

## Supplemental Materials

**Table S1:** List of sgRNA guide sequences and primers used to construct them. Spacers are italicized.

sgRNA/Primer Name	Sequence	Template
gltA1	<i>TCGAGTTCCCCGCGCCAGCGGGGATAAACCGAAAAGC ATATAATGCGTAAAAGTTATGAAGTTCGAGTTCCCCG CGCCAGCGGGGATAAACCG</i>	
gltA1-FOR	<i>GCGTAAAAGTTATGAAGTTCGAGTTCCCCGCGCCAGCG GGGATAAACCGAAAAAAAAAACCCC</i>	pCASCADE control
gltA1-REV	<i>ATTATATGCTTTTCGGTTTATCCCCGCTGGCGCGGGG AACTCGAGGTGGTACCAGATCT</i>	
G1Z	<i>TCGAGTTCCCCGCGCCAGCGGGGATAAACCGAAAAGC ATATAATGCGTAAAAGTTATGAAGTTCGAGTTCCCCG CGCCAGCGGGGATAAACCGCTCGTAAAAGCAGTACAG TGCACCGTAAGATCGAGTTCCCCGCGCCAGCGGGGAT AACCG</i>	
zwf-FOR	<i>GCGCCAGCGGGGATAAACCGCTCGTAAAAG</i>	pCASCADE-zwf
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTTCATCAGGCGGGCAAG</i>	pCASCADE-gltA 1
gltA1-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTTCATAACTT TTAC</i>	
G1U	<i>TCGAGTTCCCCGCGCCAGCGGGGATAAACCGAAAAGC ATATAATGCGTAAAAGTTATGAAGTTCGAGTTCCCCG CGCCAGCGGGGATAAACCGTTACCATTCTGTTGCTTTT ATGTATAAGAATCGAGTTCCCCGCGCCAGCGGGGATA AACCG</i>	

udhA-FOR	<i>GCGCCAGCGGGGATAAACCGTTACCATTCTGTTG</i>	pCASCADE-udh A
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTATCAGGCGGGCAAG</i>	pCASCADE-gltA 1
gltA1-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTTCATAACTT TTAC</i>	
G1G2	<i>TCGAGTTCCCCGCGCCAGCGGGGATAAACCGAAAAGC ATATAATGCGTAAAAGTTATGAAGTTCGAGTTCCCCG CGCCAGCGGGGATAAACCGTATTGACCAATTCATTCG GGACAGTTATTAGTTCGAGTTCCCCGCGCCAGCGGGG ATAAACCG</i>	
gltA2-FOR	<i>GCGCCAGCGGGGATAAACCGTATTGACCAATTCATTC</i>	pCASCADE-gltA 2
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTATCAGGCGGGCAAG</i>	pCASCADE-gltA 1
gltA1-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTTCATAACTT TTAC</i>	
G1G2U	<i>TCGAGTTCCCCGCGCCAGCGGGGATAAACCGAAAAGC ATATAATGCGTAAAAGTTATGAAGTTCGAGTTCCCCG CGCCAGCGGGGATAAACCGTATTGACCAATTCATTCG GGACAGTTATTAGTTCGAGTTCCCCGCGCCAGCGGGG ATAAACCGTTACCATTCTGTTGCTTTTATGTATAAGAA TCGAGTTCCCCGCGCCAGCGGGGATAAACCG</i>	
udhA-FOR	<i>GCGCCAGCGGGGATAAACCGTTACCATTCTGTTG</i>	pCASCADE-udh A
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	

pCASCADE-FOR	<i>CCGGATGAGCATTTCATCAGGCGGGCAAG</i>	pCASCADE-G1G 2
gltA2-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTAATAACTG TC</i>	
G1G2Z	<i>TCGAGTTCCCCGCGCCAGCGGGGATAAACCGAAAAGC ATATAATGCGTAAAAGTTATGAAGTTCGAGTTCCCCG CGCCAGCGGGGATAAACCGTATTGACCAATTCATTCG GGACAGTTATTAGTTCGAGTTCCCCGCGCCAGCGGGG ATAAACCGCTCGTAAAAGCAGTACAGTGCACCGTAAG ATCGAGTTCCCCGCGCCAGCGGGGATAAACCG</i>	
zwf-FOR	<i>GCGCCAGCGGGGATAAACCGCTCGTAAAAG</i>	pCASCADE-zwf
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTTCATCAGGCGGGCAAG</i>	pCASCADE-G1G 2
gltA2-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTAATAACTG TC</i>	
G1G2UZ	<i>TCGAGTTCCCCGCGCCAGCGGGGATAAACCGAAAAGC ATATAATGCGTAAAAGTTATGAAGTTCGAGTTCCCCG CGCCAGCGGGGATAAACCGTATTGACCAATTCATTCG GGACAGTTATTAGTTCGAGTTCCCCGCGCCAGCGGGG ATAAACCGTTACCATTCTGTTGCTTTTATGTATAAGAA TCGAGTTCCCCGCGCCAGCGGGGATAAACCGCTCGTAA AAGCAGTACAGTGCACCGTAAGATCGAGTTCCCCGCG CCAGCGGGGATAAACCG</i>	
zwf-FOR	<i>GCGCCAGCGGGGATAAACCGCTCGTAAAAG</i>	pCASCADE-zwf
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTTCATCAGGCGGGCAAG</i>	pCASCADE-G1G 2U

udhA-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGATTCTTATACATA AAAGC</i>	
FG1	<i>TCGAGTTCCTCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTTCCTCCGCGCCAGCGG GGATAAACCGAAAAGCATATAATGCGTAAAAGTTATGAAG TTCGAGTTCCTCCGCGCCAGCGGGGATAAACCG</i>	
gltA1-FOR	<i>GCGCCAGCGGGGATAAACCGAAAAGCATATAATGCG</i>	pCASCADE-gltA1
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTTCATCAGGCGGGCAAG</i>	pCASCADE-fabI
fabI-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGATACGAACAG ATAAACGGTTATTATAATC</i>	
FG2	<i>TCGAGTTCCTCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTTCCTCCGCGCCAGCGG GGATAAACCGTATTGACCAATTCATTCGGGACAGTTATTAG TTCGAGTTCCTCCGCGCCAGCGGGGATAAACCG</i>	
gltA2-FOR	<i>GCGCCAGCGGGGATAAACCGTATTGACCAATTCATTC</i>	pCASCADE-gltA2
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTTCATCAGGCGGGCAAG</i>	pCASCADE-fabI
fabI-REV	<i>CGGTTTATCCCCGCTGGCGCGGGGAACTCGATACGAACAG ATAAACGGTTATTATAATC</i>	
FU	<i>TCGAGTTCCTCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTTCCTCCGCGCCAGCGG GGATAAACCGTTACCATTCTGTTGCTTTTATGTATAAGAATC GAGTTCCTCCGCGCCAGCGGGGATAAACCG</i>	
udhA-FOR	<i>GCGCCAGCGGGGATAAACCGTTACCATTCTGTTG</i>	pCASCADE-udhA
pCASCADE-REV	<i>CTTGCCCGCCTGATGAATGCTCATCCGG</i>	
pCASCADE-FOR	<i>CCGGATGAGCATTTCATCAGGCGGGCAAG</i>	pCASCADE-fabI

fabI-REV	CGGTTTATCCCCGCTGGCGCGGGGAACTCGATACGAACAG ATAAACGGTTATTATAATC	
FZ	<i>TCGAGTCCCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTCCCCGCGCCAGCGG GGATAAACCGCTCGTAAAAGCAGTACAGTGCACCGTAAGA TCGAGTCCCCGCGCCAGCGGGGATAAACCG</i>	
zwf-FOR	GCGCCAGCGGGGATAAACCGCTCGTAAAAG	pCASCADE-zwf
pCASCADE-REV	CTTGCCCGCCTGATGAATGCTCATCCGG	
pCASCADE-FOR	CCGGATGAGCATTTCATCAGGCGGGCAAG	pCASCADE-fabI
fabI-REV	CGGTTTATCCCCGCTGGCGCGGGGAACTCGATACGAACAG ATAAACGGTTATTATAATC	
FG1G2	<i>TCGAGTCCCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTCCCCGCGCCAGCGG GGATAAACCGAAAAGCATATAATGCGTAAAAGTTATGAAG TTCGAGTCCCCGCGCCAGCGGGGATAAACCGTATTGACCA ATTCATTCCGGACAGTTATTAGTTCGAGTCCCCGCGCCAG CGGGGATAAACCG</i>	
gltA2-FOR	GCGCCAGCGGGGATAAACCGTATTGACCAATTCATTC	pCASCADE-gltA2
pCASCADE-REV	CTTGCCCGCCTGATGAATGCTCATCCGG	
pCASCADE-FOR	CCGGATGAGCATTTCATCAGGCGGGCAAG	pCASCADE-FG1
gltA1-REV	CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTTCATAA CTTTTAC	
FG1G2U	<i>TCGAGTCCCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTCCCCGCGCCAGCGG GGATAAACCGAAAAGCATATAATGCGTAAAAGTTATGAAG TTCGAGTCCCCGCGCCAGCGGGGATAAACCGTATTGACCA ATTCATTCCGGACAGTTATTAGTTCGAGTCCCCGCGCCAG CGGGGATAAACCGTTACCATTCTGTTGCTTTTATGTATAAG AATCGAGTCCCCGCGCCAGCGGGGATAAACCG</i>	
gltA2-FOR	GCGCCAGCGGGGATAAACCGTATTGACCAATTCATTC	pCASCADE-udhA
pCASCADE-REV	CTTGCCCGCCTGATGAATGCTCATCCGG	

pCASCADE-FOR	CCGGATGAGCATTTCATCAGGCGGGCAAG	pCASCADE-FG1G 2
gltA1-REV	CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTTCATAA CTTTTAC	
FG1G2Z	<i>TCGAGTCCCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTCCCCGCGCCAGCGG GGATAAACCGAAAAGCATATAATGCGTAAAAGTTATGAAG TTCGAGTCCCCGCGCCAGCGGGGATAAACCGTATTGACCA ATTCATTTCGGGACAGTTATTAGTTCGAGTCCCCGCGCCAG CGGGGATAAACCGCTCGTAAAAGCAGTACAGTGCACCGTA AGATCGAGTCCCCGCGCCAGCGGGGATAAACCG</i>	
gltA2-FOR	GCGCCAGCGGGGATAAACCGTATTGACCAATTCATTC	pCASCADE-zwf
pCASCADE-REV	CTTGCCCGCCTGATGAATGCTCATCCGG	
pCASCADE-FOR	CCGGATGAGCATTTCATCAGGCGGGCAAG	pCASCADE-FG1G 2
gltA1-REV	CGGTTTATCCCCGCTGGCGCGGGGAACTCGAACTTCATAA CTTTTAC	
FG1G2UZ	<i>TCGAGTCCCCGCGCCAGCGGGGATAAACCGTTGATTATAA TAACCGTTTATCTGTTTCGTATCGAGTCCCCGCGCCAGCGG GGATAAACCGAAAAGCATATAATGCGTAAAAGTTATGAAG TTCGAGTCCCCGCGCCAGCGGGGATAAACCGTATTGACCA ATTCATTTCGGGACAGTTATTAGTTCGAGTCCCCGCGCCAG CGGGGATAAACCGTTACCATTCTGTTGCTTTTATGTATAAG AATCGAGTCCCCGCGCCAGCGGGGATAAACCGCTCGTAAA AGCAGTACAGTGCACCGTAAGATCGAGTCCCCGCGCCAG CGGGGATAAACCG</i>	
zwf-FOR	GCGCCAGCGGGGATAAACCGCTCGTAAAAG	pCASCADE-zwf
pCASCADE-REV	CTTGCCCGCCTGATGAATGCTCATCCGG	
pCASCADE-FOR	CCGGATGAGCATTTCATCAGGCGGGCAAG	pCASCADE-FG1G 2U
udhA-REV	CGGTTTATCCCCGCTGGCGCGGGGAACTCGATTCTTATAC ATAAAAGC	
UZ	<i>TCGAGTCCCCGCGCCAGCGGGGATAAACCGTTACCATTCTG TTGCTTTTATGTATAAGAATCGAGTCCCCGCGCCAGCGGG</i>	

	<i>GATAAACCGCTCGTAAAAGCAGTACAGTGCACCGTAAGAT CGAGTTCCCCGCGCCAGCGGGGATAAACCG</i>	
zwf-FOR	GCGCCAGCGGGGATAAACCGCTCGTAAAAG	pCASCADE-zwf
pCASCADE-REV	CTTGCCCGCCTGATGAATGCTCATCCGG	
pCASCADE-FOR	CCGGATGAGCATTTCATCAGGCGGGCAAG	pCASCADE-udhA
udhA-REV	CGGTTTATCCCCGCTGGCGCGGGGAACTCGATTCTTATAC ATAAAAGC	

**Table S2:** List of synthetic DNA used in this study

<b>tetA-sacB Cassette</b>
TCCTAATTTTGTGACACTCTATCATTGATAGAGTTATTTTACCACTCCCTATCAGTGATA GAGAAAAGTGAAATGAATAGTTTCGACAAAGATCGCATTGGTAATTACGTTACTCGATGCC ATGGGGATTGGCCTTATCATGCCAGTCTTGCCAACGTTATTACGTGAATTTATTGCTTCGG AAGATATCGCTAACCCTTTGGCGTATTGCTTGCACCTTATGCGTTAATGCAGGTTATCTTT GCTCCTTGGCTTGGAAAAATGTCTGACCGATTTGGTCGGCGCCAGTGCTGTTGTTGTCAT TAATAGGCGCATCGCTGGATTACTTATTGCTGGCTTTTCAAGTGCCTTTGGATGCTGTAT TTAGGCCGTTTGTCTTCAGGGATCACAGGAGCTACTGGGGCTGTCGCGGCATCGGTCATTG CCGATACCACCTCAGCTTCTCAACGCGTGAAGTGGTTCGGTTGGTTAGGGGCAAGTTTTGG GCTTGGTTAATAGCGGGGCCTATTATTGGTGGTTTTGCAGGAGAGATTCACCGCATAGT CCTTTTTTATCGCTGCGTTGCTAAATATTGTCACCTTTCCTTGTGGTTATGTTTTGGTTCGGT GAAACCAAAAATACACGTGATAATACAGATACCGAAGTAGGGGTTGAGACGCAATCGAA TTCGGTATACATCACTTATTTAAAACGATGCCATTTTGTGATTATTTATTTTCAGCGC AATTGATAGGCCAAATTCCCGCAACGGTGTGGGTGCTATTTACCGAAAATCGTTTTGGATG GAATAGCATGATGGTTGGCTTTTCATTAGCGGGTCTTGGTCTTTTACACTCAGTATTCCAAG CCTTTGTGGCAGGAAGAATAGCCACTAAATGGGGCGAAAAACGGCAGTACTGCTCGGAT TTATTGCAGATAGTAGTGCATTTGCCTTTTLAGCGTTTATATCTGAAGGTTGGTTAGTTTTC CCTGTTTTAATTTTATTGGCTGGTGGTGGGATCGCTTTACCTGCATTACAGGGAGTGATGTC TATCCAAACAAAGAGTCATCAGCAAGGTGCTTTACAGGGATTATTGGTGAGCCTTACCAAT GCAACCGGTGTTATTGGCCATTACTGTTTGTGTTATTTATAATCATTACTACCAATTTG GGATGGCTGGATTTGGATTATTGGTTTLAGCGTTTTACTGTATTATTATCCTGCTATCGATGA CCTTCATGTTAACCCTCAAGCTCAGGGGAGTAAACAGGAGACAAGTGCTTAGTTATTTTCG TCACCAAATGATGTTATTCCGCGAAATATAATGACCCTCTTGATAACCCAAGAGCATCACA

TATACCTGCCGTTCACTATTATTTAGTGAAATGAGATATTATGATATTTTCTGAATTGTGAT  
TAAAAAGGCAACTTTATGCCCATGCAACAGAACTATAAAAAATACAGAGAATGAAAAG  
AAACAGATAGATTTTTTAGTTCTTTAGGCCCGTAGTCTGCAAATCCTTTTATGATTTTCTAT  
CAAACAAAAGAGGAAAATAGACCAGTTGCAATCCAAACGAGAGTCTAATAGAATGAGGT  
CGAAAAGTAAATCGCGCGGGTTTGTACTGATAAAGCAGGCAAGACCTAAAATGTGTAAA  
GGGCAAAGTGTATACTTTGGCGTCACCCCTTACATATTTTAGGTCTTTTTTTATTGTGCGTA  
ACTAACTTGCCATCTTCAAACAGGAGGGCTGGAAGAAGCAGACCGCTAACACAGTACATA  
AAAAAGGAGACATGAACGATGAACATCAAAAAGTTTGCAAAACAAGCAACAGTATTAAC  
CTTTACTACCGCACTGCTGGCAGGAGGGCGCAACTCAAGCGTTTGCAGAAAGAAACGAACCA  
AAAGCCATATAAGGAAACATACGGCATTTCATATTACACGCCATGATATGCTGCAAAT  
CCCTGAACAGCAAAAAAATGAAAAATATCAAGTTCCTGAGTTCGATTCGTCACAAATTA  
AATATCTCTTCTGCAAAAGGCCTGGACGTTTGGGACAGCTGGCCATTACAAAACGCTGA  
CGGCACTGTCGCAAACATCACGGTACCACATCGTCTTTCATTAGCCGGAGATCCTAAA  
AATGCGGATGACACATCGATTTACATGTTCTATCAAAAAGTCGGCGAAACTTCTATTGACA  
GCTGGAAAAACGCTGGCCGCGTCTTTAAAGACAGCGACAAATTCGATGCAAATGATTCTA  
TCCTAAAAGACCAAACACAAGAATGGTCAGGTTACGCCACATTTACATCTGACGGAAAA  
TCCGTTTATTCTACACTGATTTCTCCGGTAAACATTACGGCAAACAAACACTGACAACTGC  
ACAAGTTAACGTATCAGCATCAGACAGCTCTTGAACATCAACGGTGTAGAGGATTATAA  
ATCAATCTTTGACGGTGACGGAAAAACGTATCAAAATGTACAGCAGTTCATCGATGAAGG  
CAACTACAGCTCAGGCGACAACCATACGCTGAGAGATCCTCACTACGTAGAAGATAAAGG  
CCACAAATACTTAGTATTTGAAGCAAACACTGGAAGTGAAGATGGCTACCAAGGCGAAGA  
ATCTTTATTTAACAAAGCATACTATGGCAAAGCACATCATTCTTCCGTCAAGAAAGTCAA  
AAACTTCTGCAAAGCGATAAAAAACGCACGGCTGAGTTAGCAAACGGCGCTCTCGGTATG  
ATTGAGCTAAACGATGATTACACACTGAAAAAGTGATGAAACCGCTGATTGCATCTAAC  
ACAGTAACAGATGAAATTGAACGCGCAACGTCTTTAAATGAACGGCAAATGGTACCTG  
TTCAGTACTCCCAGGATCAAAAATGACGATTGACGGCATTACGTCTAACGATATTTACA  
TGCTTGGTTATGTTTCTAATTCTTTAACTGGCCATAAAGCCGCTGAACAAAACCTGGCCTT  
GTGTTAAAAATGGATCTTGATCCTAACGATGTAACCTTTACTTACTCACACTTCGCTGTACC  
TCAAGCGAAAGGAAACAATGTCGTGATTACAAGCTATATGACAAACAGAGGATTCTACGC  
AGACAAACAATCAACGTTTGCGCCAAGCTTCCTGCTGAACATCAAAGGCAAGAAAACATC  
TGTTGTCAAAGACAGCATCCTTGAACAAGGACAATTAACAGTTAACAAATAAAAAACGCAA  
AAGAAAATGCCGATATTGACTACCGGAAGCAGTGTGACCGTGTGCTTCTCAAATGCCTGA  
TTCAGGCTGTCTATGTGTGACTGTTGAGCTGTAACAAGTTGTCTCAGGTGTTCAATTTCATG  
TTCTAGTTGCTTTGTTTTACTGGTTTCACCTGTTCTATTAGGTGTTACATGCTGTTTCTGT  
TACATTGTCGATCTGTTTATGGTGAACAGCTTTAAATGCACCAAAAACCTCGTAAAAGCTCT  
GATGTATCTATCTTTTTTACACCGTTTTTCTCTGTGCATATGGACAGTTTTCCCTTTGAT

**recA1::ampR**

CCATCTCTACCGGTTTCGTTTTACTGGATATCGCGCTTGGGGCAGGTGGTCTGCCGATGGGCCGTAT  
CGTCGAAATCTACGGACCGGAATCTTCCGGTAAAACCACGCTGACGCTGCAGGTGATCGCCGACG  
GCAGCGTGAAGGTAACCTGTGCGTTTATCGATGCTGAACACGCGCTGGACCAATCTACGCACG  
TAAACTGGGCGTCGATATCGACAACCTGCTGTGCTCCCAGCCGGACACCGGCGAGCAGGCACTGGA



AATCTGTGACGCCCTGGCGGTTCTGGCGCAGTAGACGTTATCGTCGTTGACTCCGTGGCGGCACTG  
ACGCCGAAAGCGGAAATCGAAGGCGAAATC**GAT**GACTCTCACATGGGCCTTGCGGCACGTATGATG  
AGCCAGGCGATGCGTAAGCTGGCGGGTAACCTGAAGCAGTCCAACACGCTGCTGATCTTCATCAAC  
CAGATCCGTATGAAAATTGGTGTGATGTTTCGGTAACCCGGAACCACTACCGGTGGTAACGCGCTG  
AAATTCTACGCCTCTGTTTCGTCTCGACATCCGTCGTATCGGCGCGGTGAAAGAGGGGCGAAAACGTG  
GTGGGTAGCGAAACCCGCGTGAAAGTGGTGAAGAACAATAATCGCTGCGCCGTTTAAACAGGCTGAA  
TTCCAGATCCTCTACGGCGAAGGTATCAACTTCTACGGCGAACTGGTTGACCTGGGCGTAAAAGAG  
AAGCTGATCGAGAAAGCAGGCGCGTGGTACAGCTACAAAGGTGAGAAGATCGGTCAGGGTAAAGC  
GAATGCGACTGCCTGGCTGAAAGATAACCCGGAACCCGCGAAAGAGATCGAGAAGAAAGTACGTG  
AGTTGCTGCTGAGCAACCCGAACTCAACGCCGATTTCTCTGTAGATGATAGCGAAGGCGTAGCAG  
AAACTAACGAAGATTTTTAATGATTGCAGTCCAGTTACGCTGGAGTCTGAGGCTCGTCCTGAATGAT  
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TTCAAATATCTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAG  
AATATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGCGCATTTTGCCTTCCTGTTTTT  
GCTCACCCAGAAACGCTGGTGAAGTAAAAGATGCCGAAGATCAGTTGGGTGCACGTGTGGGTTAC  
ATCGAACTGGACCTCAACAGCGGTAAGATTCTTGAGAGTTTTCGCCCCGAAGAACGTTTCCAATGA  
TGAGCACTTTTAAAGTTCTGCTCTGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACT  
CGGTCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACTACCAGTCACAGAAAAGCATCTT  
ACGGACGGCATGACAGTACGCGAATTATGCAGCGCTGCCATAACCATGAGTGATAACACGGCGGCC  
AACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTTACCGCTTTTTTGCACAACATGGGTGATC  
ATGTAACCTGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATAACAAACGACGAGCGTGACA  
CCACGATGCCTGTAGCTATGGCAACAACGTTGCGCAAACCTTAACTGGCGAACTTCTTACTCTCGC  
TTCCCGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCGCTCGGC  
CCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCCC GCGGTATTATT  
GCAGCCCTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGCCAGGCA  
ACTATGGACGAACGTAATCGCCAGATCGCTGAGATAGGTGCCTCCCTGATTAAGCATTGGTAATAA  
CCAGGCATCTCGTCTTGTGTTGATACACAAGGGTCGCATCTGCGGCCCTTTTGTCTTTTTAAGTTGTAA  
GGATATGCCATGACAGAATCAACATCCCGTGCCCGGCATATGCTCGCCTGTTGGATCGTGCGGTAC  
GCATTCTGGCGGTGCGCGATCACAGTGAGCAAGAACTGCGACGTAAACTCGCGGCACCGATTATGG  
GCAAAAATGGCCCAGAAGAGATTGATGCTACGGCAGAAGATTACGAGCGCGTTATTG

**AsbcD::ampR**

TGATTGCAGTCCAGTTACGCTGGAGTCTGAGGCTCGTCCTGAATGATATCAAGCTTGAATTCGTTGG  
TTCATCCCGTGGGCATTGCATAGGGATAACAGGGTAATCTAAATACATTCAAATATCTATCCGCTCA  
TGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAATATGAGTATTCAACATT  
TCCGTGTCGCCCTTATTCCCTTTTTTTCGCGCATTTTGCCTTCCTGTTTTTGTCTCACCCAGAAACGCTGG  
TGAAAGTAAAAGATGCCGAAGATCAGTTGGGTGCACGTGTGGGTTACATCGAACTGGACCTCAACA  
GCGGTAAGATTCTTGAGAGTTTTCGCCCCGAAGAACGTTTCCAATGATGAGCACTTTTAAAGTTCT  
GCTCTGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTCGCCGCATACACTAT  
TCTCAGAATGACTTGGTTGAGTACTACCAGTCACAGAAAAGCATCTTACGGACGGCATGACAGTA  
CGCGAATTATGCAGCGCTGCCATAACCATGAGTGATAACACGGCGGCCAACTTACTTCTGACAACG  
ATCGGAGGACCGAAGGAGCTTACCGCTTTTTTGCACAACATGGGTGATCATGTAACCTGCCTTGATC  
GTTGGGAACCGGAGCTGAATGAAGCCATAACAAACGACGAGCGTGACACCACGATGCCTGTAGCTA  
TGGCAACAACGTTGCGCAAACCTTAACTGGCGAACTTCTTACTCTCGCTTCCC GGC AACAATTAAT  
AGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCGCTCGGCCCTTCCGGCTGGCTGGTTT  
ATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCCC GCGGTATTATTGCAGCCCTGGGGCCAGAT

GGTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGCCAGGCAACTATGGACGAACGTAAT  
CGCCAGATCGCTGAGATAGGTGCCTCCCTGATTAAGCATTGGTAATAACCAGGCAT

**del\_sbcD\_p1**

gatttcgtagggcagaaaaagcaaatggcacatctgtttgggtataatcgcccatgcttttcgccaTGATTGCAGTCCAGTTACG

**del\_sbcD\_p2**

gggtgaatcaatcttccattcgcttttaatgagttcaggttttcaggcgcaggctgagaattATGCCTGGTTATTACCAATGCTTAA

**Δcas1::purR**

GATCATTTCACGAATTTTTGCGGATACATCACCTACATATACCCCTGCACGTACCTCCAACAACCAG  
ATGGCTAATCTGCCTCGTAAGCGCGGAGGTACATTTTCAGTGACCACGACCAACATACTCATTTCCT  
GACGGATGGCCTTTTTGCGTTTCTACAAACTCTTTTTGTTTATTTTTCTAAATACATTCAAATATGTAT  
CCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGACTGAA  
TACAAGCCACGGTACGCTTGGCGACGCGGACGATGTTCCCCGCGCTGTTTCGTACATTAGCTGCGG  
CTTTTGCAGATTACCCAGCGACGCGCCATACGGTCGATCCGGACCGCCATATCGAGCGTGTACACAG  
AATTGCAGGAACTTTTCTTAACTCGCGTGGGCCTTGACATCGGAAAGGTCTGGGTGGCTGACGATGG  
CGCTGCAGTGGCTGTTTGGACCACTCCGGAGAGTGTAGAGGCTGGTGCAGTGTTCGCCGAAATTGGT  
CCTCGTATGGCCGAATTAAGTGGAAGTCGTCTGGCAGCCCAACAACAATGGAAGGGTTGCTTGCG  
CCCCACCGTCCGAAAGAACCCGCGTGGTTCCTTGCCACCGTTGGAGTAAGCCAGATCACCAGGGG  
AAGGGTTTAGGATCTGCCGTAGTTTTACCAGGTGTGGAGGCAGCAGAACGTGCGGGAGTTCCGGCC  
TTCCTTGAGACGTGCGCGCCGCGCAATTTACCGTTTTACGAACGTCTTGGATTACCGTTACGGCGG  
ACGTGGAGGTGCCGAGGGACCCCGTACTTGGTGTATGACTCGTAAACCGGGAGCCTGATAATTTA  
TTACACCTCAATCACAGTGGAGCCAAAGATAGCAAGCCACATCCCATCGATTTAGCTGGCCCAATA  
CCTTGCTGTACAAGATCTATTAACGCTGGCGCGTTCGTTGATGGTGAGCACACCTTCAAAGCAAACCG

**Δcas2::purR**

GCGGTTTATCCCCGCTGGCGCGGGAACTCTCTAAAAGTATACATTTGTTCTTAAAGCATTTTTTTCCC  
ATAAAAACAACCCACCAACCTTAATGTAACATTTCTTATTATTAAAGATCAGCTAATTCTTTGTTTT  
CCTGACGGATGGCCTTTTTGCGTTTCTACAAACTCTTTTTGTTTATTTTTCTAAATACATTCAAATATG  
TATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGACT  
GAATACAAGCCACGGTACGCTTGGCGACGCGGACGATGTTCCCCGCGCTGTTTCGTACATTAGCTG  
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