCCCUGUCUCCUCUCCAAAUUCCUCAG
AGUCCUCUUGAGGGAGAGGACUCCCUGUCUUCUCUCCAUUUUCCUCAGAGUCCUCCUGAGUGGGAGGACUCC
CUCUCUCCUCUCCACUUUCCUCAGUUUCCUCCUCAGGGGGAGGACUUCCAGUCUUCUCUCCAGAGUCCUGUG
AGUAUCUGCUCCUCCUCCACUUCUUUGAGUCUUCCCCAGAGUUUCCCUGAGAGUCCUCAGAGUCCUCCUGAG
GGGCCUGCUCAGUCUCCUCUCCAGAGACCUGUCAGCUCCUUCUUCUCCUACACUUUAGCGAGUCUUCUCCAA
AGUUCCCAUGAGAGUCCUCAGAGUCCUCCUGAGGGGCCUGCCCAGUCUCCUCUCCAGAGUCCUGUGAGCUCC
UUCCCCUCCUCCACUUCAUCGAGUCUUUCCCAGAGUUCUCCUGUGAGCUCCUUCCCCUCCUCCACUUCAUCG
AGUCUUUCCAAGAGUUCCCCUGAGAGUCCUCUCCAGAGUCCUGUGAUCUCCUUCUCCUCCUCCACUUCAUUG
AGCCCAUUCAGUGAAGAGUCCAGCAGCCCAGUAGAUGAAUAUACAAGUUCCUCAGACACCUUGCUAGAGAGU
GAUUCCUUGACAGACAGCGAGUCCUUGAUAGAGAGCGAGCCCUUGUUCACUUAUACACUGGAUGAAAAGGUG
GACGAGUUGGCGCGGUUUCUUCUCCUCAAAUAUCAAGUGAAGCAGCCUAUCACAAAGGCAGAGAUGCUGACG
AAUGUCAUCAGCAGGUACACGGGCUACUUUCCUGUGAUCUUCAGGAAAGCCCGUGAGUUCAUAGAGAUACUU
UUUGGCAUUUCCCUGAGAGAAGUGGACCCUGAUGACUCCUAUGUCUUUGUAAACACAUUAGACCUCACCUCU
GAGGGGUGUCUGAGUGAUGAGCAGGGCAUGUCCCAGAACCGCCUCCUGAUUCUUAUUCUGAGUAUCAUCUUC
AUAAAGGGCACCUAUGCCUCUGAGGAGGUCAUCUGGGAUGUGCUGAGUGGAAUAGGGGUGCGUGCUGGGAGG
GAGCACUUUGCCUUUGGGGAGCCCAGGGAGCUCCUCACUAAAGUUUGGGUGCAGGAACAUUACCUAGAGUAC
CGGGAGGUGCCCAACUCUUCUCCUCCUCGUUACGAAUUCCUGUGGGGUCCAAGAGCUCAUUCAGAAGUCAUU
AAGAGGAAAGUAGUAGAGUUUUUGGCCAUGCUAAAGAAUACCGUCCCUAUUACCUUUCCAUCCUCUUACAAG
GAUGCUUUGAAAGAUGUGGAAGAGAGAGCCCAGGCCAUAAUUGACACCACAGAUGAUUCGACUGCCACAGAA
AGUGCAAGCUCCAGUGUCAUGUCCCCCAGCUUCUCUUCUGAGUGA

Fig. 15

MAGE-C1 full-length CDS GC-optimized

AUGGGCGACAAGGACAUGCCCACCGCCGGGAUGCCGAGCCUGCUCCAGUCCAGCUCCGAGAGCCCCCAGUCC
UGCCCCGAGGGCGAGGACAGCCAGUCCCCCCUGCAGAUCCCGCAGAGCUCCCCCGAGAGCGACGACACCCUG
UACCCCCUCCAGUCCCCGCAGAGCCGGUCCGAGGGGGAGGACAGCUCCGACCCGCUGCAGCGCCCCCCCGAG
GGCAAGGACAGCCAGUCCCCGCUGCAGAUCCCGCAGAGCUCCCCCGAGGGGGACGACACGCAGAGCCCCCUC
CAGAACAGCCAGUCCAGCCCCGAGGGCAAGGACUCCCUGAGCCCGCUGGAGAUCUCCCAGAGCCCCCCCGAG
GGCGAGGACGUGCAGUCCCCGCUCCAGAACCCGGCCAGCUCCUUCUUCAGCUCCGCGCUGCUGAGCAUCUUC
CAGUCCAGCCCCGAGUCCACCCAGAGCCCCUUCGAGGGGUUCCCCCAGUCCGUCCUCCAGAUCCCGGUGAGC
GCCGCCUCCAGCAGCACCCUGGUGUCCAUCUUCCAGAGCUCCCCCGAGAGCACCCAGUCCCCCUUCGAGGGC
UUCCCCCAGAGCCCGCUGCAGAUCCCCGUGUCCCGGAGCUUCUCCAGCACGCUCCUGUCCAUCUUCCAGAGC
UCCCCCGAGCGCACCCAGAGCACCUUCGAGGGGUUCGCCCAGUCCCCGCUGCAGAUCCCCGUGAGCCCCUCC
AGCAGCUCCACCCUCCUGAGCCUGUUCCAGUCCUUCAGCGAGCGGACGCAGUCCACCUUCGAGGGCUUCGCC
CAGAGCUCCCUCCAGAUCCCCGUGAGCCCGUCCUUCAGCUCCACCCUGGUCAGCCUGUUCCAGUCCAGCCCC
GAGCGCACCCAGUCCACGUUCGAGGGGUUCCCCCAGAGCCCCCUCCAGAUCCCGGUGUCCAGCUCCAGCAGC
UCCACCCUGCUGAGCCUCUUCCAGUCCAGCCCCGAGCGGACCCACUCCACCUUCGAGGGCUUCCCCCAGAGC
CUGCUGCAGAUCCCCAUGACGUCCAGCUUCUCCAGCACCCUCCUGUCCAUCUUCCAGAGCUCCCCGGAGAGC
GCGCAGUCCACCUUCGAGGGCUUCCCCCAGAGCCCCCUGCAGAUCCCCGGGUCCCCGAGCUUCUCCAGCACC
CUCCUGAGCCUGUUCCAGUCCAGCCCCGAGCGCACGCACUCCACCUUCGAGGGCUUCCCCCAGAGCCCCUC
CAGAUCCCGAUGACCUCCAGCUUCUCCAGCACCCUGCUGUCCAUCCUCCAGAGCUCCCCCGAGAGCGCCCAG
UCCGCCUUCGAGGGGUUCCCCCAGAGCCCCCUGCAGAUCCCGGUGUCCAGCUCCUUCAGCUACACGCUGCUC
UCCCUGUUCCAGAGCAGCCCCGAGCGGACCCACUCCACCUUCGAGGGCUUCCCCCAGAGCCCGCUGCAGAUC
CCCGUGUCCAGCUCCAGCUCCAGCUCCACCCUCCUGAGCCUGUUCCAGUCCAGCCCCGAGUGCACGCAGUCC
ACCUUCGAGGGCUUCCCCCAGAGCCCGCUGCAGAUCCCCCAGUCCCCCCCCGAGGGGGAGAACACCCACAGC
CCGCUCCAGAUCGUGCCCCUCCCUGCCCGAGUGGGAGGACAGCCUGUCCCCGCACUACUUCCCGCAGAGCCCC
CCGCAGGGCGAGGACAGCCUCUCCCCCCACUACUUCCCGCAGAGCCCGCCCCAGGGGGAGGACUCCCUGAGC
CCCCACUACUUCCCGCAGUCCCCCCAGGGCGAGGACAGCCUGUCCCCGCACUACUUCCCCCAGAGCCCGCCC
CAGGGGGAGGACUCCAUGAGCCCCCUCUACUUCCCCCAGUCCCCGCUGCAGGGCGAGGAGUUCCAGAGCUCC
CUGCAGAGCCCCGUGUCCAUCUGCAGCUCCAGCACCCCCUCCAGCCUCCCGCAGAGCUUCCCCGAGUCCAGC
CAGUCCCCCCCCGAGGGCCCGGUCCAGAGCCCCCUGCACUCCCCGCAGAGCCCCCCGGAGGGGAUGCACUCC
CAGAGCCCCCUGCAGUCCCCCGAGAGCGCCCCCGAGGGCGAGGACUCCCUCAGCCCGCUGCAGAUCCCCCAG
UCCCCGCUGGAGGGGGAGGACAGCCUCUCCAGCCUGCACUUCCCCCAGUCCCCGCCCGAGUGGGAGGACAGC
CUGAGCCCCCUCCACUUCCCCCAGUUCCCGCCCCAGGGCGAGGACUUCCAGUCCAGCCUGCAGUCCCCCGUG
AGCAUCUGCUCCAGCUCCACGAGCCUGUCCCUCCCCCAGAGCUUCCCGGAGUCCCCCCAGAGCCCGCCCGAG
GGGCCGGCGCAGUCCCCCCUGCAGCGCCCCGUGAGCUCCUUCUUCAGCUACACCCUGGCCUCCCUCCUGCAG
AGCUCCCACGAGAGCCCGCAGAGCCCGCCCGAGGGCCCCGCCCAGUCCCCGCUGCAGAGCCCCGUGUCCAGC
UUCCCCUCCAGCACCUCCAGCUCCCUCAGCCAGUCCAGCCCCGUGUCCAGCUUCCCGUCCAGCACCUCCAGC
UCCCUGAGCAAGAGCUCCCCCGAGAGCCCCCUGCAGUCCCCCGUGAUCAGCUUCUCCAGCUCCACGAGCCUC
UCCCCGUUCAGCGAGGAGUCCAGCUCCCCCGUCGACGAGUACACCAGCUCCAGCGACACCCUGCUGGAGUCC
GACAGCCUCACCGACUCCGAGAGCCUGAUCGAGAGCGAGCCCCUGUUCACCUACACGCUCGACGAGAAGGUG
GACGAGCUGGCCCGGUUCCUGCUCCUGAAGUACCAGGUGAAGCAGCCCAUCACCAAGGCCGAGAUGCUGACC
AACGUCAUCUCCCGCUACACCGGCUACUUCCCGGUGAUCUUCCGGAAGGCGCGCGAGUUCAUCGAGAUCCUC
UUCGGGAUCAGCCUGCGGGAGGUGGACCCCGACGACUCCUACGUCUUCGUGAACACGCUGGACCUCACCAGC
GAGGGCUGCCUGUCCGACGAGCAGGGGAUGAGCCAGAACCGCCUGCUCAUCCUGAUCCUGUCCAUCAUCUUC
AUCAAGGGCACCUACGCCAGCGAGGAGGUCAUCUGGGACGUGCUCUCCGGGAUCGGCGUGCGGGCCGGCCGC
GAGCACUUCGCCUUCGGGGAGCCCCGGGAGCUGCUGACCAAGGUCUGGGUGCAGGAGCACUACCUCGAGUAC
CGCGAGGUGCCCAACAGCUCCCCGCCCCGGUACGAGUUCCUGUGGGGCCCCCGCGCCCACAGCGAGGUCAUC
AAGCGGAAGGUGGUGGAGUUCCUGGCGAUGCUCAAGAACACGGUCCCCAUCACCUUCCCGUCCAGCUACAAG
GACGCCCUGAAGGACGUGGAGGAGCGGGCCCAGGCCAUCAUCGACACCACCGACGACUCCACGGCCACCGAG
AGCGCGUCCAGCUCCGUGAUGAGCCCCAGCUUCUCCAGCGAGUGA

Fig. 16

MAGE-C1 (aa 613-1142) CDS GC-optimized

AUGCAGUCCCCGCUGCAGGGCGAGGAGUUCCAGAGCUCCCUGCAGAGCCCCGUGUCCAUC
UGCAGCUCCAGCACCCCCUCCAGCCUCCCGCAGAGCUUCCCCGAGUCCAGCCAGUCCCCC
CCCGAGGGCCCGGUCCAGAGCCCCCUGCACUCCCCGCAGAGCCCCCCGGAGGGGAUGCAC
UCCCAGAGCCCCCUGCAGUCCCCCGAGAGCGCCCCCGAGGGCGAGGACUCCCUCAGCCCG
CUGCAGAUCCCCCAGUCCCCGCUGGAGGGGGAGGACAGCCUCUCCAGCCUGCACUUCCCC
CAGUCCCCGCCCGAGUGGGAGGACAGCCUGAGCCCCCUCCACUUCCCCCAGUUCCCGCCC
CAGGGCGAGGACUUCCAGUCCAGCCUGCAGUCCCCCGUGAGCAUCUGCUCCAGCUCCACG
AGCCUGUCCCUCCCCCAGAGCUUCCCGGAGUCCCCCCCAGAGCCCGCCCGAGGGGCCGGCG
CAGUCCCCCCUGCAGCGCCCCGUGAGCUCCUUCUUCAGCUACACCCUGGCCUCCCCUCCUG
CAGAGCUCCCACGAGAGCCCGCAGAGCCCGCCCGAGGGCCCCGCCCAGUCCCCGCUGCAG
AGCCCCGUGUCCAGCUUCCCCUCCAGCACCUCCAGCUCCCUCAGCCAGUCCAGCCCCGUG
UCCAGCUUCCCGUCCAGCACCUCCAGCUCCCUGAGCAAGAGCUCCCCCGAGAGCCCCCUG
CAGUCCCCCGUGAUCAGCUUCUCCAGCUCCACGAGCCUCUCCCCGUUCAGCGAGGAGUCC
AGCUCCCCCGUCGACGAGUACACCAGCUCCAGCGACACCCUGCUGGAGUCCGACAGCCUC
ACCGACUCCGAGAGCCUGAUCGAGAGCGAGCCCCUGUUCACCUACACGCUCGACGAGAAG
GUGGACGAGCUGGCCCGGUUCCUGCUCCUGAAGUACCAGGUGAAGCAGCCCAUCACCAAG
GCCGAGAUGCUGACCAACGUCAUCUCCCGCUACACCGGCUACUUCCCGGUGAUCUUCCGG
AAGGCGCGCGAGUUCAUCGAGAUCCUCUUCGGGAUCAGCCUGCGGGAGGUGGACCCCGAC
GACUCCUACGUCUUCGUGAACACGCUGGACCUCACCAGCGAGGGCUGCCUGUCCGACGAG
CAGGGGAUGAGCCAGAACCGCCUGCUCAUCCUGAUCCUGUCCAUCAUCUUCAUCAAGGGC
ACCUACGCCAGCGAGGAGGUCAUCUGGGACGUGCUCUCCGGGAUCGGCGUGCGGGCCGGC
CGCGAGCACUUCGCCUUCGGGGAGCCCCGGGAGCUGCUGACCAAGGUCUGGGUGCAGGAG
CACUACCUCGAGUACCGCGAGGUGCCCAACAGCUCCCCGCCCCGGUACGAGUUCCUGUGG
GGCCCCCGCGCCCACAGCGAGGUCAUCAAGCGGAAGGUGGUGGAGUUCCUGGCGAUGCUC
AAGAACACGGUCCCCAUCACCUUCCCGUCCAGCUACAAGGACGCCCUGAAGGACGUGGAG
GAGCGGGCCCAGGCCAUCAUCGACACCACCGACGACUCCACGGCCACCGAGAGCGCGUCC
AGCUCCGUGAUGAGCCCCAGCUUCUCCAGCGAGUGA

Fig. 17

MAGE-C2 (GC)-muag-A64-C30

GGGAGAAAGCUUACCAUGCCCCCGGUGCCCGGCGUCCCCUUCCGGAACGUGGACAACGAC
AGCCCCACCUCCGUGGAGCUGGAGGACUGGGUCGACGCCCAGCACCCGACCGACGAGGAG
GAGGAGGAGGCCAGCUCCGCGAGCUCCACGCUCUACCUGGUGUUCAGCCCCUCCAGCUUC
UCCACCAGCUCCAGCCUGAUCCUCGGGGGCCCCGAGGAGGAGGAGGUGCCCUCCGGGGUC
AUCCCGAACCUGACCGAGAGCAUCCCCUCCAGCCCCCCGCAGGGCCCGCCCCAGGGGCCC
UCCCAGAGCCCCCUGUCCAGCUGCUGCAGCUCCUUCAGCUGGUCCAGCUUCUCCGAGGAG
AGCUCCAGCCAGAAGGGCGAGGACACCGGCACGUGCCAGGGGCUCCCGGACUCCGAGAGC
UCCUUCACCUACACCCUGGACGAGAAGGUGGCCGAGCUGGUGGAGUUCCUCCUGCUGAAG
UACGAGGCCGAGGAGCCCGUCACCGAGGCCGAGAUGCUCAUGAUCGUGAUCAAGUACAAG
GACUACUUCCCCGUGAUCCUGAAGCGCGCCCGGGAGUUCAUGGAGCUGCUCUUCGGCCUG
GCGCUGAUCGAGGUCGGGCCCGACCACUUCUGCGUGUUCGCCAACACGGUGGGCCUCACC
GACGAGGGGAGCGACGACGAGGGCAUGCCGGAGAACUCCCUGCUGAUCAUCAUCCUCAGC
GUCAUCUUCAUCAAGGGCAACUGCGCCUCCGAGGAGGUGAUCUGGGAGGUGCUGAACGCC
GUCGGGGUGUACGCGGGCCGCGAGCACUUCGUGUACGGGGAGCCCCGGGAGCUGCUCACC
AAGGUCUGGGUGCAGGGCCACUACCUGGAGUACCGCGAGGUGCCGCACAGCUCCCCCCCG
UACUACGAGUUCCUGUGGGGCCCCCGGGCCCACAGCGAGUCCAUCAAGAAGAAGGUCCUC
GAGUUCCUGGCCAAGCUGAACAACACCGUGCCCAGCAGCUUCCCCUCCUGGUACAAGGAC
GCCCUCAAGGACGUCGAGGAGCGCGUGCAGGCCACGAUCGACACCGCGGACGACGCCACC
GUGAUGGCCAGCGAGUCCCUGAGCGUCAUGUCCAGCAACGUGUCCUUCAGCGAGUGACCA
CUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACGGGCCCUCCUCCCCUCCUUGCA
CCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAUAUUCCCCCCCCCCCCCCCCCCCCCCCCCCCCCUCUAGACAAUU
GGAAUU

Fig. 18

MAGE-C2 (GC)-muag-A64-C30-histoneSL

GGGAGAAAGCUUACCAUGCCCCCGGUGCCCGGCGUCCCCUUCCGGAACGUGGACAACGAC
AGCCCCACCUCCGUGGAGCUGGAGGACUGGGUCGACGCCCAGCACCCGACCGACGAGGAG
GAGGAGGAGGCCAGCUCCGCGAGCUCCACGCUCUACCUGGUGUUCAGCCCCUCCAGCUUC
UCCACCAGCUCCAGCCUGAUCCUCGGGGGCCCCGAGGAGGAGGAGGUGCCCUCCGGGGUC
AUCCCGAACCUGACCGAGAGCAUCCCCUCCAGCCCCCCGCAGGGCCCGCCCCAGGGGCCC
UCCCAGAGCCCCCUGUCCAGCUGCUGCAGCUCCUUCAGCUGGUCCAGCUUCUCCGAGGAG
AGCUCCAGCCAGAAGGGCGAGGACACCGGCACGUGCCAGGGGCUCCCGGACUCCGAGAGC
UCCUUCACCUACACCCUGGACGAGAAGGUGGCCGAGCUGGUGGAGUUCCUCCUGCUGAAG
UACGAGGCCGAGGAGCCCGUCACCGAGGCCGAGAUGCUCAUGAUCGUGAUCAAGUACAAG
GACUACUUCCCCGUGAUCCUGAAGCGCGCCCGGGAGUUCAUGGAGCUGCUCUUCGGCCUG
GCGCUGAUCGAGGUCGGGCCCGACCACUUCUGCGUGUUCGCCAACACGGUGGGCCUCACC
GACGAGGGGAGCGACGACGAGGGCAUGCCGGAGAACUCCCUGCUGAUCAUCAUCCUCAGC
GUCAUCUUCAUCAAGGGCAACUGCGCCUCCGAGGAGGUGAUCUGGGAGGUGCUGAACGCC
GUCGGGGUGUACGCGGGCCGCGAGCACUUCGUGUACGGGGAGCCCCGGGAGCUGCUCACC
AAGGUCUGGGUGCAGGGCCACUACCUGGAGUACCGCGAGGUGCCGCACAGCUCCCCCCCG
UACUACGAGUUCCUGUGGGGCCCCCGGGCCCACAGCGAGUCCAUCAAGAAGAAGGUCCUC
GAGUUCCUGGCCAAGCUGAACAACACCGUGCCCAGCAGCUUCCCCUCCUGGUACAAGGAC
GCCCUCAAGGACGUCGAGGAGCGCGUGCAGGCCACGAUCGACACCGCGGACGACGCCACC
GUGAUGGCCAGCGAGUCCCUGAGCGUCAUGUCCAGCAACGUGUCCUUCAGCGAGUGACCA
CUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACGGGCCCUCCUCCCCCUCCUUGCA
CCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAUGCAUCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCAAAGGCUCU
UUUCAGAGCCACCAGAAUU

Fig. 19

MAGE-C2 CDS wild type

AUGCCUCCCGUUCCAGGCGUUCCAUUCCGCAACGUUGACAACGACUCCCCGACCUCAGUU
GAGUUAGAAGACUGGGUAGAUGCACAGCAUCCCACAGAUGAGGAAGAGGAGGAAGCCUCC
UCCGCCUCUUCCACUUUGUACUUAGUAUUUUCCCCCUCUUCUUUCUCCACAUCCUCUUCU
CUGAUUCUUGGUGGUCCUGAGGAGGAGGAGGUGCCCUCUGGUGUGAUACCAAAUCUUACC
GAGAGCAUUCCCAGUAGUCCUCCACAGGGUCCUCCACAGGGUCCUUCCCAGAGUCCUCUG
AGCUCCUGCUGCUCCUCUUUUUCAUGGAGCUCAUUCAGUGAGGAGUCCAGCAGCCAGAAA
GGGGAGGAUACAGGCACCUGUCAGGGCCUGCCAGACAGUGAGUCCUCUUUCACAUAUACA
CUAGAUGAAAAGGUGGCCGAGUUAGUGGAGUUCCUGCUCCUCAAAUACGAAGCAGAGGAG
CCUGUAACAGAGGCAGAGAUGCUGAUGAUUGUCAUCAAGUACAAAGAUUACUUUCCUGUG
AUACUCAAGAGAGCCCGUGAGUUCAUGGAGCUUCUUUUUGGCCUUGCCCUGAUAGAAGUG
GGCCCUGACCACUUCUGUGUGUUUGCAAACACAGUAGGCCUCACCGAUGAGGGUAGUGAU
GAUGAGGGCAUGCCCGAGAACAGCCUCCUGAUUAUUAUUCUGAGUGUGAUCUUCAUAAAG
GGCAACUGUGCCUCUGAGGAGGUCAUCUGGGAAGUGCUGAAUGCAGUAGGGGUAUAUGCU
GGGAGGGAGCACUUCGUCUAUGGGGAGCCUAGGGAGCUCCUCACUAAAGUUUGGGUGCAG
GGACAUUACCUGGAGUAUCGGGAGGUGCCCCACAGUUCUCCUCCAUAUUAUGAAUUCCUG
UGGGGUCCAAGAGCCCAUUCAGAAAGCAUCAAGAAGAAAGUACUAGAGUUUUUAGCCAAG
CUGAACAACACUGUUCCUAGUUCCUUUCCAUCCUGGUACAAGGAUGCUUUGAAAGAUGUG
GAAGAGAGAGUCCAGGCCACAAUUGAUACCGCAGAUGAUGCCACUGUCAUGGCCAGUGAA
AGCCUCAGUGUCAUGUCCAGCAACGUCUCCUUUUCUGAGUGA

Fig. 20

MAGE-C2 CDS GC-optimized

AUGCCCCCGGUGCCCGGCGUCCCCUUCCGGAACGUGGACAACGACAGCCCCACCUCCGUG
GAGCUGGAGGACUGGGUCGACGCCCAGCACCCGACCGACGAGGAGGAGGAGGAGGCCAGC
UCCGCGAGCUCCACGCUCUACCUGGUGUUCAGCCCCUCCAGCUUCUCCACCAGCUCCAGC
CUGAUCCUCGGGGGCCCCGAGGAGGAGGAGGUGCCCUCCGGGGUCAUCCCGAACCUGACC
GAGAGCAUCCCCUCCAGCCCCCCGCAGGGCCCGCCCCAGGGGCCCUCCCAGAGCCCCCUG
UCCAGCUGCUGCAGCUCCUUCAGCUGGUCCAGCUUCUCCGAGGAGAGCUCCAGCCAGAAG
GGCGAGGACACCGGCACGUGCCAGGGGCUCCCGGACUCCGAGAGCUCCUUCACCUACACC
CUGGACGAGAAGGUGGCCGAGCUGGUGGAGUUCCUCCUGCUGAAGUACGAGGCCGAGGAG
CCCGUCACCGAGGCCGAGAUGCUCAUGAUCGUGAUCAAGUACAAGGACUACUUCCCCGUG
AUCCUGAAGCGCGCCCGGGAGUUCAUGGAGCUGCUCUUCGGCCUGGCGCUGAUCGAGGUC
GGGCCCGACCACUUCUGCGUGUUCGCCAACACGGUGGGCCUCACCGACGAGGGGAGCGAC
GACGAGGGCAUGCCGGAGAACUCCCUGCUGAUCAUCAUCCUCAGCGUCAUCUUCAUCAAG
GGCAACUGCGCCUCCGAGGAGGUGAUCUGGGAGGUGCUGAACGCCGUCGGGGUGUACGCG
GGCCGCGAGCACUUCGUGUACGGGGAGCCCCGGGAGCUGCUCACCAAGGUCUGGGUGCAG
GGCCACUACCUGGAGUACCGCGAGGUGCCGCACAGCUCCCCCCCGUACUACGAGUUCCUG
UGGGGCCCCCGGGCCCACAGCGAGUCCAUCAAGAAGAAGGUCCUCGAGUUCCUGGCCAAG
CUGAACAACACCGUGCCCAGCAGCUUCCCCUCCUGGUACAAGGACGCCCUCAAGGACGUC
GAGGAGCGCGUGCAGGCCACGAUCGACACCGCGGACGACGCCACCGUGAUGGCCAGCGAG
UCCCUGAGCGUCAUGUCCAGCAACGUGUCCUUCAGCGAGUGA

Fig. 21

MUC1 5×VNTR (GC)-muag-A64-C30

GGGAGAAAGCUUACCAUGACCCCCGGCACCCAGAGCCCGUUCUUCCUGCUCCUGCUGCUC
ACGGUGCUGACCGUCGUGACCGGGUCCGGCCACGCCAGCUCCACCCCCGGGGGCGAGAAG
GAGACGAGCGCCACCCAGCGGUCCAGCGUGCCCUCCAGCACCGAGAAGAACGCGGUCUCC
AUGACCAGCUCCGUGCUGAGCUCCCACAGCCCCGGGUCCGGCAGCUCCACGACCCAGGGC
CAGGACGUGACCCUCGCCCCGGCCACCGAGCCCGCCAGCGGGUCCGCCGCGACGUGGGGC
CAGGACGUCACCAGCGUGCCCGUGACCCGCCCCGCCCUGGGGAGCACCACGCCGCCCGCC
CACGACGUCACCUCCGCCCCCGACAACAAGCCCGCGCCGGGCAGCACCGCCCCCCCCGCC
CACGGGGUGACCUCCGCCCCCGACACGCGGCCGGCCCCCGGCAGCACCGCGCCCCCCGCC
CACGGCGUGACCUCCGCCCCGGACACCCGCCCCGCCCCCGGGAGCACGGCCCCGCCGGCG
CACGGCGUCACCUCCGCCCCCGACACCCGGCCCGCCCCCGGGAGCACCGCCCCGCCCGCC
CACGGCGUGACGUCCGCGCCCGACACCCGCCCGGCCCCCGGCAGCACCGCCCCCCCCGCC
CACGGGGUGACCUCCGCCCCGGACACGCGGCCCGCGCCCGGCAGCACCGCCCCGCCGGCC
CACGGGGUCACCUCCGCGCCCGACAACCGCCCCGCCCUGGGGAGCACCGCCCCGCCCGUG
CACAACGUGACCUCCGCCAGCGGCUCCGCGAGCGGGUCCGCCAGCACCCUCGUCCACAAC
GGCACGUCCGCCCGGGCCACCACCACCCCCGCCAGCAAGUCCACGCCCUUCAGCAUCCCG
UCCCACCACAGCGACACCCCCACCACCCUGGCGUCCCACAGCACGAAGACCGACGCCUCC
AGCACCCACCACUCCAGCGUGCCCCCGCUGACCAGCUCCAACCACAGCACGUCCCCGCAG
CUCAGCACCGGGGUGUCCUUCUUCUUCCUGAGCUUCCACAUCUCCAACCUGCAGUUCAAC
AGCUCCCUCGAGGACCCCAGCACCGACUACUACCAGGAGCUGCAGCGGGACAUCUCCGAG
AUGUUCCUGCAGAUCUACAAGCAGGGCGGCUUCCUCGGGCUGAGCAACAUCAAGUUCCGC
CCCGGCUCCGUCGUGGUGCAGCUGACCCUCGCCUUCCGGGAGGGGACGAUCAACGUCCAC
GACGUGGAGACCCAGUUCAACCAGUACAAGACCGAGGCCGCCAGCCGCUACAACCUGACC
AUCUCCGACGUGAGCGUCUCCGACGUGCCCUUCCCGUUCAGCGCGCAGUCCGGCGCCGGC
GUGCCCGGGUGGGGCAUCGCCCUGCUCGUCCUGGUGUGCGUGCUGGUCGCCCUCGCCAUC
GUGUACCUGAUCGCGCUGGCCGUGUGCCAGUGCCGGCGCAAGAACUACGGGCAGCUCGAC
AUCUUCCCCGCCCGGGACACGUACCACCCGAUGAGCGAGUACCCGACCUACCACACCCAC
GGCCGCUACGUCCCCCCCAGCUCCACCGACCGGAGCCCCUACGAGAAGGUGUCCGCCGGG
AACGGCGGCAGCUCCCUGAGCUACACCAACCCGGCGGUGGCCGCCGCCUCCGCCAACCUG
UGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACGGGCCCUCCUCCCCUC
CUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAUAUUCCCCCCCCCCCCCCCCCCCCCCCCCCCCCUCUAG

Fig. 22

MUC1 5×VNTR (GC)-muag-A64-C30-histoneSL

GGGAGAAAGCUUACCAUGACCCCCGGCACCCAGAGCCCGUUCUUCCUGCUCCUGCUGCUC
ACGGUGCUGACCGUCGUGACCGGGUCCGGCCACGCCAGCUCCACCCCCGGGGGCGAGAAG
GAGACGAGCGCCACCCAGCGGUCCAGCGUGCCCUCCAGCACCGAGAAGAACGCGGUCUCC
AUGACCAGCUCCGUGCUGAGCUCCCACAGCCCCGGGUCCGGCAGCUCCACGACCCAGGGC
CAGGACGUGACCCUCGCCCCGGCCACCGAGCCCGCCAGCGGGUCCGCCGCGACGUGGGGC
CAGGACGUCACCAGCGUGCCCGUGACCCGCCCCGCCCUGGGGAGCACCACGCCGCCCGCC
CACGACGUCACCUCCGCCCCCGACAACAAGCCCGCGCCGGGCAGCACCGCCCCCCCCGCC
CACGGGGUGACCUCCGCCCCCGACACGCGGCCGGCCCCCGGCAGCACCGCGCCCCCCGCC
CACGGCGUGACCUCCGCCCCGGACACCCGCCCCGCCCCCGGGAGCACGGCCCCGCCGGCG
CACGGCGUCACCUCCGCCCCCGACACCCGGCCCGCCCCCGGGAGCACCGCCCCGCCCGCC
CACGGCGUGACGUCCGCGCCCGACACCCGCCCGGCCCCCGGCAGCACCGCCCCCCCCGCC
CACGGGGUGACCUCCGCCCCGGACACGCGGCCCGCGCCCGGCAGCACCGCCCCGCCGGCC
CACGGGGUCACCUCCGCGCCCGACAACCGCCCCGCCCUGGGGAGCACCGCCCCGCCCGUG
CACAACGUGACCUCCGCCAGCGGCUCCGCGAGCGGGUCCGCCAGCACCCUCGUCCACAAC
GGCACGUCCGCCCGGGCCACCACCACCCCCGCCAGCAAGUCCACGCCCUUCAGCAUCCCG
UCCCACCACAGCGACACCCCCACCACCCUGGCGUCCCACAGCACGAAGACCGACGCCUCC
AGCACCCACCACUCCAGCGUGCCCCCGCUGACCAGCUCCAACCACAGCACGUCCCCGCAG
CUCAGCACCGGGGUGUCCUUCUUCUUCCUGAGCUUCCACAUCUCCAACCUGCAGUUCAAC
AGCUCCCUCGAGGACCCCAGCACCGACUACUACCAGGAGCUGCAGCGGGACAUCUCCGAG
AUGUUCCUGCAGAUCUACAAGCAGGGCGGCUUCCUCGGGCUGAGCAACAUCAAGUUCCGC
CCCGGCUCCGUCGUGGUGCAGCUGACCCUCGCCUUCCGGGAGGGGACGAUCAACGUCCAC
GACGUGGAGACCCAGUUCAACCAGUACAAGACCGAGGCCGCCAGCCGCUACAACCUGACC
AUCUCCGACGUGAGCGUCUCCGACGUGCCCUUCCCGUUCAGCGCGCAGUCCGGCGCCGGC
GUGCCCGGGUGGGGCAUCGCCCUGCUCGUCCUGGUGUGCGUGCUGGUCGCCCUCGCCAUC
GUGUACCUGAUCGCGCUGGCCGUGUGCCAGUGCCGGCGCAAGAACUACGGGCAGCUCGAC
AUCUUCCCCGCCCGGGACACGUACCACCCGAUGAGCGAGUACCCGACCUACCACACCCAC
GGCCGCUACGUCCCCCCCCAGCUCCACCGACCGGAGCCCCUACGAGAAGGUGUCCGCCGGG
AACGGCGGCAGCUCCCUGAGCUACACCAACCCGGCGGUGGCCGCCGCCUCCGCCAACCUG
UGACCACUAGUUAUAAGACUGACUAGCCCGAUGGGCCUCCCAACGGGCCCUCCUCCCCUC
CUUGCACCGAGAUUAAUAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAUGCAUCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCAAA
GGCUCUUUUCAGAGCCACCAGAAUU

Fig. 23

Muc1-5×VNTR CDS wild type

AUGACACCGGGCACCCAGUCUCCUUUCUUCCUGCUGCUGCUCCUCACAGUGCUUACAGUU
GUUACAGGUUCUGGUCAUGCAAGCUCUACCCCAGGUGGAGAAAAGGAGACUUCGGCUACC
CAGAGAAGUUCAGUGCCCAGCUCUACUGAGAAGAAUGCUGUGAGUAUGACCAGCAGCGUA
CUCUCCAGCCACAGCCCCGGUUCAGGCUCCUCCACCACUCAGGGACAGGAUGUCACUCUG
GCCCCGGCCACGGAACCAGCUUCAGGUUCAGCUGCCACCUGGGGACAGGAUGUCACCUCG
GUCCCAGUCACCAGGCCAGCCCUGGGCUCCACCACCCCGCCAGCCCACGAUGUCACCUCA
GCCCCGGACAACAAGCCAGCCCCGGGCUCCACCGCCCCCCCAGCCCACGGUGUCACCUCG
GCCCCGGACACCAGGCCGGCCCCGGGCUCCACCGCCCCCCCAGCCCACGGUGUCACCUCG
GCCCCGGACACCAGGCCGGCCCCGGGCUCCACCGCCCCCCCAGCCCACGGUGUCACCUCG
GCCCCGGACACCAGGCCGGCCCCGGGCUCCACCGCCCCCCCAGCCCACGGUGUCACCUCG
GCCCCGGACACCAGGCCGGCCCCGGGCUCCACCGCCCCCCCAGCCCACGGUGUCACCUCG
GCCCCGGACACCAGGCCGGCCCCGGGCUCCACCGCCCCCCCAGCCCACGGUGUCACCUCG
GCCCCGGACAACAGGCCCGCCUUGGGCUCCACCGCCCCUCCAGUCCACAAUGUCACCUCG
GCCUCAGGCUCUGCAUCAGGCUCAGCUUCUACUCUGGUGCACAACGGCACCUCUGCCAGG
GCUACCACAACCCCAGCCAGCAAGAGCACUCCAUUCUCAAUUCCCAGCCACCACUCUGAU
ACUCCUACCACCCUUGCCAGCCAUAGCACCAAGACUGAUGCCAGUAGCACUCACCAUAGC
UCGGUACCUCCUCUCACCUCCUCCAAUCACAGCACUUCUCCCCAGUUGUCUACUGGGGUC
UCUUUCUUUUUCCUGUCUUUUCACAUUUCAAACCUCCAGUUUAAUUCCUCUCUGGAAGAU
CCCAGCACCGACUACUACCAAGAGCUGCAGAGAGACAUUUCUGAAAUGUUUUUGCAGAUU
UAUAAACAAGGGGGUUUUCUGGGCCUCUCCAAUAUUAAGUUCAGGCCAGGAUCUGUGGUG
GUACAAUUGACUCUGGCCUUCCGAGAAGGUACCAUCAAUGUCCACGACGUGGAGACACAG
UUCAAUCAGUAUAAAACGGAAGCAGCCUCUCGAUAUAACCUGACGAUCUCAGACGUCAGC
GUGAGUGAUGUGCCAUUUCCUUUCUCUGCCCAGUCUGGGGCUGGGGUGCCAGGCUGGGGC
AUCGCGCUGCUGGUGCUGGUCUGUGUUCUGGUUGCGCUGGCCAUUGUCUAUCUCAUUGCC
UUGGCUGUCUGUCAGUGCCGCCGAAAGAACUACGGGCAGCUGGACAUCUUUCCAGCCCGG
GAUACCUACCAUCCUAUGAGCGAGUACCCCACCUACCACACCCAUGGGCGCUAUGUGCCC
CCUAGCAGUACCGAUCGUAGCCCCUAUGAGAAGGUUUCUGCAGGUAACGGUGGCAGCAGC
CUCUCUUACACAAACCCAGCAGUGGCAGCCGCUUCUGCCAACUUGUAG

Fig. 24

MUC1-5×VNTR CDS GC-OPTIMIZED

AUGACCCCCGGCACCCAGAGCCCGUUCUUCCUGCUCCUGCUGCUCACGGUGCUGACCGUC
GUGACCGGGUCCGGCCACGCCAGCUCCACCCCCGGGGGCGAGAAGGAGACGAGCGCCACC
CAGCGGUCCAGCGUGCCCUCCAGCACCGAGAAGAACGCGGUCUCCAUGACCAGCUCCGUG
CUGAGCUCCCACAGCCCCGGGUCCGGCAGCUCCACGACCCAGGGCCAGGACGUGACCCUC
GCCCCGGCCACCGAGCCCGCCAGCGGGUCCGCCGCGACGUGGGGCCAGGACGUCACCAGC
GUGCCCGUGACCCGCCCCGCCCUGGGGAGCACCACGCCGCCCGCCCACGACGUCACCUCC
GCCCCCGACAACAAGCCCGCGCCGGGCAGCACCGCCCCCCCCGCCCACGGGGUGACCUCC
GCCCCCGACACGCGGCCGGCCCCCGGCAGCACCGCGCCCCCCGCCCACGGCGUGACCUCC
GCCCCGGACACCCGCCCCGCCCCCGGGAGCACGGCCCCGCCGGCGCACGGCGUCACCUCC
GCCCCCGACACCCGGCCCGCCCCCGGGAGCACCGCCCCGCCCGCCCACGGCGUGACGUCC
GCGCCCGACACCCGCCCGGCCCCCGGCAGCACCGCCCCCCCCGCCCACGGGGUGACCUCC
GCCCCGGACACGCGGCCCGCGCCCGGCAGCACCGCCCCGCCGGCCCACGGGGUCACCUCC
GCGCCCGACAACCGCCCCGCCCUGGGGAGCACCGCCCCGCCCGUGCACAACGUGACCUCC
GCCAGCGGCUCCGCGAGCGGGUCCGCCAGCACCCUCGUCCACAACGGCACGUCCGCCCGG
GCCACCACCACCCCCGCCAGCAAGUCCACGCCCUUCAGCAUCCCGUCCCACCACAGCGAC
ACCCCCACCACCCUGGCGUCCCACAGCACGAAGACCGACGCCUCCAGCACCCACCACUCC
AGCGUGCCCCCGCUGACCAGCUCCAACCACAGCACGUCCCCGCAGCUCAGCACCGGGGUG
UCCUUCUUCUUCCUGAGCUUCCACAUCUCCAACCUGCAGUUCAACAGCUCCCUCGAGGAC
CCCAGCACCGACUACUACCAGGAGCUGCAGCGGGACAUCUCCGAGAUGUUCCUGCAGAUC
UACAAGCAGGGCGGCUUCCUCGGGCUGAGCAACAUCAAGUUCCGCCCCGGCUCCGUCGUG
GUGCAGCUGACCCUCGCCUUCCGGGAGGGGACGAUCAACGUCCACGACGUGGAGACCCAG
UUCAACCAGUACAAGACCGAGGCCGCCAGCCGCUACAACCUGACCAUCUCCGACGUGAGC
GUCUCCGACGUGCCCUUCCCGUUCAGCGCGCAGUCCGGCGCCGGCGUGCCCGGGUGGGGC
AUCGCCCUGCUCGUCCUGGUGUGCGUGCUGGUCGCCCUCGCCAUCGUGUACCUGAUCGCG
CUGGCCGUGUGCCAGUGCCGGCGCAAGAACUACGGGCAGCUCGACAUCUUCCCCGCCCGG
GACACGUACCACCCGAUGAGCGAGUACCCGACCUACCACACCCACGGCCGCUACGUCCCC
CCCAGCUCCACCGACCGGAGCCCCUACGAGAAGGUGUCCGCCGGGAACGGCGGCAGCUCC
CUGAGCUACACCAACCCGGCGGUGGCCGCCGCCUCCGCCAACCUGUGA

Fig. 25

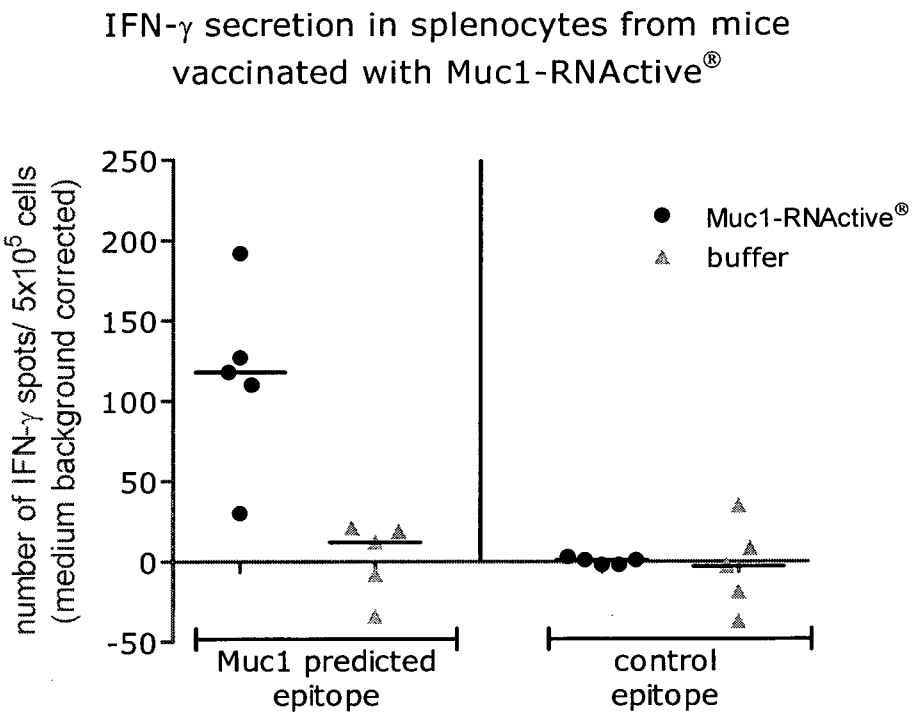

IFN-γ secretion in splenocytes from mice vaccinated with Muc1-RNActive®
number of IFN-γ spots/ 5x10^5 cells (medium background corrected)
250
200
150
100
50
0
-50
Muc1-RNActive®
buffer
Muc1 predicted epitope
control epitope

Fig. 26

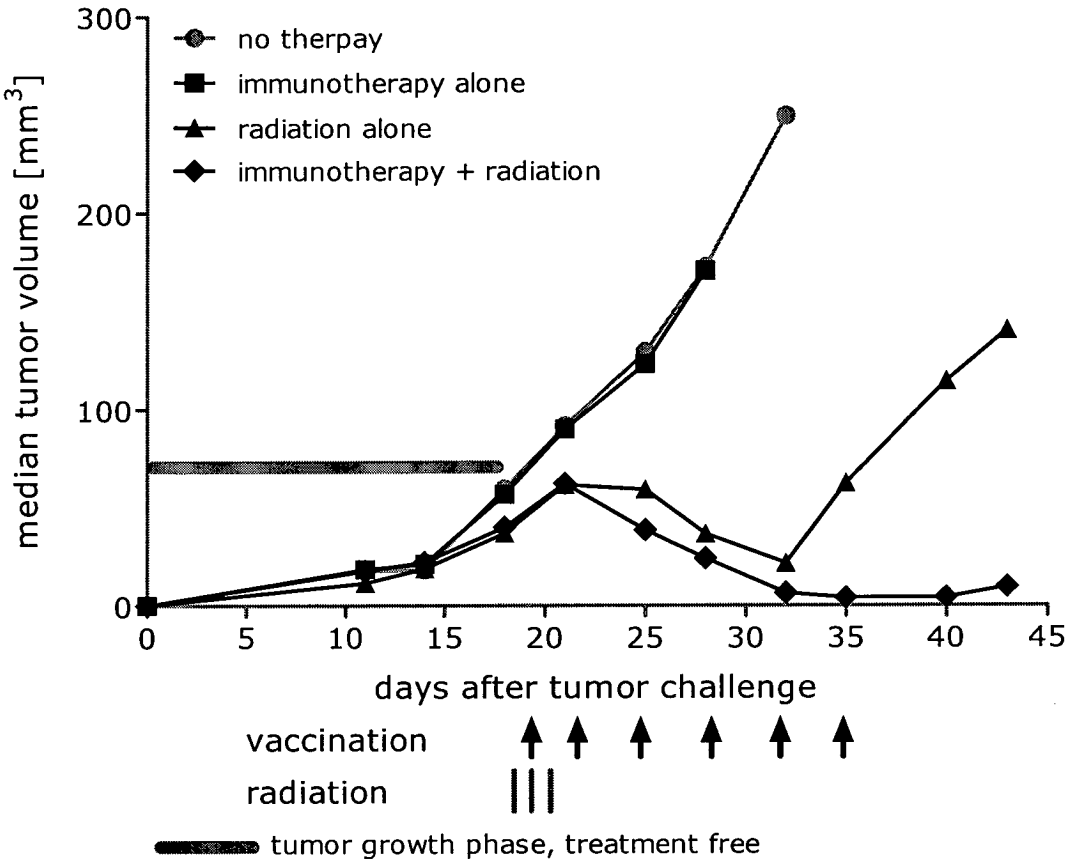

300
200
100
0
median tumor volume [mm3]
no therpay
immunotherapy alone
radiation alone
immunotherapy + radiation
0
5
10
15
20
25
30
35
40
45
days after tumor challenge
vaccination
radiation
tumor growth phase, treatment free

Fig. 27

5T4 Protein NP_001159864.1:

mpggcsrgpa agdgrlrlar lalvllgwvs sssptssass fsssapflas avsaqpplpd
qcpalcecse aartvkcvnr nltevptdlp ayvrnlfltg nqlavlpaga farrpplael
aalnlsgsrl devragafeh lpslrqldls hnpladlspf afsgsnasvs apsplvelil
nhivppeder qnrsfegmvv aallagralq glrrlelasn hflylprdvl aqlpslrhld
lsnnslvslt yvsfrnlthl eslhlednal kvlhngtlae lqglphirvf ldnnpwvcdc
hmadmvtwlk etevvqgkdr ltcaypekmr nrvllelnsa dldcdpilpp slqtsyvflg
ivlaligaif llvlylnrkg ikkwmhnird acrdhmegyh yryeinadpr ltnlssnsdv

Fig. 28

Survivin (BIRC5) Protein O15392:

MGAPTLPPAWQPFLKDHRISTFKNWPFLEGCACTPERMAEAGFIHCPTENEPDLAQCFFC
FKELEGWEPDDDPIEEHKKHSSGCAFLSVKKQFEELTLGEFLKLDRERAKNKIAKETNNK
KKEFEETAKKVRRAIEQLAAMD

Fig. 29

Survivin (BIRC5) Protein NP_001159.2:

mgaptlppaw qpflkdhris tfknwpfleg cactpermae agfihcpten epdlaqcffc fkelegwepd ddpieehkkh ssgcaflsvk kqfeeltlge flkldrerak nkiaketnnk kkefeetaek vrraieqlaa md

Fig. 30

NY-ESO-1 Protein NP_001318.1:

mqaegrgtgg stgdadgpgg pgipdgpggn aggpgeagat ggrgprgaga arasgpggga
prgphggaas glngccrcga rgpesrllef ylampfatpm eaelarrsla qdapplpvpg
vllkeftvsg niltirltaa dhrqlqlsis sclqqlsllm witqcflpvf laqppsgqrr

Fig. 31

MAGE-C1 Protein NP_005453.2:

mgdkdmptag mpsllqssse spqscpeged sqsplqipqs spesddtlyp lqspqsrseg
edssdplqrp pegkdsqspl qipqsspegd dtqsplqnsq sspegkdsls pleisqsppe
gedvqsplqn passffssal lsifqsspes tqspfegfpq svlqipvsaa ssstlvsifq
sspestqspf egfpqsplqi pvsrsfsstl lsifqssper tqstfegfaq splqipvsps
ssstllslfq sfsertqstf egfaqsslqi pvspsfsstl vslfqssper tqstfegfpq
splqipvsss ssstllslfq ssperthstf egfpqsllqi pmtssfsstl lsifqsspes
aqstfegfpq splqipgsps fsstllslfq ssperthstf egfpqsplqi pmtssfsstl
lsilqsspes aqsafegfpq splqipvsss fsytllslfq ssperthstf egfpqsplqi
pvsssssssst llslfqsspe ctqstfegfp qsplqipqsp pegenthspl qivpslpewe
dslsphyfpq sppqgedsls phyfpqsppq gedslsphyf pqspqgedsl sphyfpqspp
qgedsmsply fpqsplqgee fqsslqspvs icssstpssl pqsfpessqs ppegpvqspl
hspqsppegm hsqsplqspe sapegedsls plqipqsple gedslsslhf pqsppeweds
lsplhfpqfp pqgedfqssl qspvsicsss tslslpqsfp espqsppegp aqsplqrpvs
sffsytlasl lqsshespqs ppegpaqspl qspvssfpss tssslsqssp vssfpsstss
slsksspesp lqspvisfss stslspfsee ssspvdeyts ssdtllesds ltdseslies
eplftytlde kvdelarfll lkyqvkqpit kaemltnvis rytgyfpvif rkarefieil
fgislrevdp ddsyvfvntl dltsegclsd eqgmsqnrll ililsiifik gtyaseeviw
dvlsgigvra grehfafgep relltkvwvq ehyleyrevp nssppryefl wgprahsevi
krkvveflam lkntvpitfp ssykdalkdv eeraqaiidt tddstatesa sssvmspsfs
se

Fig. 32

MAGE-C2 Protein NP_057333.1:

mppvpgvpfr nvdndsptsv eledwvdaqh ptdeeeeeas sasstlylvf spssfstsss
lilggpeeee vpsgvipnlt esipssppqg ppqgpsqspl ssccssfsws sfseesssqk
gedtgtcqgl pdsessftyt ldekvaelve flllkyeaee pvteaemlmi vikykdyfpv
ilkrarefme llfglalіev gpdhfcvfan tvgltdegsd degmpensll iiilsvifik
gncaseeviw evlnavgvya grehfvygep relltkvwvq ghyleyrevp hssppyyefl
wgprahsesi kkkvleflak lnntvpssfp swykdalkdv eervqatidt addatvmase
slsvmssnvs fse

Fig. 33

MUC1 Protein J05582.1:

mtpgtqspff lllltvltv vtgsghasst pggeketsat qrssvpsste knavsmtssv
lsshspgsgs sttqgqdvtl apatepasgs aatwgqdvts vpvtrpalgs ttppahdvts
apdnkpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdtrpapgs tappahgvts
apdtrpapgs tappahgvts apdtrpapgs tappahgvts apdnrpalgs tappvhnvts
asgsasgsas tlvhngtsar atttpaskst pfsipshhsd tpttlashst ktdassthhs
svppltssnh stspqlstgv sffflsfhis nlqfnssled pstdyyqelq rdisemflqi
ykqggflgls nikfrpgsvv vqltlafreg tinvhdvetq fnqykteaas rynltisdvs
vsdvpfpfsa qsgagvpgwg iallvlvcvl valaivylia lavcqcrrkn ygqldifpar
dtyhpmseyp tyhthgryvp psstdrspye kvsagnggss lsytnpavaa asanl

Fig. 34

MUC1 Protein 5xVNTR

M T P G T Q S P F F L L L L T V L T V V T G S G H A S S T
P G G E K E T S A T Q R S S V P S S T E K N A V S M T S S V
L S S H S P G S G S S T T Q G Q D V T L A P A T E P A S G S
A A T W G Q D V T S V P V T R P A L G S T T P P A H D V T S
A P D N K P A P G S T A P P A H G V T S A P D T R P A P G S
T A P P A H G V T S A P D T R P A P G S T A P P A H G V T S
A P D T R P A P G S T A P P A H G V T S A P D T R P A P G S
T A P P A H G V T S A P D T R P A P G S T A P P A H G V T S
A P D N R P A L G S T A P P V H N V T S A S G S A S G S A S
T L V H N G T S A R A T T T P A S K S T P F S I P S H H S D
T P T T L A S H S T K T D A S S T H H S S V P P L T S S N H
S T S P Q L S T G V S F F F L S F H I S N L Q F N S S L E D
P S T D Y Y Q E L Q R D I S E M F L Q I Y K Q G G F L G L S
N I K F R P G S V V V Q L T L A F R E G T I N V H D V E T Q
F N Q Y K T E A A S R Y N L T I S D V S V S D V P F P F S A
Q S G A G V P G W G I A L L V L V C V L V A L A I V Y L I A
L A V C Q C R R K N Y G Q L D I F P A R D T Y H P M S E Y P
T Y H T H G R Y V P P S S T D R S P Y E K V S A G N G G S S
L S Y T N P A V A A A S A N L

Fig. 35

MUC1 CDS wild type:

ATGACACCGGGCACCCAGTCTCCTTTCTTCCTGCTGCTGCTCCTCACAGTGCTTACAGTT
GTTACAGGTTCTGGTCATGCAAGCTCTACCCCAGGTGGAGAAAAGGAGACTTCGGCTACC
CAGAGAAGTTCAGTGCCCAGCTCTACTGAGAAGAATGCTGTGAGTATGACCAGCAGCGTA
CTCTCCAGCCACAGCCCCGGTTCAGGCTCCTCCACCACTCAGGGACAGGATGTCACTCTG
GCCCCGGCCACGGAACCAGCTTCAGGTTCAGCTGCCACCTGGGGACAGGATGTCACCTCG
GTCCCAGTCACCAGGCCAGCCCTGGGCTCCACCACCCCGCCAGCCCACGATGTCACCTCA
GCCCCGGACAACAAGCCAGCCCCGGGCTCCACCGCCCCCCCAGCCCACGGTGTCACCTCG
GCCCCGGACACCAGGCCG

GCCCCGGACACCAGGCCGGCCCCGGGCTCCACCGCCCCCCCAGCCCATGGTGTCACCTCG
GCCCCGGACAACAGGCCCGCCTTGGGCTCCACCGCCCCTCCAGTCCACAATGTCACCTCG
GCCTCAGGCTCTGCATCAGGCTCAGCTTCTACTCTGGTGCACAACGGCACCTCTGCCAGG
GCTACCACAACCCCAGCCAGCAAGAGCACTCCATTCTCAATTCCCAGCCACCACTCTGAT
ACTCCTACCACCCTTGCCAGCCATAGCACCAAGACTGATGCCAGTAGCACTCACCATAGC
TCGGTACCTCCTCTCACCTCCTCCAATCACAGCACTTCTCCCCAGTTGTCTACTGGGGTC
TCTTTCTTTTTCCTGTCTTTTCACATTTCAAACCTCCAGTTTAATTCCTCTCTGGAAGAT
CCCAGCACCGACTACTACCAAGAGCTGCAGAGAGACATTTCTGAAATGTTTTTGCAGATT
TATAAACAAGGGGGTTTTCTGGGCCTCTCCAATATTAAGTTCAGGCCAGGATCTGTGGTG
GTACAATTGACTCTGGCCTTCCGAGAAGGTACCATCAATGTCCACGACGTGGAGACACAG
TTCAATCAGTATAAAACGGAAGCAGCCTCTCGATATAACCTGACGATCTCAGACGTCAGC
GTGAGTGATGTGCCATTTCCTTTCTCTGCCCAGTCTGGGGCTGGGGTGCCAGGCTGGGGC
ATCGCGCTGCTGGTGCTGGTCTGTGTTCTGGTTGCGCTGGCCATTGTCTATCTCATTGCC
TTGGCTGTCTGTCAGTGCCGCCGAAAGAACTACGGGCAGCTGGACATCTTTCCAGCCCGG
GATACCTACCATCCTATGAGCGAGTACCCCACCTACCACACCCATGGGCGCTATGTGCCC
CCTAGCAGTACCGATCGTAGCCCCTATGAGAAGGTTTCTGCAGGTAACGGTGGCAGCAGC
CTCTCTTACACAAACCCAGCAGTGGCAGCCGCTTCTGCCAACTTGTAG

Fig. 36