

### Supplementary Table S1. Primers used in this study

KanMX qrtPCR reverse primer (used with uptag primer), TCGATTGATACTAACGCCGCCATCCAGTG; KanMX qrtPCR forward primer (used with downtag primer), TATTCTGGGCTCCATGTTCGC.

Gene	Forward primer for gene knockout	Reverse primer for gene knockout	Gene position knockout	Knockout size (bp)	Uptag for qrtPCR	Downtag for qrtPCR
YGR059W	AAAAGGGAGTCGGTTGTCAACAGACTGTCTGTCTG AATTTCCCAACCCTAGTTCTTAATCTACGGCAGCTG AAGCTTCGTACGC	AGCACTATCTGTGGAATGGCTGTTGGAACCTTT TCCGATTAGGATTGCCACAAGCGAACAGCAT AGGCCACTAGTGGATCTG	Chr 7 from 607576 to 609076	1500	CCCTAGTTCCTTAATC TACGG	GGATTGCCACAAGCG AACA
URA3	TCCTAGTCTGTGTCTGCTGCAAGCTATTTAATATCAT GCACGAAAAGCAAACAACCTTGTGGGGCACACCC AATTTAGACACAGCTGAAGCTTCGTACGC	ATTTGCAAAGGGAAGGGATGCTAAGGTAGAG GGTGAACGTTACAGAAAAGCAGGCTGGGAAA GGCGCGTCAAGTACAAAGTTAGCATGCCACTA GTGGATCTG	Chr 5 from 116206 to 116936	730	GGGCACACCCAATT TAGACA	GCGCGTCAAGTACAA AGTTA
DANI	AGTATATTAGCTGTGCGCCGAGCATTAGTGGCAAG TGCAAGTCACGGACTTCTATCACATCAGCTGAAGC TTCGTACGC	ACCAGCAATAGCAGCGGCACCGAAAACACCGT TATTGAACTTGTGAGCCTACTGGATCTCGTGTG CATAGGCCACTAGTGGATCTG	Chr 10 from 708740 to 709603	863	GTCACGGACTTCTA TCACAT	GAGCCTACTGGATCTC GTGT
UPC2	CAGAATCACAAAGAAAGCGGTGACAAAACCCAGAA GAAGAGAAAAGTCATCGAGCTAATTGTACTCCGG TTCAGCATGTTACAGTGAAGCTTCGTACGC	TTTGTGTGTGTCATCGATGGTAATCCGCCACCG AGGAAATCTAGCTAGGAGCTACCAGGACCTTC GCATAGGCCACTAGTGGATCTG	Chr 4 from 889767 to 892468	2701	GTACTIONCGGTTTCCAG CATGTT	TAGGAGCTACCAGGA CCTTC
ANB1	ACATACACCTATTTTATTACACACTAAAACATGT CTGACGGATATTGATCTCACCTGCCTCAGCTGAAG CTTCGTACGC	GCTATAGAAATCTAAAATATCTAATCAGATCT TGGAGCTTCCGAGATTAGACATCATGCTCGC ATAGGCCACTAGTGGATCTG	Chr 10 from 525287 to 524844	443	GATATTGATCTCAC CTGCCT	GCAGATTAGACATCAT GCTC
MUC1	GGTCCTTTTCGCTTCTATTTAACTCGGCTTTGGGTTT TCCAGCCAGGTAGTACAGTTACGCAGCTGAAGCT TCGTACGC	GGAAGAGCGAGTAGCAACCACATAAAAGTTTCC AAGAACCCTGATAGTGCCCGTAAGTCTCCGGC ATAGGCCACTAGTGGATCTG	Chr 9 from 393604 to 389582	4022	GCCCAGGTAGTACA GTTACG	ATAGTGCCCGTAAGTC TCCG
SML1	CAAGACTACTTTTACGCTCAAATCGCTGCCAACA ACAACAAGCCCGACTGCTCTTCAGGCTATTACAGCT GAAGCTTCGTACGC	TCCTCGACCTTACCCTGGTTGAACATAGATTTT AGTTCCGCCACGGCTTGCTCATAGTATTGCATAG GCCACTAGTGGATCTG	Chr 13 from 159395 to 159684	289	CGACTGCTCTTCAG GCTATT	CACGGCTTGCTCATAG TATT (from YML058C-A)
FET4	AATCCAGGTGCTAGGCTGACGTTTCATCATAGAGC ACCTACCGCATCATGGAACATAGACCAGCTGAAGC TTCGTACGC	GGGAAACGCTTTTCTACGTATGATAGAAGTAT GCGCCTACCGCCAGATAGTCAAGACGACGCAT AGGCCACTAGTGGATCTG	Chr 13 from 914470 to 912942	1528	CCGCATCATGGAAC ATAGAC	CGCCAGATAGTCAAG ACGAC
YLR143W	CCCATTGTGCTTTATTGACACTTACAACATTTCT GTTGACCATATACGGACCACAGGCTGCCAGCTGAA GCTTCGTACGC	GGGGCTTTTCGTGTTCTCAATGATTCTTGAGGT AGTAGAGAGTTGAGACCATTACATCGCATA GGCCACTAGTGGATCTG	Chr 12 from 951173 to 953150	1977	ATATACGGACCACA GGCTGC	AGTTGAGACCCATTCA CATC
AAC3	ATGAGTAGCGACGCTAAGCAACAAGAAAACAACCT TTGCCAACAGCTATTAGGACGTGTTGCAGCTGAAG CTTCGTACGC	CGAACAATATCATTTGCAACTGGTCATACATG GAAATAACACATGGTCCGACTGGATCACCTGC ATAGGCCACTAGTGGATCTG	Chr 2 from 415977 to 416883	906	ACAGCTATTAGGAC GTGTTG	ATGGTCCGACTGGATC ACCT
PLB2	CATATTACAGGCTAGCTCGCTAATTTCTGGACTTTC GCTCCACAGCATGAAATTGGTCCACAGCTGAAGCT TCGTACGC	GCTGTTATGGCACCTAACAAAACCTATTAGAGT ATTAGTGTCCGCTAGTCAAATATGTCCAGC ATAGGCCACTAGTGGATCTG	Chr 13 from 279628 to 277621	2007	CACAGCATGAAATT GGTCCA	CGCCTAGTCAAATATG TCCA (from YMR007W)

Gene	Forward primer for gene knockout	Reverse primer for gene knockout	Gene position knockout	Knockout size (bp)	Uptag for qrtPCR	Downtag for qrtPCR
YJR116W	GCAATGAACGCCAACTCTACCACGACAGCAATCGG CCTCACCGACTCTACGATACGTCGCTGCAGCTGAA GCTTCGTACGC	TCTAGCTTCGACGTTGGGGCTGGTTTTGCAAGT TTCTTGGGACGTATTGGCATAGTTGCTGCATAG GCCACTAGTGGATCTG	Chr 10 from 640738 to 641576	838	GACTCTACGATACG TCGCTG	GACGTATTGGCATAGT TGCT
YGR131W	GTGCGCATATAAATGCTGTTTTTCTTATTATATCC ATAGGAGAATTTGCACCAAGCGCGACAGCTGAAG CTTCGTACGC	GAAATTGTAGGTATGCCCATTTGTCTTCTTGCC CTCCTTCCGCCCAAGTATGGTAAATAGCATA GGCCACTAGTGGATCTG	Chr 7 from 754755 to 755245	490	AGAATTTGCACCAA GCGCGA	CGCCGCAAGTATGGTA AATA
YOR012W	AAGAATCCTCTTTGGCGGTAACCTTGACAAGCGAT GTAGAGCAGATAATACTGTCACCCAGCTGAAGC TTCGTACGC	GCATAAAGGTAGTAATAGTCCATTCCCAGAGG CATGACTTCGCCAAACAAGAGCTTCTGAGCA TAGGCCACTAGTGGATCTG	Chr 15 from 356565 to 356898	333	GCAGATAATACACT GTCACC	GCCCAAACAAGAGCTT CTGA
YHL042W	GTAGCAACTGTTATATTCTTCGTACATGAGTATCCGT TCTCCACATACGATCACAGTTAGGTCCAGCTGAAG CTTCGTACGC	CACAGGCAATGTCGGCTTTTCTGATATACGGC AACAATTCCTCGCGGGAACAAGATGCAAGCAT AGGCCACTAGTGGATCTG	Chr 8 from 15686 to 16097	229	CATACGATCACAGT TAGGTC	CTCGCGGGAACAAGA TGCAA
YOL101C	TTCATTGACTACAATAGAGCAAAGCCAGTCAAAT GCGAGACTATTTCTACGCCGACAGGGCAGCTGAA GCTTCGTACGC	CGGGCTGATTCAAACCTGAATGCATCAAATA TAAGATTGTGTGTCACCGCACTTCATGGGCAT AGGCCACTAGTGGATCTG	Chr 15 from 127874 to 127044	830	TATTTCTCACGCCG ACAGGG	TGTGTCACCGCACTTC ATGG
COX5B	GCCACATATTCATTGTAAAGAGCATGTATAACAAA CACTGATACATCTGCGAAATGCGGCCACAGCTGAA GCTTCGTACGC	C TTCAGATACTCGTCTGATTTCAACTGCCATTC CCTGTTCTCATGCTGTACCATATTGGGGCATAG GCCACTAGTGGATCTG	Chr 9 from 155199 to 155711	512	ACATCTGCGAAATG CGGCCA	TCATGCTGTACCATAT TGGG
YOR013W	GGTGAAATGCTGAGGCAAATGATTTTCGATGCAGT CGCAATATGGAGGATAGCTCTCAATTCACCCAGCT GAAGCTTCGTACGC	ATCTTTGTGGTAGAGCATCAAGTAGGCCGTGA ATCCCTTCATGAGTGACAAGGTTCTGAGCAT AGGCCACTAGTGGATCTG	Chr 15 from 356762 to 357197	435	AGGATAGCTCTCAA TTCACC	CATGAGTGACAAGGTT CTGA
ECM34	CCGCAAAAGTGAAGATGAAAAGAACGAAGCCGCT TTAGCCTACACTCAGCATATAGGTCCAGCTGAA GCTTCGTACGC	GGGTTCTCCTAAATGCTACATGGCAGCTAGAA CCATCAACAACATGAGTCCAAAGGTGGCAAGC ATAGGCCACTAGTGGATCTG	Chr 8 from 14907 to 15446	539	CACTCACGACATA TAGGTC	CATGAGTCCAAAGGTG GCAA
IZH2	TATTAGAAAGGACTAAGAGTGTGCAAGAGCTGAA GAAGAGGAGACAGGAGCATATTGTACCAGCTGAA GCTTCGTACGC	GACAATCCCCTTCTCCATCTTTATATGGACTAA CTCATAACAGCTGATAATTCAAGGCACCGCAT AGGCCACTAGTGGATCTG	Chr 15 from 324316 to 323458	858	GAGACAGGAGCATA TTGTAC	AGCTGATAAATCAAGG CACC
YLR437C	GGCAAGCAGCCTCGTCCCAAAGAGACAGCTTCAAC AACAATGATACTGCCATACTGGCGCAGCTGAAGC TTCGTACGC	GTCTTCTTGGATCCATTAAACCATTGTTTCGT GCTCCGCAGGCACCTACGATATGCTCGGCATA GGCCACTAGTGGATCTG	Chr 12 from 1011961 to 1011663	298	TGATACTGCCCATA CTGGCG	AGGCACCTACGATATG CTCG
SRO77	TTGAAGAATGTGTCAAATGCTATCAAATCCGCGAG AGTTTCAGACCTCAGCTTCAAGTAAACGCAGCTGAAGC TTCGTACGC	CTCTTCATCATATCCCTTCCCGTTTTCTTCCATTG CGTCATACCTTATGTGTAATGAGCGGCATAG GCCACTAGTGGATCTG	Chr 2 from 13819 to 10902	2917	AGACCTCAGCTTCA GTAACG	ACCTTATGTGTAATGA GCGG
SET4	CACTATCTTCTCGTCATATCAGGCAAGGAAGGACA TACACTAGTCCCTTACATATCTGCGCAGCTGAAGC TTCGTACGC	CGTTTATGGCTTACAGTTGTGCATTATTGTATT AAAGTAAGAGATCTAGCCACAGTGTATGCGCA TAGGCCACTAGTGGATCTG	Chr 10 from 224989 to 226658	1669	TAGTCCTTACATA TCTGCG	GATCTAGCCACAGTGT ATGC
YDL241W	GAAAATGCTCTATTGTTTAAAGTGCAGTGAAGGG CTATATGGGCACACTAGGAAATCCACAGCTGAAG CTTCGTACGC	CACTAGCATGAACAGTATGGTAAATTTGGCGA GAGAATGAGGAGACCCACTTAATGGCAACGCA TAGGCCACTAGTGGATCTG	Chr 4 from 20647 to 20988	341	GGGCACACTAGGAA ACTCCA	GAGACCCACTTAATGG CAAC

Gene	Forward primer for gene knockout	Reverse primer for gene knockout	Gene position knockout	Knockout size (bp)	Uptag for qrtPCR	Downtag for qrtPCR
YPL272C	CTCACTTTATCATAATGACTACGTTTAGGCCACTAT CAAGTAGACTCAGCCAGATGCCAGCAGCTGAAGCT TCGTACGC	CGTCACCTGCCTATTCAATAAAAGGATTTCGAAG CATTCTACCAGATGTCAGAATAGCTCACGCAT AGGCCACTAGTGGATCTG	Chr 16 from 28139 to 26640	1499	TAGACTCAGCCAGA TGCCAG	CAGATGTCAGAATAGC TCAC
<i>GSY1</i>	ATCATCTACTGTTTGAAGTAGCAACAGAAGTAACT AACAGGCCCATCCAGTTGAATGAGAGCAGCTGAA GCTTCGTACGC	CCTCGTAGTATGCAGACGTATCGTTGTCATCAT CGTCATTTCGTTACATACTCAGCCATAGGCATA GGCCACTAGTGGATCTG	Chr 6 from 176324 to 174304	2020	CCCATCCAGTTGAA TGAGAG	CGTTACATACTCAGCC ATAG
YGL039W	ACTACTGAAAAAACC GTTGT TTTTCTGGTGCT ACTGGCTAGAAACAGAAGGGTCGTCAGCTGAAG CTTCGTACGC	CITCTAGTAATTGCGAGGCAGTATCGACAATG CAATCTCACCATTGTACGATTGGTGCATA GGCCACTAGTGGATCTG	Chr 7 from 423970 to 424996	1026	CTAGAAACAGAAGG GTCGTC	CACCGATTGTACGATT TGGT
<i>YSR3</i>	TGAATTGGGTGTTACCGAGGACACCATTAAGGTTT AGATGCACTCTATGCAATTAAGGCCAGCTGAAGC TTCGTACGC	AAGTAAAAAAACTGGGCATAGCAAAAAGAC GGTTGTAGGTATGACAGCACAGGTGGTCCGCA TAGGCCACTAGTGGATCTG	Chr 11 from 534861 to 533765	1096	CACTCTATGCAATT AAGGCC	TATGACAGCACAGGTG GTCC
<i>EUG1</i>	TTCAATTTCCAAGACTTGACGTTTCAATTATATGGC AATCAGCAGTGGCCGATTCCCTTTCAGCTGAAGCT TCGTACGC	TATTTTCTTCCAGAAACGATGCGAGTAATCAG ATGTAAACCACGCGAAGAACGGATTTAGCAT AGGCCACTAGTGGATCTG	Chr 4 from 1478531 to 1480223	1692	AGCAGTGGCCGATT CCCTTT	CCACGCGAAGAACGG ATTTA