吕双娟，舒林娟，林啟研，等. 2021. 优化 sgRNA 序列提高斑马鱼 CRISPR/Cas9 系统的突变效率[J]. 四川动物，40(6)：622-631.

附件　35 个斑马鱼基因中的 157 个 sgRNAs

Appendix　157 sgRNAs in 35 genes of zebrafish

基因	靶点	靶点序列	上游检测引物	下游检测引物	PAM	靶点有效性
hoxb1a	T1	GAGGTCTTTAGACGAAGTGG	TTTCTCGCAGGTAAAGTGGC	GTTATTGTGCTCGGTTAGGA	AGG	YES
	T2	GACGAACGCCTACTCGCCCA	CGCTGACAAACTTCTGGAGG	GTAGATGCCGTTCTGGTGCT	AGG	NO
	T3	GCAAGTATCTGACGCGAGCG	TTTCTCGCAGGTAAAGTGGC	GTTATTGTGCTCGGTTAGGA	CGG	NO
	T4	GCCGCACCTTATCAGCATCA	GAGCAATCAGCCACCAACAG	GAGGCCGATAAGTCAGCGTA	TGG	NO
	T5	GCTGATGGACGACTTTACGT	CGCTGACAAACTTCTGGAGG	GTAGATGCCGTTCTGGTGCT	AGG	NO
	T6	GCCTTACCTATGGTGGAACT	GAGCAATCAGCCACCAACAG	GAGGCCGATAAGTCAGCGTA	GGG	YES
hoxb1b	T1	GAACCCGAACCACACGGCTA	ACGTTCTCACTCAAGCAGATGA	CGCTTGTTTAATGTTCGTCTTG	TGG	NO
	T2	GTCGCCGAATACGGAATCCA	ATCCCCCTAAAACAGGTGAGTT	GATTTTAACCTGCGTTTCGTTC	TGG	NO
	T3	GATGTGCCATGAGTTTCGTG	GTTGGGTGTTTTCCTGTAGAGC	GTGTTGATGTCCATAGTCCGAA	CGG	NO
	T4	GGTTACTCTTTTAATCACCG	CAACAAATACTTGACCAGAGCG	AAATAGTCCTCCAGCAACGAAA	GGG	YES
	T5	GACTTTATCAGATTGACGGG	ACAGTTGTCCTCACCGTCAC	GTATGTCAAACCACGCAAAG	TGG	YES
	T6	GGTCAATATGAGCTGATGTG	CTTTATCAGATTGACGGGTGG	ATTTGTGCGTAAGATGTGCC	TGG	NO
hoxb3a	T1	GCATTGGTTCATCATCAGGG	TTCACTTCAACCGATACCTGTG	GTAACTGCCCATTGAGTGCATA	GGG	YES
	T2	GACAACTCGACACTTTTCGG	TTACCTCGTGCCCCTCTTATTA	AGACCTTTGGTAGTCACCCTCA	AGG	YES
	T3	GTTCTGAGGAGGGGAAACCT	CCAAGACGAAAGAGCTTAATGG	CCTTCATCCAAGGAAAGATTTG	GGG	NO
	T4	GCATGCTCCCTACAGTCGCT	GGAAATGCAGAAAACGACCTAC	CTGCCATTAAGCTCTTTCGTCT	CGG	YES
hoxb5a	T1	GATACCTCACCCGAAGAAGG	ACCATTTGGTGATTTCCCTG	CTATCCTCCTTCTTCGGGTG	AGG	NO
	T2	GAGCGAACAACTCTGCACCC	CAACAGCGAAAGCCTTGGAC	AGTGGAGGTTGCCGTGGTCT	CGG	YES
	T3	GCCGTAAGAGCCTGAATGCA	ACTCGTTCTCAGGGCGCTAC	TGACGCTTAGGTCCATTCCA	TGG	NO
	T4	GTGGTGCTTTGGTCGGAAGG	GAACGCTTCGTACAGGGACT	AGTGGAGGTTGCCGTGGTCT	GGG	YES
hoxb6b	T1	GACTTCCAATAGCGCACGAG	GATCCACCAGTGCTTGTGACTA	TAAGACATGCAAGGAAATCACG	CGG	NO
	T2	GGGGTCGTCAAACCTACACT	GGACAATTAGTTGCCAAGTGGT	AGCGTGCGATATTTCAATTCTT	CGG	YES
	T3	GTAGCTCCGAACGTAGCGCT	CAACTTTTCCCGTGTCTCTACC	GGGTGTTGAGTAGTCACAAGCA	TGG	YES
	T4	GTTGACGAAATAGGAACTCA	CACCGTACACGTTATCCTGTTG	CGGTATCTGACCCAAGAAAGAC	TGG	YES
hoxc4a	T1	GGAGGACGAGGATCTGACTT	CGTATCGAGATTGCTCATTCCT	GATCTTGCTTTCTCTCCTCGAA	TGG	YES
	T2	GAAGGGGTGGCAGGAGACAG	ACTCAAAGAGGACATGGACTGC	AGAGAGAGTTAGGATGAGGGGC	GGG	NO
	T3	GACATGGACTGCCTCACGCG	GCGTCAGTATAACTGTGCAAGC	CATGGGTACACTACGGGTTGTT	GGG	YES
	T4	GCAAGTCTTAGAATTGGAGA	TTTGCTTCTCCTCTTTCCAGTC	ACGAGGATCTGACTTTGGTGTT	AGG	NO
hoxc8a	T1	GTTCAGTTAAGCTTAGCGCG	GACATACAGCCGATACCAGACA	TCTCTTCCGTTTCCTTGTCTTC	TGG	YES
	T2	GACAAATTTCCGGGGCAGAG	ACGACAGGTGAAGATCTGGTTT	TCACTCCTTGCTTTCCTCTTTC	AGG	YES
	T3	GTTCTGTTGATACCCAGGGT	TTACTACGACTGCAGGTTTCCA	TTTACAGTCTGGGTATTGCGCT	TGG	NO
	T4	GCTTTATGGTACCCAGCAAG	ATCACGGAACCACAGGTATCTC	TTGACTTAAGTGGCCTTGTCCT	AGG	YES
hoxd3a	T1	GAGGTTGAACATGGGGCCGG	GAACAGAGTACGACCACCACAG	CTGTAGTCCACACTAGCGGATG	AGG	YES
	T2	GTGTGTTGGACCGTACGTGT	CATGCTATTGGACAGGAGTTCA	TACAACTGCCATTGATGTCTCC	AGG	YES
	T3	GCAGAATATATACGGCTTGG	AATGCACTCTCCCTTAGGACAC	AGCATTAGCAAAGCTACCGTTC	CGG	YES
	T4	GATTCGAGCCACTTAACGGC	GGAGTTTCATTTCAACCGCTAC	CGTAGCTGAGGCTGTTTACGTT	GGG	NO
atl1	T1	GTGGCAGGAGCCTTCCGGAA	TGTATGACTGGAGCTCTGAGGA	TTTAAGACAACCTGACCTGGCT	GGG	YES
	T2	GTATGACTGGAGCTCTGAGG	CTGAGGTTTGCTTACATTGCTG	TATGGTCATCTTTCACCACCAG	AGG	YES
	T3	GGCCAGTGAAAAGTGGTTGG	ACCCCATTTTGTATGCTTCTGA	TGTCCAAGTAGGTTAGATGGGC	GGG	NO
enc3	T1	GACCACATCCTGTATGTAGT	ACACTCTGCATGATGAATGGTC	TCTCGAAGAGGAGCTACCAGAG	AGG	YES
	T2	GGCTTAGGAAGTCCTCAGTG	GATGCTTCTGTCTGATGCTCAC	TCATCCTCAACTTCCAATTCCT	TGG	YES
	T3	GAAGCGGTAAGCAGAGCTGG	AACAAACTCTTTGCTTTCGGAG	GCATGACAGCTGATTCTCTTTG	CGG	YES
	T4	GAAGGAGAGCCGAGATGCCG	CGTGTCTTCACGGATGTAGTCT	GATGTCATGGAACTGGAGCATA	AGG	NO

续附件

基因	靶点	靶点序列	上游检测引物	下游检测引物	PAM	靶点有效性
rorca	T1	GTAATCCCATGCAAGATTTG	TGATAGCTGATGGCTTTCAATG	CTTCACAAGTGATCACCCCATA	CGG	NO
	T2	GGCAGCGGTTGCGATTGGTT	TCTTCCGTCGAAGTCAGCAG	AGCCAGTGATAATACGAGGGTC	CGG	YES
	T3	GGCACAGTCGGGCTTACAGT	AAAAGCAGCGTGACAGTCTTTAC	GATCAAAAAGAAGACCGTCTGG	CGG	YES
	T4	GGCTGCTCATTGATGGAAAT	CAGTGGGAACAGTTCGTCT	TGCAACACTGCAGTAATGACGTTTA	AGG	NO
rorcb	T1	GTCATACCGTGTAAGATCTG	CCGTGCAAGAGTCAATGTCA	ACTATTTGGTGCTGCGAGGA	TGG	NO
	T2	GGCTGCGTCGGAAAAAACCC	GCTTGTGCTCTGCCCTCCTT	TTGCGGTTGGTTCGGTCAAT	TGG	YES
	T3	GGCAGGCGAGTACTGCGCTC	TAGATGACATCGCCACGCTG	GTATGGAGCCCAGCAGAGAG	TGG	YES
	T4	GGATCTGGCGGACGCAGTGA	TAGATGACATCGCCACGCTG	GTATGGAGCCCAGCAGAGAG	GGG	NO
rxrba	T1	GGGTGGGAGAGAAGTCATGG	GTCCAGACAGTTCATCCGTTTC	TTCTTTGAGTGCCCTCCACA	CGG	YES
	T2	GGAACTCCCTCGGTGGGCTA	GTCCAGACAGTTCATCCGTTTC	TTCTTTGAGTGCCCTCCACA	CGG	NO
	T3	GTCTGGTGGACAAGCGCCAG	TCGTCTTGACGTCTCATCATCA	TAGGTTTGCAATTTAACTCAGTAGC	AGG	YES
	T4	GGTCTCCACAGATGGCACAC	ATCTTCCACCTCGACAAACT	CACCACCAGTGAAACTCCTA	AGG	YES
rorab	T1	GAGCAACTCTGCCGCCGAAC	CGAACCCGAGCTGTTCTACA	GTGAACTTGGCTGAGCAGGA	TGG	YES
	T2	GAGGCTCAGTGGCCATGCAG	AGCCAACGCCAACCCTATTA	AAGATCCCATTTGCCATTCA	AGG	YES
	T3	GCAGTGGGCATGTCAAGAGA	GGGCACTGTGTCATATTCATGT	CGCTGAAGAAAAGGAATGAGAT	TGG	YES
	T4	GGCCGTTGACGTATCCACTG	GAAGTTCGGGCGCATGTCTA	CATCCTGCTGTTACCTAAATC	AGG	NO
	T5	GACAGTCCTACAGAGCAACC	TACAGAGCCAGGAATGTGTGTC	TACCAGAACCATTGAGACGATG	TGG	NO
	T6	GGCGCATGTCTAAGAAGCAG	ATGGTCCAAGTCCAGTATTA	GACAGGGCGTATGAGGGTG	AGG	NO
	T7	GAGATCCCTGATGACCTCAG	GAAGTTCGGGCGCATGTCTA	CATCCTGCTGTTACCTAAATC	TGG	YES
	T8	GAAGATACTGGCACGTCTCC	TACAGAGCCAGGAATGTGTGTC	TACCAGAACCATTGAGACGATG	AGG	NO
rarga	T1	GTGACATCGTACAGTTGGCG	CAGGATCAGGCAGCACGTAT	GGTTTGTTTGGGTCGACGTG	GGG	NO
	T2	GAGTCCTTTCTATGCTGGAC	CAGGATCAGGCAGCACGTAT	GGTTTGTTTGGGTCGACGTG	TGG	NO
	T3	GGTTTGTAAACACGCGGTGG	AGCACTCGTGGGTCTTTGAA	TGTTTACCTTGCAGCCCTCG	AGG	NO
	T4	GGCATGTCCAAGGAAGGTGA	GTCTGTTGTAGGGTTTCTTCCG	TAACCTATATCAGCGTGTCCCC	GGG	YES
	T5	GCTCTGAGTCTCCACCGCTG	GTGGGTCTTTGAAATCGGATAC	GTGGTACCCAGAAGACTTGTCC	AGG	YES
	T6	GATCTGATCTGCGATGGTGA	GACCACAGGATTCAGCTAGACC	GTATCGTGTACAGATTCGCAGC	GGG	YES
rxrab	T1	GATGTGTTTGGTGAGGGACA	CCTCCTCTTGGTCTGAACGGA	ATTAATTGGGTTAGGGGAGGGTT	GGG	NO
	T2	GCCGGCAGGTAAACACTACG	TGGTCTCTCCATATGCTCTGC	CGTCAGGTCCTTTCTGACCG	GGG	NO
	T3	GGCTTACAGAATTGGCAGAC	GACATGCCCGTGGAGAAGATT	AGGAGCGATTGTGAAGCGTAA	GGG	YES
	T4	GGATGACCTGATCGTCCAGC	CCTTAGTGGAGTGGGCCAAG	AGCCCATGCTATTTTGTTCAGC	GGG	YES
pparg	T1	GTAGTGCAGTCATGCTGCAC	GACGACAGACAGACAGGAGGAG	CTGAGAAGTTCATTCACGGATC	AGG	NO
	T2	GTGTTGTTCGTCAGATATGG	ACACTGTGAATAAGAGTGGCAAGG	CTGTAGTCGAGCGTGGAGAAGG	TGG	YES
	T3	GAATACCTTGCATCCCTCGC	GTTTGCTGTGTTTTCAGACTCG	AATAAATCTGATGCACGGACCT	AGG	NO
	T4	GCTTCAGGCGAATCGTCCTG	GTGACGCCCCGATTCTGAT	TCTGGAAGCGGCAGTATTGG	CGG	NO
onecut1	T1	GGAAAAGTTCTGTTCTTATA	GCACTGCTGAAGGGACG	ACAGACTGCTCCGATGACT	TGG	NO
	T2	GAGAACATTGGCGATCTGCA	TGGACACTGCTCCGCTAT	GACAGACTGCTCCGATGACT	CGG	YES
	T3	GGGAAACCTTCCGTAGGATG	AAAGATACAGCATTCCACAGGC	CATGAACGCTGAATGGAAACTA	TGG	YES
	T4	GGAGCACGGTAAAGGCGAGC	GATTGATTCACCCTCCAAAAAG	GGACGCTTGTTCTCTTTGAATA	GGG	NO
onecut2	T1	GGCGTACGCATCCAAATCCT	CCGTCTGATAGAGATCGGTGTT	AAGTCCTGCTCATGGCTTACTC	TGG	YES
	T2	GGCCGACATCCTCTGAAACT	ACCTGCTGCGGAACCC	CACCTTTATTTTATGACGAGTGC	CGG	NO
onecut3a	T1	GGAGAGGACCGGACAACGAA	GCGGCTTTGAGATCGTTT	GGGTGGTGATGAGCGTGA	TGG	YES
	T2	GGAGGCAAATGGTGCTGCAA	GCGGCTTTGAGATCGTTT	GGGTGGTGATGAGCGTGA	CGG	YES
	T3	GGAACTTGGTATCATCGCAC	GCGGCTTTGAGATCGTTT	GGGTGGTGATGAGCGTGA	GGG	YES
	T4	GGAGAACAAGCGGCCCTCGA	AGCAGCACAAGGAACGC	AAAGGTGGTGGCAGAGG	AGG	NO

续附件

基因	靶点	靶点序列	上游检测引物	下游检测引物	PAM	靶点有效性
onecut3b	T1	GGGGTCGCTCCGGTAATCAC	GAATCTGGTCTCCCACGGC	ACTGTAGAAATCGGTGGCAGG	CGG	YES
	T2	GCCGAGTCCGTTGGATAGCG	GAACGTCAGCGGGAGTTTCA	TCTGTCGGCCAGCATGGAGC	GGG	NO
	T3	GAAGCGAGGAGCACCTAGCG	GAACGTCAGCGGGAGTTTCA	TCTGTCGGCCAGCATGGAGC	CGG	NO
id2a	T1	GGTGATTCACCTGTAGTGAG	CGCTCGACTCCAATT	CATGCAACACGATAGATAG	AGG	NO
	T2	GATCGCGCTCGACTCCAATT	TGACAGCTCGCTAATCCACTGCGTT	AATTGAGTAGGCGGTGAT	CGG	YES
	T3	GGCTGAGAGGATCGTCCACG	TGACAGCTCGCTAATCCACTGCGTT	AATTGAGTAGGCGGTGAT	GGG	YES
	T4	GCCTGCATCACCCGCGAGCG	TGACAGCTCGCTAATCCACTGCGTT	AATTGAGTAGGCGGTGAT	GGG	YES
id2b	T1	GGTTTCCTGACGGACCTCAC	TCTCATCGACCAATCCGCGT	GCTCCCAGTGATCTGACAGTCTT	CGG	YES
	T2	GAACCGGAGCGTGAGTAAGA	TCTCATCGACCAATCCGCGT	GCTCCCAGTGATCTGACAGTCTT	TGG	YES
	T3	GATCTGACAGTCTTTTTTGG	GTGCCGAGTTTACCGCAGAA	GTAAATCGCGGTGCAGCATTC	AGG	NO
	T4	GCTACAAAACTTGCCTTACC	GTGCCGAGTTTACCGCAGAA	GTAAATCGCGGTGCAGCATTC	TGG	NO
foxa2	T1	GCAGACTGGAGCACTTACTA	GACACGAGTGTATCCCGTGG	CGAATCGGAATTCGACGAGG	CGG	YES
	T2	GCTCATGCCCGTGTTGACAT	CAGCAACATGAACACTGGACTT	GCATGAGTGTAGCTCCTGCG	AGG	NO
	T3	GTACGAGGTTAGGGCGTTCA	CAGCAACATGAACACTGGACTT	GCATGAGTGTAGCTCCTGCG	TGG	YES
	T4	GTCTGACATGAAGTCGGGTC	TGGACCCTTCATCCCGATTCC	CCTTCGTGCGCTAAAACAGAG	AGG	NO
hnf4b	T1	GTCTCTTGACCTGAGTGTGA	ACGAGTTTTTGATGGACGCTGA	TCTAGTCTTGTCAGCAGGGTGT	CGG	YES
	T2	GACGGAGTATGGAATAACCC	ACGAGTTTTTGATGGACGCTGA	TCTAGTCTTGTCAGCAGGGTGT	TGG	NO
	T3	GGACCCGACATTCACCATGC	ACGAGTTTTTGATGGACGCTGA	TCTAGTCTTGTCAGCAGGGTGT	TGG	NO
	T4	GACCTGAGTGTGACGGAGTA	ACGAGTTTTTGATGGACGCTGA	TCTAGTCTTGTCAGCAGGGTGT	TGG	NO
hnf1bb	T1	GAGCGCCTTGCTGGACTCGG	ACGCACTTTTGTCTCGTGC	CCGGACAGTTTTCCGCCTTT	GGG	NO
	T2	GTTGGCACTGGACGGTGACA	GGGGGTCACGAAGGATGTC	CATGCGATCGACCTCCGC	GGG	NO
	T3	GTCCGGTGATGAAGGCTCGG	GGGGGTCACGAAGGATGTC	CATGCGATCGACCTCCGC	AGG	NO
	T4	GCTGCAGTCGCTGAACACCG	GGGACTCGAAACCGGTATTTCT	TGACTCGTTTGAAAACCCCTCC	AGG	NO
	T5	GTCGCTGCCGCCGTTGGCAC	GGGGGTCACGAAGGATGTC	CATGCGATCGACCTCCGC	TGG	NO
	T6	GGTGATGAAGGCTCGGAGGA	GGGGGTCACGAAGGATGTC	CATGCGATCGACCTCCGC	CGG	YES
ccndbp1	T1	GGAACTCGGTGAAGTGCAGC	AGTTCCGCTTGACTTTCGTTC	GTTTAGCCGTTAGCATTCCCAC	AGG	YES
	T2	GGAGAGTCCAACGACAGCAG	AGATGTTGTCAGTGATGTGCTGAA	ATCTGCGGAAAGAGAAGAGCTG	CGG	YES
	T3	GGCCCAAACACTCCCGGTGG	TTTACATTCTCCTGTGTTCCCC	GGATGCACAAACTTACCGATT	AGG	YES
	T4	GGACCCGTTTGGAGACGTCC	TTGGTGAAGGACGCTCTG	TGCCGGTCTGACGCTGA	TGG	NO
daxx	T1	GGAGGAGAACGAATTTGCTG	CATCATAGAAATAACAGGGCCTAA	ACAAGCATACCTCATTGAACAGT	AGG	NO
	T2	GGCACCGGCTGACTCTTCAC	CATCATAGAAATAACAGGGCCTAA	ACAAGCATACCTCATTGAACAGT	TGG	NO
nr2c1	T1	GGGTTATTATCCAAATCCCG	TCACTAAAATCAATGCTGACGG	GCCGGCTAATAACAGTGCTAAC	CGG	YES
	T2	GGAAGAGGTTAGGATGACCT	GAGCTGGAAAGCAGCAGTTTAT	ACTTTGGTCATACCATCCATCC	TGG	YES
	T3	GGGCTCGATGAAGCCTCCAG	GAAATGCATTCAAACACCCAC	CAAATCAAGCCCAAAACTAAGC	TGG	NO
	T4	GGACTGAACCACAACAGTTG	TTTGCACATTCAGACGCTTTAT	AGAGAAAGTCAGTGCTTTTGGG	TGG	YES
phox2bb	T1	GGGTGCCCGTCGCTTACACC	TGTATGGCCGGGATGG	GGTGACTCTGGGCTTACCT	GGG	YES
	T2	GGGATTGTACTGAAAGCCAC	TGTATGGCCGGGATGG	GGTGACTCTGGGCTTACCT	TGG	YES
	T3	GGTGACTCTGGGCTTACCTG	TGTATGGCCGGGATGG	GGTGACTCTGGGCTTACCT	CGG	YES
	T4	GTGATCGGTGAAAAGCTTGT	TACTTGCTGTCTGAATCAA	GTGATCGGTGAAAAGCTTGTAGG	AGG	YES
diras1a	T1	GGGTGTAGGCAAGAGCTCCC	GCAGAGTAACGATTACCGAGTG	GCATAGCCGGGAACTGG	TGG	YES
	T2	GGACACCTACATCCCAACAG	GCAGAGTAACGATTACCGAGTG	GCATAGCCGGGAACTGG	TGG	YES

续附件

基因	靶点	靶点序列	上游检测引物	下游检测引物	PAM	靶点有效性
diras1b	T1	GGACACCTACATCCCGACGG	GACTATCGTGTGGTGGTGTTTG	GCTGGTATATGGGCTTCAATTC	TGG	YES
	T2	GGCAGGGAACTGGTGGCTCC	GACTATCGTGTGGTGGTGTTTG	GCTGGTATATGGGCTTCAATTC	CGG	YES
	T3	GGAGATGGACAGACGCTGCA	GACTATCGTGTGGTGGTGTTTG	GCTGGTATATGGGCTTCAATTC	TGG	NO
pmp22b	T1	GGCGGTCGCTTCTTCCTCAC	ATTCAAAATGACCATCCCATTC	GCATCAAGATGCCACAATACTT	TGG	YES
	T2	GGCCACCCAGGCCAGGATGT	GCGGAGCCATCATTTACACTG	ATACTGCGGGATTTCACTTC	AGG	NO
	T3	GGCAGTGCCACATGGGTCAG	AACAGGCATGGGTAGTGAACTC	CAGTGTAAAGGGCAAAACACAG	TGG	NO
	T4	GGAAGCTGAAGATGACTGAA	ATTCAAAATGACCATCCCATTC	GCATCAAGATGCCACAATACTT	AGG	NO
	T5	GGGAATCGTTGTTTTGCATG	GAGCATCAACACAGTAAAGGCA	TTCTGCTTCAGCTATAGCATCTT	TGG	NO
pcdh7b	T1	GGTAATGTAGCCGCGGACCT	TATGAGGACTACAGGCATTG	GCCCGAGTGACTGTCAACAC	CGG	YES
	T2	GGAGAGCGTGAGAACAGGTG	TATGAGGACTACAGGCATTG	GCCCGAGTGACTGTCAACAC	AGG	YES
tcf4	T1	GACTGCACAAAACACACAGG	TTTCAATAAGCCCAAATAGC	ACAACCTTAACACGTCCAAG	AGG	NO
	T2	GGGCTGGTTCATACTGCCGG	TTTAGCCTGAAGAAAAGCTTAACG	ACGAGTCTGTCGTGTGGATG	AGG	NO
	T3	GCCGGTACGTCTTGGGGGAA	GATGCTGCTCTTGTGATTGTAA	TGTGGCATCCATGTTTCACAAG	TGG	NO
	T4	GAGAATGGCCGCTTTAGGGA	TGATCGGGTGTTTTCTCATTGC	TTTGCGCACTCTAACACAATGC	CGG	NO
	T5	GCATGCTGTTGTATCCGGGC	TTTAGCCTGAAGAAAAGCTTAACG	ACGAGTCTGTCGTGTGGATG	TGG	NO
	T6	GGACCCACGTCTCTAGGAAG	AATACCGCAGGGAATTGAGCA	GAATGTGTGCCGTCAATCAGC	TGG	NO
	T7	GGTGCTGTCTGTGCCGTTGG	CACTCGTCGGCAGAAATCAA	GCGTTAGTTTTCATCAGGAGCG	TGG	NO
	T8	GTCATCACAGTACAGACCCA	TTTAGCCTGAAGAAAAGCTTAACG	ACGAGTCTGTCGTGTGGATG	TGG	NO
	T9	GCAGCGGTGGTTCATAACTG	GCCTTGCTTGTGTATTTCATCA	TATCAATAATGTATCGCAGCCG	GGG	NO
	T10	GCCCCGTTGTGAGAGTGTGA	AGTACACTACTAAGTCCCACATGC	AAAGCCCCTCTTACCATGAGC	AGG	NO
	T11	GGGGGCTAAAGAAGGGGGAA	TGCAATACGGACGCCACAC	CTGGTGGCCGACTTTCCAA	GGG	NO
	T12	GTGATTTATAGACGACACGC	AATGGCAGTATTTGCTTGGTGA	GAGACAGCTCGGGTCTACTT	AGG	NO
	T13	GTGTCCACTTCCTAGAGACG	AATACCGCAGGGAATTGAGCA	GAATGTGTGCCGTCAATCAGC	TGG	NO
	T14	GTGCTCACGAGTCTGTCGTG	TCCGGCAGTATGAACC	TCTCCCTATTATGACACG	TGG	NO
	T15	GGACGCTGTGCTGTAGTGAC	CACTCGTCGGCAGAAATCAA	GCGTTAGTTTTCATCAGGAGCG	TGG	NO
	T16	GCGCTCCAGTCAAACCCGCG	CGCTCAATAAGATTTCAGCGCC	AGCGACCGATCAATAACTCG	CGG	NO
	T17	GATATACTACCATTGACGTG	GTCACTTCGCGTTTCTCCACG	TCTGTCAAGGGTCAACACAACAT	GGG	NO
	T18	GTATCGAGGACAGATTGGAG	AGTACACTACTAAGTCCCACATGC	AAAGCCCCTCTTACCATGAGC	CGG	NO
	T19	GCCTTCACACTCTCACAACG	AGTACACTACTAAGTCCCACATGC	AAAGCCCCTCTTACCATGAGC	GGG	NO

注：PAM. 前间区序列邻近基序

Note：PAM. protospacer adjacent motif