Supplementary Information

Identification of novel sRNAs involved in biofilm formation, motility, and fimbriae formation in *Escherichia coli*

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Supplementary Table 1. *E. coli* sRNAs used for construction of sRNA-overexpressing plasmids

	Name	Length (nt)	Characterized function	Hfq interaction	Biogenesis			Ref
					5'-end	3'-end	Rho-independent terminator	
1	ArcZ	120	Activation of RpoS, repression of *arcB*, *flhDC*	Yes	Yes	Yes	Yes	1–5
2	C0067	~125	Unknown	ND[c]	ND	ND	ND	6
3	C0293	~73	Unknown	ND	ND	ND	ND	6
4	C0299	~79	Unknown	ND	ND	ND	ND	6
5	C0343	~75	Unknown	ND	ND	ND	ND	6
6	C0362	~386	Unknown	ND	ND	ND	ND	6
7	C0465	~78	Unknown	ND	ND	ND	ND	6
8	C0614	~87	Unknown	ND	ND	ND	ND	6
9	C0664	~113	Unknown	ND	ND	ND	ND	6
10	C0719	~222	Unknown	ND	ND	ND	ND	6
11	CsrB	369	Antagonizing CsrA regulation	No	Yes	Yes	Yes	1,2,7,8
12	CsrC	245	Antagonizing CsrA regulation	No	Yes	Yes	Yes	1,2,7,9
13	CyaR	87	Induced by low glucose conditions, repression of *ompX, yqaE, nadE, luxS*	Yes	Yes	Yes	Yes	2,10,11
14	DicF	53	Inhibition of cell division, Interference with *ftsZ* translation	Yes	Yes	Yes	ND	12–14
15	DsrA	87	Activation of RpoS, repression of *hns*	Yes	Yes	Yes	Yes	15–18
16	EyeA (I001)	~75	Unknown	ND	ND	ND	ND	19
17	Ffs	114	4.5S RNA of Signal recognition particle (SRP)	No	Yes	Yes	ND	20,21
18	FnrS	119	Induced by unaerobic conditions, repression of *sodB, maeA, gpmA, folE, folX*	Yes	Yes	Yes	Yes	22,23
19	GadY	105	Antisense regulator of *gadXW*, repression of *gadW*, positive regulation of *gadX*	Yes	Yes	Yes	Yes	24–26
20	GcvB	205	Induced by high glycine, regulation of genes involved in amino acid metabolism (*oppA, dppA, gltI, livK, livJ, argT, cycA, sstT)*, repression of CsgD	Yes	Yes	Yes	Yes	27–32
21	GlmY	184	Decoy sRNAs for GlmZ	No	Yes	Yes	Yes	7,33–36
22	GlmZ	207	Increasing synthesis of *glmUS,* Stabilization of *glmS*	Yes	Yes	Yes	Yes	1,2,34–37
23	IS118	~190	Unknown	Yes	ND	ND	ND	24,38,39
24	IS128	~209	Unknown	ND	ND	ND	ND	24
25	McaS	94	Motility and biofilm regulator	Yes	Yes	Yes	Yes	24,32,40
26	IsrB	~160	Unknown, containing *azuC* ORF	No	ND	ND	ND	24,41
27	IsrC	~204	Unknown	ND	ND	ND	ND	24
28	IstR-1	75	*tisB* regulator	ND	Yes	Yes	Yes	42,43
29	IstR-2	140	SOS-regulated, mitigating IstR-1	ND	Yes	Yes	Yes	42,43
30	MgrR	99	Induced by low Mg^{2+}, PhoP, Regulator of LPS modification gene *eptB, ygdQ*	Yes	Yes	Yes	Yes	38,44
31	MicA	72	Repression of *ompA, ompX, phoPQ*	Yes	Yes	Yes	Yes	1,10,45–47
32	MicC	109	Repression of *ompC*	Yes	Yes	Yes	Yes	24,48
33	MicF	93	Repression of *ompF, lrp* antibiotics resistance	Yes	Yes	Yes	Yes	49–52
34	MicM	85	Repression of *chiP, dpiBA* by chbBCARFG decoy mRNA	Yes	Yes	Yes	Yes	2,53–56
35	OhsC	77	Regulator of *shoB* toxin	ND	Yes	Yes	ND	2,57,58

36	OmrA	88	Repression of outer membrane proteins (*cirA, fecA, fepA, ompT, gntP, ompR*), repression of *csgD, flhDC*	Yes	Yes	Yes	Yes	[1,2,59–62]
37	OmrB	82	Repression of outer membrane proteins (*cirA, fecA, fepA, ompT, gntP, ompR*), repression of *csgD, flhDC*	Yes	Yes	Yes	Yes	[1,2,59–62]
38	OxyS	110	Induced by oxidative stress, Repression of *fhlA, yobF-cspC, ybaYwrbA, rpoS*	Yes	Yes	Yes	Yes	[63,64]
39	PsrD	149~168	Unknown	Yes?[a]	Yes	Yes	Yes	[1]
40	PsrO	146~174	Unknown	ND	Yes	Yes	ND	[1]
41	RdlA	67	Antisense regulator of *ldr* toxin	ND	Yes	Yes	ND	[57]
42	RdlB	66	Antisense regulator of *ldr* toxin	ND	Yes	Yes	ND	[57]
43	RdlC	68	Antisense regulator of *ldr* toxin	ND	Yes	Yes	ND	[57]
44	RdlD	66	Antisense regulator of *ldr* toxin	ND	Yes	Yes	ND	[57,65]
45	RnpB	377	RNase P RNA	No	Yes	Yes	Yes	[66–68]
46	RprA	105	Activation of RpoS, repression of *csgD, ydaM*	Yes	Yes	Yes	Yes	[32,69–71]
47	RseX	91	Repression of *ompC, ompA*	Yes	Yes	Yes	Yes	[24,72]
48	RttR	171	Processed from *tyrT* transcript	ND	Yes	Yes	ND	[73]
49	RybA	202	*mntS* mRNA, Regulator of aromatic amino acid synthesis under oxidative stress	No	Yes	Yes	ND	[2,74,75]
50	RybB	81	Repression of *ompC, ompW*	Yes	Yes	Yes	ND	[2,76,77]
51	RybD	~103	Unknown	Yes	ND	ND	Yes	[38]
52	RydB	~68	Unknown	No	ND	ND	ND	[2,7]
53	RydC	64	Repression of ABC permease *yejABEF*	Yes	Yes	Yes	ND	[38,78]
54	RyeA	~249	Unknown	No	Yes	Yes	ND	[1,2]
55	SdsR	104	RpoS-dependent sRNA	Yes	Yes	Yes	Yes	[2,79]
56	RyeF	~388	Unknown	Yes	ND	ND	ND	[38]
57	RyfA	~304	Unknown	ND	ND	ND	ND	[2,7]
58	RyfB	280	Unknown, *shoB* mRNA	ND	Yes	Yes	ND	[57]
59	RyfD	143	Unknown	ND	Yes	Yes	ND	[57]
60	RyhB	90	Induced by iron limitation, repression of iron-containing proteins (*sdhCDAB, acnA, fumA, bfr, sodB*), repression of *cysE, shiA*	Yes	Yes	Yes	Yes	[1,2,80–83]
61	RyjA	140	Unknown	No	Yes	Yes	Yes	[1,2]
62	RyjB	90	Unknown	Yes	Yes	Yes	ND	[38,57]
63	SgrS	227	Repression of *ptsG, manXYZ*, containing *sgrT* ORF	Yes	Yes	Yes	Yes	[84–86]
64	SibA	144	Antisense regulator of toxin *ibs*	ND	Yes	Yes	ND	[2,58]
65	SibB	130	Antisense regulator of toxin *ibs*	ND	Yes	Yes	ND	[2,58]
66	SibC	141	Antisense regulator of toxin *ibs*	ND	Yes	Yes	ND	[2,58]
67	SibD	145	Antisense regulator of toxin *ibs*	ND	Yes	Yes	ND	[2,58]
68	SibE	144	Antisense regulator of toxin *ibs*	ND	Yes	Yes	ND	[58]
69	SokA	30	Pseudogene, antisense sRNA blocking mok/hok translation; the last 30/52 nt remain	ND	Yes	Yes	ND	[87]
70	SokB	56	antisense sRNA blocking mok/hok translation	ND	Yes	Yes	ND	[57,87]
71	SokC	55	antisense sRNA blocking mok/hok translation	ND	Yes	Yes	ND	[57,87]
72	SokE	59	antisense sRNA blocking mok/hok translation, missed start codon of mokE	ND	Yes	Yes	ND	[57,87]

73	SokX	56	Unknown, No hok toxic peptide	ND	Yes	Yes	ND	[57,87]
74	Spf	109	Repression of *galK*, broad role in catabolite repression	Yes	Yes	Yes	Yes	[88–90]
75	SraA	**~120**	Unknown	ND	ND	ND	ND	[1]
76	SroA	93	Unknown, leader region of *thiBPQ*	ND	Yes	Yes	ND	[91]
77	SroC	163	Unknown, leader region of *gltJKL*	Yes?[b]	Yes	Yes	Yes	[91]
78	SroD	86	Unknown, processed from *fadD*	ND	Yes	Yes	Yes	[91]
79	SroE	92	Unknown, processed from *gcpE*	ND	Yes	Yes	ND	[91]
80	SroG	149	Unknown, leader region of *ribB*	Yes?[a]	Yes	Yes	ND	[91]
81	SroH	161	Unknown, mutant is sensitive to envelope stress	ND	Yes	Yes	ND	[91,92]
82	SsrA	363	tmRNA	No	Yes	Yes	ND	[93]
83	SsrS	183	6S RNA, inhibition of σ^{70} RNA polymerase	No	Yes	Yes	ND	[94]
84	SymR	77	Antisense regulator of *symE*	ND	Yes	Yes	ND	[57,95]
85	T44	~136	Unknown, leader region of *rpsB*	ND	Yes	ND	ND	[7]
86	Tp2	~120	Unknown	ND	ND	ND	ND	[7]
87	Tpke11	~88	Unknown	ND	ND	ND	ND	[7]
88	Tpke70	~435	Unknown	ND	ND	ND	ND	[7]
89	pRNA	20	Unknown, synthesis from 6S RNA	ND	Yes	Yes	ND	[96]
90	Och1	255	Unknown	Yes	Yes	Yes	ND	[97]
91	Och2	188	Unknown	ND	Yes	Yes	Yes	[97]
92	Och3	192	Unknown	ND	Yes	Yes	Yes	[97]
93	Och4	241	Unknown	ND	Yes	Yes	ND	[97]
94	Och5	158	Unknown	ND	Yes	Yes	Yes	[97]
95	Och6	106	Unknown	Yes	Yes	Yes	ND	[97]
96	Och7	158	Unknown	Yes	Yes	Yes	ND	[97]
97	Och8	144	Unknown	ND	Yes	Yes	Yes	[97]
98	Och9	72	Unknown	Yes	Yes	Yes	ND	[97]
99	Och10	106	Unknown	Yes	Yes	Yes	ND	[97]

[a,b]Hfq interaction cited from other studies on *Klebsiella pneumoni*[a,98] and *Salmonella enterica serovar Typhimurium*[b,99].

[c]ND; Not determined.

Supplementary Table 2. Full sequences of cloned regions of each sRNA

sRNA	Vector	Preparation	Enzyme sites	Cloned sequence
ArcZ	pHM-tac	PCR	*Eco*RI/*Xba*I	GTGCGGCCTGAAAAACAGTGCTGTGCCCTTGTAACTCATCATAATAATTTACGGCGCAGCCAAGATTTCCCTGGTGTTGGCGCAGTATTCGCGCACCCCG GTCTAGCCGGGGTCATTTTTTagtggcttttgccacccacgctttc
C0067	pHMB1	PCR	*Eco*RI/*Xba*I	ataagagttagctgtattgttATGTCTGTGGCGAAATTGACTACCTTCGTTTTTTTGATTAAGAATGATTTTATTATCGTAAGTAAAATTACATGAATATTTAAAAAGGAAAA CGACATGAAACCGAAGCACAGAATCAACATTCTccaatcataaaatatttccgtggagcattttattattgaatatagaggtttaactc
C0293	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	agccggttttgtatcaactacTCACCCGGGACTCGCCAGGGGACAGCCAACAGGCATTGGGTGCAATCACCTTAGCGTTCAGGTACATGCGGAAtgtaaaaaaggccgcg agcgcggccccttcacatacatctttagtactgaga
C0299	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	atgagcgtcgtcgccagaagGCCACGTGAGCACAAGATAAGAGAACGAAAAATCAGCAGCCTATGCAGCGACAAATATTGATAGCCTGAATCAGTATTGatctgctggca agaacagactactgtatataaaaacagta
C0343	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	atgaaccgattcctggcgatcCTGTTCCAGTGCCCGATCCGATCCCTCGCCCGCAACCCATGCCTGACCCACCACCCGATGAAGAACCGATTAAATtgtcgcatcgtgagc gtagatctgcgaggatacgcgcctg
C0362	pHMB1	PCR	*Eco*RI/*Xba*I	aagggatataatctcttttgAACTTTAAGCTGAAAATGGCGCTGTAAAAGGCGCCATTTTCATATTGTAGACAACGTAGGCTTTGTTCATGCCGGATGCGGCGTGAAC GCCTTATCCGGCATGAAAACCCTTCAAATCCAATAGATTGCAGTGAACGTGTAGGCCTGATAAGCGTAGCGCATCAGGCAATGTTGCGTTTGTCATCAGTTT CAAATGGCGCTGTAAAAGGCGTCATTTTCATATTGTAGACAACGTAGGCTTTGTTCATGCCGGATGCGGCGTGAACGCCTTATCCGGCATGAAAACCCTTC AAATCCAATAGATTGCAGTGAACGTGTAGGCCTGATAAGCGTAGCGCATCAGGCAATGTTGCGTTTGTCATCAGTTCTAAATGGCGCTTTATAAAgtgccatttttt attgcgtaaccagacggcgtaatcgcgacac
C0465	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	actcgttatcggcaaggagggGGGAAACTTTATTGCTGATGCCACCCGCCGCGAAATTGAAATAAAAAACCCGATGCGCAGATCATCGGGTTCATTTCAattgaggaaatc gggagaattacgccacttctgacgccgc
C0614	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	attaccgaacacggcggaaagGGCCGGTGTCGATAATACGCTAAATAAACAATAATTACTCTCTTTTGCTTGACAAAAAGAGAGTTACTGGTGAGTATTGTTTTGCTGt gaagcacctgcgttgctcatgtaacacaagtcaacctgct
C0664	pHMB1	PCR	*Eco*RI/*Xba*I	atgccgatgtaggtgggctacTGTGCCTAAAATGTCGGATGCGACGCTGGCGCGTCTTATCCGACCTACGGGGACGCATGTGTAGGCCGGATAAGGCGTTTACGCC GCATCCGGCAATGGTGTCCAAATGCAACacgttttatccgttctggacttcacccgctaaccaacgcg
C0719	pHMB1	PCR	*Eco*RI/*Xba*I	aagaggactgaactgtaaaaTATAGGCGTTATACTTTACAGCAACAGTACGCCGCTAACGCAATTGCTACCTCTGGCATAACAAGTATATCGGGTAAGGGTTTCTGTT CCGCACACGCAGACGCAGAGTATCGTTAAGATGTCCATATTGTTGTTTTAGGCCCGCTAGTAATGCGCTACGGGTATTTAATATTGTTAAACCCTGATAATCG CTCCGGTTATTTCCGGGATAAATGTACTACCgcagttactatcatagccccgacaataaaacttgccgggg
CsrB	pHMB1	PCR	*Eco*RI/*Xba*I	aGTCGACAGGGAGTCAGACAACGAAGTGAACATCAGGATGATGACACTTCTGCAGGACACACCAGGATGGTGTTTCAGGGAAAGGCTTCTGGATGAAGC GAAGAGGATGACGCAGGACGCGTTAAAGGACACCTCCAGGATGGAGAATGAGAACCGGTCAGGATGATTCGGTGGGTCAGGAAGGCCAGGGACACTTC AGGATGAAGTATCACATCGGGGTGGTGTGAGCAGGAAGCAATAGTTCAGGATGAACGATTGGCCGCAAGGCCAGAGGAAAAGTTGTCAAGGATGAGCAG GGAGCAACAAAAGTAGCTGGAATGCTGCGAAACGAACCGGGAGCGCTGTGAATACAGTGCTCCCTTTTTTTATTcctgctatccttcgcggcagttttt
CsrC	pHMB1	PCR	*Eco*RI/*Xba*I	ATAGAGCGAGGACGCTAACAGGAACAATGACTCAGGATGAGGGTCAGGAGCGCCAGGAGGCGAAGACAGAGGATTGTCAGGAAGACAAACGTCCGGAG ACGTAATTAAACGGAAATGGAATCAACACGGATTGTTCCGGCTAAAGGAAAAACAGGGTGTGTTGGCGGCCTGCAAGGATTGTAAGACCCGTTAAGGGTT ATGAGTCAGGAAAAAAGGCGACAGAGTAATCTGTCGCCTTTTTTCTTgcttgctttctgttagattccgcc
CyaR	pHM-tac	PCR	*Eco*RI/*Xba*I	GCTGAAAAACATAACCCATAAAATGCTAGCTGTACCAGGAACCACCTCCTTAGCCTGTGTAATCTCCCTTACACGGGCTTATTTTTTcgcgtaatacaatgaaataaaa ggatttatttctggtcacgtccacacattgaccacatcgacaaaaaagcccctcgactgaggggcttcctgtttcta
DicF	pHMB1	PCR	*Eco*RI/*Xba*I	aTTTCTGGTGACGTTTGGCGGTATCAGTTTTACTCCGTGACTGCTCTGCCGCCCttttaaagtgaattttgtgatgtggtgaatgcggctgagcgc
DsrA	pHMB1	PCR	*Eco*RI/*Xba*I	AACACATCAGATTTCCTGGTGTAACGAATTTTTTAAGTGCTTCTTGCTTAAGCAAGTTTCATCCCGACCCCCTCAGGGTCGGGATTTttttattgtgcattcaacgattca cttca
EyeA	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	agaaacaccggggcagcagcgTCTATCACGCTTGCGTTGCTGACTTCTGCCAACTTGCGGCAAGCAAGGATAAAGAGTGCGACGGGCAGCCTCCTCagtatgcctgag tccaggcaggtaaaccggggaaggtcag
Ffs	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGGGGGCTCTGTTGGTTCTCCCGCAACGCTACTCTGTTTACCAGGTCAGGTCCGGAAGGAAGCAGCCAAGGCAGATGACGCGTGTGCCGGGATGTAGC TGGCAGGGCCCCCACCCatttctgcctcccaccgtttcgtca
FnrS	pHMB1	PCR	*Eco*RI/*Xba*I	aGCAGGTGAATGCAACGTCAAGCGATGGGCGTTGCGCTCCATATTGTCTTACTTCCTTTTTTGAATTACTGCATAGCACAATTGATTCGTACGACGCCGACT TTGATGAGTCGGCTTTTTTTTgcctgttatttatcagcgtctaccc
GadY	pHMB1	PCR	*Eco*RI/*Xba*I	ACTGAGAGCACAAAGTTTCCCGTGCCAACAGGGAGTGTTATAACGGTTTATTAGTCTGGAGACGGCAGACTATCCTCTTCCCGGTCCCCTATGCCGGGTT TTTTTtatgtctgagtaaaactctataatc
GcvB	pHMB1	PCR	*Eco*RI/*Xba*I	ACTTCCTGAGCCGGAACGAAAAGTTTTATCGGAATGCGTGTTCTGGTGAACTTTTGGCTTACGGTTGTGATGTTGTGTTGTTGTGTTTGCAATTGGTCTGC GATTCAGACCATGGTAGCAAAGCTACCTTTTTTCACTTCCTGTACATTTACCCTGTCTGTCCATAGTGATTAATGTAGCACCGCCTAATTGCGGTGCTTTTTT

				TTaccttgcgatcgcgaattactgatc
GlmY	pHM-tac	PCR	*Eco*RI/*Xba*I	AGTGGCTCATTCACCGACTTATGTCAGCCCCTTCGGGACGTGCTACATAAAATACGAATGACGCACAACAAGGTGCCTGCCGTCCAACTTCTGATATCAGC GTAGCTATATCAACCATCGGGCGAAACGTCGAGTTAGGCACCGCCTTATTCCATAACAAAGCCGGGTAATTCCCGGCTTTGTTtatctgaacttcccctcggttagcatca ggctattcgcgtctgacgagagtaacaccttgaaacgctggcccgtttttccccgctcattacgacaactg
GlmZ	pHM-tac	PCR	*Eco*RI/*Xba*I	GTAGATGCTCATTCCATCTCTTATGTTCGCCTTAGTGCCTCATAAACTCCGGAATGACGCAGAGCCGTTTACGGTGCTTATCGTCCACTGACAGATGTCGCT TATGCCTCATCAGACACCATGGACACAACGTTGAGTGAAGCACCCACTTGTTGTCATACAGACCTGTTTTAACGCCTGCTCCGTAATAAGAGCAGGCGTTT TTTTatgtatcaggaaggccccggaggtgcttgcctccgggtgagaaggaactactgtggcgggttatt
IS118	pHMB1	PCR	*Eco*RI/*Xba*I	aGGTTCTGGAGGGGGTTTGTTGTGGGCAATGATGCATTTAAGTTATCGTCTGCAGATAGAGGAGATATTACAATAAACAACGAATCAGGGCATTTGATAGTC AATACCGCAATTCTATCAGGAGATATAGTCACTCTAAGAGGAGGAGAAATTAGGTTGGTATTATAGCTTGTGCGCGCCATGATTGGCGCGCAATTTaaacttagtg ctttacatcgctattgtcttgatttctttgaattattttataaattaa
IS128	pHMB2	PCR	*Sma*I/*Xba*I	aagagagtaattattgtttaTTTAGCGTATTATCGACACCGGCCCTTTCCGCCGTGTTCGGTAATAAAATAACCTGGCTTATTAGTCCGAATTCAGACAAATATAAATAAA TCCTGCTCAAAATTAAAAATTCTAACCGGTAAAAGATATTACTTAAACATGTAAATTCACTTTCCTTTAAAAAACAAAAAACCGCCAAAATCAGGCGGTTTTTT GTTGCTGGTCCGGTtcgcggcctttccagcaggttgtattaccgtagtaatgca
McaS	pHMB1	PCR	*Eco*RI/*Xba*I	acgatattaataatgtaacttatatttttcgtgaaatctgtcactgaagaaaattggcaactaaaggttaaaaccgttataacacagtcACCGGCGCAGAGGAGACAATGCCGGATTTAAGACGCGGAT GCACTGCTGTGTGTACTGTAGAGTCTGGCGGATGTCGACAGACTCTATTTTTTTTATgcagttttaactttgcagatagccgcatt
IsrB	pHMB1	PCR	*Eco*RI/*Xba*I	atgtcatattataagcgcaaaGACAATAACACCTGTATAACAAATGGTCGGAGTGCCGCGATGAAACTGCGCAAAATCCTGAAAAGTATGTTCAATAACTATTGCAAGA CGTTCAAAGACGTACCGCCAGGCAATATGTTCCGATAACAAAAAACCTGCTCCGGCAGGTTTTTTTGTGTCCtgatgacggtggatgtgactatcgctgaagatgtgaagtc
IsrC	pHMB1	PCR	*Eco*RI/*Xba*I	atagctcaataatagaataaaACGATCAATATCTATTTTATCGATCGTTTATATCGATCGATAAGCTAATAATAACCTTTGTCAGTAACATGCACAGATACGTACAGAAAG ACATTCAGGGAACAACAGAACCACAATTCAGAAACTCCCACAGCCGGACCTCCGGCACTGTAACCCTTTACCTGCCGGTATCCACGTTTGTGGGTACCGG CTTTTTTATTCACCctcaatctaaggaaaagctgatgaaa
IstR-1	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGTTGACATAATACAGTGTGCTTTGCGGTTACCAGCCGCAGGCGACTGACGAAACCTCGCTCCGGCGGGGTTTTTTgttatctgcaattcagtacaaaacg
IstR-2	pHMB1	PCR	*Eco*RI/*Xba*I	aGCACTAAATACGTCAAAATTCGTGCCGAAATTGCGCGTTCTGCGCGGAACACGTATACTTTCAGTGTTGACATAATACAGTGTGCTTTGCGGTTACCAGCC GCAGGCGACTGACGAAACCTCGCTCCGGCGGGGTTTTTTgttatctgcaattcagtacaaaacg
MgrR	pHMB1	PCR	*Eco*RI/*Xba*I	aGATTCGTTATCAGTGCAGGAAAATGCCTGTTAGCGTAAAAGCAAAACACAAATCTATCCATGCAAGCATTCACCGCCGGTTTACTGGCGGTTTTTTTTcgccg tcataaaaatcaggcccctt
MicA	pHMB2	PCR	*Sma*I/*Xba*I	aGAAAGACGCGCATTTGTTATCATCATCCCTGAATTCAGAGATGAAATTTTGGCCACTCACGAGTGGCCTTTTTCTTTTctgtcaggcgtgtttttccagccac
MicC	pHMB1	PCR	*Eco*RI/*Xba*I	aGTTATATGCCTTTATTGTCACAGATTTTATTTTCTGTTGGGCCATTGCATTGCCACTGATTTTCCAACATATAAAAAGACAAGCCCGAACAGTCGTCCGGGC TTTTTTTttagaattggataatccttatccagag
MicF	pHMB1	PCR	*Eco*RI/*Xba*I	aGCTATCATCATTAACTTTATTTATTACCGTCATTCATTTCTGAATGTCTGTTTACCCCTATTTCAACCGGATGCCTCGCATTCGGTTTTTTTTaccctttacacacttt tcatta
MicM	pHMB1	PCR	*Eco*RI/*Xba*I	ACACCGTCGCTTAAAGTGACGGCATAATAATAAAAAAATGAAATTCCTCTTTGACGGGCCAATAGCGATATTGGCCATTTTTTTagcgcaacatttgcggcaaattccc
OhsC	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	actgatccataatcgctgttGTTGAGGGTGCATGCTGCACAAAATTAAAGTTAAAAAGTAAAACCCCCGTTCCTTACCAGTTCGGGGGTTTTACTTTttaaagagaacggtatt atttttaa
OmrA	pHMB1	PCR	*Eco*RI/*Xba*I	aCCCAGAGGTATTGATTGGTGAGATTATTCGGTACGCTCTTCGTACCCTGTCTCTTGCACCAACCTGCGCGGATGCGCAGGTTTTTTTTcgcacctaatttactgtcg ctcgcg
OmrB	pHMB1	PCR	*Eco*RI/*Xba*I	aCCCAGAGGTATTGATAGGTGAAGTCAACTTCGGGTTGAGCACATGAATTACACCAGCCTGCGCAGATGCGCAGGTTTTTTTTgccggtcatcaatctgtaacagtaa
OxyS	pHMB1	PCR	*Eco*RI/*Xba*I	aGAAACGGAGCGGCACCTCTTTTAACCCTTGAAGTCACTGCCCGTTTCGAGAGTTTCTCAACTCGAATAACTAAAGCCAACGTGAACTTTTGCGGATCTCC AGGATCCGCTttttttgccataaaaaagcccggcgataagc
PsrD	pHMB1	PCR	*Eco*RI/*Xba*I	aTAGGCATATTTTTTTCCATCAGATATAGCGTATTGATGATAGCCATTTTAAACTATGCGCTTCGTTTTGCAGGTTGATGTTTGTTATCAGCACTGAACGAAAAT AAAGCAGTAACCCGCAATGTGTGCGAATTATTGGCAAAAGGCAACCACAGGCTGCCTTTTTCTTTgactctatgacgttacaaagttaat
PsrO	pHM-tac	PCR	*Eco*RI/*Xba*I	ATCTTCTGCGCATCCTCGCGACTAATGACAACCCTAACCCAGCTCTATGTGGGTAAAGCCTCTCATTAGCCGCGCGAACCTCTGCAACGGAAGATCATTCA TAGCAACAATACATTAGTTTCCAGTGAATTGCTGCCGTCAGCTTGAAAAAAGGGGCCACTCAGGCCCCCTTTTctgaaactcgcaagaattagcgacgcagacccaggcgc tcgatgagctgggtgtaacgtgctacgtctttacgtttcaggtagtcgagcagtttacgacg
RdlA	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	atttgcggctattcttgaattGTTCTGGTTCAAGATTAGCCCCCGTTCTGTTGTCAGGTTGTACCTCTCAACGTGCGGGGGTTTTCTCtttccagcaaccaatgccaccagggataa agcccccgcaa
RdlB	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGTCTGGTTTCAAGATTAGCCCCCGTTCTGTTGTCAGGTTTTACCTCTCAACGTGCGGGGGTTTTCTctttccagcaaccaatgccaccagggataaagcccccgca
RdlC	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGTCTGGTTTCAAGATTAGCCCCCGTTTTGTTGTCAGGTTTTACCTCTCAACGTGCGGGGGTTTTCTCTTtccagcaaccaatgccaccagggataaagccccgcaaca
RdlD	pHMB1	Gene synthesis	*Eco*RI/*Hind*III	aGTCTAGAGTCAAGATTAGCCCCCGTGGTGTTGTCAGGTGCATACCTGCAACGTGCGGGGGTTTTCtctctccagcaaccaatgccaccagggataaagcccccgca

RnpB	pHMB1	PCR	*Eco*RI/*Xba*I	GAAGCTGACCAGACAGTCGCCGCTTCGTCGTCGTCCTCTTCGGGGGAGACGGGCGGAGGGGAGGAAAGTCCGGGCTCCATAGGGCAGGGTGCCAGG TAACGCCTGGGGGGGAAACCCACGACCAGTGCAACAGAGAGCAAACCGCCGATGGCCCGCGCAAGCGGGATCAGGTAAGGGTGAAAGGGTGCGGTAA GAGCGCACCGCGCGGCTGGTAACAGTCCGTGGCACGGTAAACTCCACCCGGAGCAAGGCCAAATAGGGGTTCATAAGGTACGGCCCGTACTGAACCCG GGTAGGCTGCTTGAGCCAGTGAGCGATTGCTGGCCTAGATGAATGACTGTCCACGACAGAACCCGGCTTATCGGTCAGTTTCACCTgatttacgtaaaaacccgctt cggcgggtttttgcttttg
RprA	pHMB1	PCR	*Eco*RI/*Xba*I	ACGGTTATAAATCAACATATTGATTTATAAGCATGGAAATCCCCTGAGTGAAACAACGAATTGCTGTGTGTAGTCTTTGCCCATCTCCCACGATGGGCTTTTT TTTaacatttttccgcttcgctacctcg
RseX	pHMB1	PCR	*Eco*RI/*Xba*I	aTTTTTATTATTCTGTGTCATGATGCTTCCGTTATTAGCCTTTTATCGTCTTGTTTATATTTTTTGGGCCGGCATGATGCCGGCTTTTTTTTatgccttcattaatgtgcgcc tgat
RttR	pHMB1	PCR	*Eco*RI/*Xba*I	atccccaccaccatcactttCAAAAGTCCCTGAACTTCCCAACGAATCCGCAATTAAATATTCTGCCCATGCGGGGAAGGATGAGAAGCTTCGACCAAGGTTCGAC TCGAGCGCCAGCGAGAGAGCGTTGCCGCAGGCAACGACCCGAAGGGCGAAGCGCGCAGCGCTGAGTAATCCTTCCCCCACCACCAtcactttcaaaagtccctg aactctcaagcgaatccgcaa
RybA	pHMB1	PCR	*Eco*RI/*Xba*I	agcctgtgctatatctgtatgtaatgcaaTCATCCCTCAAGGATCGACGGGATTAGCAAGTCAGGAGGTCTTATGAATGAGTTCAAGAGGTGTATGCGCGTGTTTAGTCAT TCTCCCTTTAAAGTACGGTTAATGCTGCTCTCTATGTTGTGCGATATGGTCAACAACAAACCGCAGCAAGATAAACCTTCCGATAAATAGCGGCGTCGCGGT ACGCCGCTTCACtcctgctttcatgcaggcataacgcgttttggtctgaaaa
RybB	pHMB1	PCR	*Eco*RI/*Xba*I	ACTGCTTTTCTTTGATGTCCCCATTTTGTGGAGCCCATCAACCCCGCCATTTCGGTTCAAGGTTGATGGGTTTTTTTGTTatctaaaacttatctactaccctgc
RybD	pHMB1	PCR	*Eco*RI/*Xba*I	ATATCTGTAATAAGAAATAGCCCTCGCCGCTTCCCTCTACAGGAATGGCGAAGGGCTGTCGGTTTCGACATGGTTGGCCATCGTATGATGGCCTTTTTTgtgc ttatcgcgatgattttcgctg
RydB	pHMB1	PCR	*Eco*RI/*Xba*I	actaatcgcagtttgtgttaaaacggcgggttagctttatgagATTATTCTTATCGCCCCTTCAAGAGCTAAGCCACTGAGAGTGCCGGAGATAAGCGCCGGATGGGGTAGAAAC CCTTAAGCctgtgtcgcacagacttaagggttttcttatttct
RydC	pHMB1	PCR	*Eco*RI/*Xba*I	aCTTCCGATGTAGACCCGTATTCTTCGCCTGTACCACGGGTCGGTTTTAGTACAGGCGTTTTCTTtaaatatccttcaggaacgtttacg
RyeA	pHM-tac	PCR	*Eco*RI/*Xba*I	AAAGTCAGCGAAGGAAATGCTTCTGGCTTTTAACAGATAAAAAGAGACCGAACACGATTCCTGTATTCGGTCCAGGGAAATGGCTCTTGGGAGAGAGCCG TGCGCTAAAAGTTGGCATTAATGCAGGCTTAGTTGCCTTGCCCTTTAAGAATAGATGACGACGCCAGGTTTTCCAGTTTGCGTGCAAAATGGTCAATAAAAA GCGTGGTGGTCATCAGCTGAAATGTTAAAAACCGCCCGTTCTGGTGAaagaactgaggcggttttttattggaaatcaaaaggctattttaggtaattaacagagttttcagctcgttctataaac ggtgccagactcatttttcgccgggattgttaggatcatcaatctgaatcaccgaaatgggttgggcattggtcttcccactggcaacttcctttgtgcgatatcgtttaaaggatactgcacgagggtactcggattaataacatac aaagcattacccggtcggcaagtcagcatcacctcttcgc
SdsR	pHM-tac	PCR	*Eco*RI/*Xba*I	GGCAAGGCAACTAAGCCTGCATTAATGCCAACTTTTAGCGCACGGCTCTCTCCCAAGAGCCATTTCCCTGGACCGAATACAGGAATCGTGTTCGGTCTCT TTTTatctgttaaaagccagaagcatttccttcgctgactttat
RyeF	pHMB1	PCR	*Eco*RI/*Xba*I	ATTTTTACCGTTGCATCATGTCGCCCAATATGATGCTTGCTCGTACCAGGCCCCTGCAATTTCAACAGGGGCCTTTTTTTATCCCTGAACAGTATAAAAAACG AACGATAACCGTGATCTGTTGAGCGGGTGACAGTGCGCATAGCGTTGTGCTAAAAATATTGTATATATTCACATTAATTATGGGATTTAAATTACTAAAACTGA TAAATATATATTCTAAATAGCAACTGGGTTATTCCTTAGCAATTAATGATTACATTGTAATAAATCATATTCTTTATCGATTGTTTCAGGCAGTGTTGTGCCTAATT ATGCAAGCGGTTAATTCGTTGTATATTTAATTATACAATGATTTCGGTGTCCAGTAATTTAATTAGAGGAATCT
RyfA	pHMB1	PCR	*Eco*RI/*Xba*I	aGCGGCCCTTTCCGCCGTCTCGCAAACGGGCGCTGGCTTTAGGAAAGGATGTTCCGTGGCCGTAAATGCAGGTGTTTCACAGCGCTTGCTATCGCGGCA ATATCGCCAGTGGTGCTGTCGTGATGCGGTCTTCGCATGGACCGCACAATGAAGATACGGTGCTTTTGTATCGTACTTATTGTTTCTGGTGCGCTGTTAAC CGAGGTAAATAATAACCGGAGTCTCTCCGGCGACAATTTACTGGTGGTTAACAACCTTCAGAGCAGCAAGTAAGCCCGAATGCCGCCCTTTGGGCGGCAT ATTTTagattatccgattctgtttaaagtc
RyfB	pHMB1	PCR	*Eco*RI/*Xba*I	aCGTTATTGAAGATTTTGCTGTGCTTTACACCATGCCACAGAATTCCCCCATTGAAACGAGTGGTGTCGTCAAAGCTCTGGTGTGGAGTGCAGCATGCACC CTCAATAACTCGCACGTTCAGTTTTGGGGAGATGTAAGGGCTAATCTGAATGGCTGCATTCCTTGTTTAAGGAAAAACGAATGACTGATTGCCGATACCTGA TTAAACGGGTCATCAAAATCATCATTGCTGTTTTACAGCTGATCCTTCTGTTCTTATAACACAAGGAAACGTACTTAAGGTGCGTCCGGTGAACCAGTCGGA CGCACCTTTAATAACtataaataagtgtctgggcagatactatataaattaactt
RyfD	pHMB1	PCR	*Eco*RI/*Xba*I	AATCAAGACGATCCGGTACGCGTGATTTTCTTTTCACATTAATCTGGTCAATAACCTTGAATAATTGAGGGATGACCTCATTTAATCTCCAGTAGCAACTTTGA TCCGTTATGGGAGGAGTTATGCGTCTGGATCGTCTTACTaataaattccagcttgctcttgccgatgcccaatcactt
RyhB	pHM-tac	PCR	*Eco*RI/*Xba*I	GCGATCAGGAAGACCCTCGCGGAGAACCTGAAAGCACGACATTGCTCACATTGCTTCCAGTATTACTTAGCCAGCCGGGTGCTGGCTTTTttttgatctttcgttctc aatttatccacgggagtgcttgtgttcgttatgcgcactccagtaggaaccacgtccgctttgcgctaaggtgtaaataac
RyjA	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	ATCAACACCAACCGGAACCTCCACCACGTGCTCGAATGAGGTGTGTTGACGTCGGGGGAAACCCTCCTGTGTACCAGCGGGATAGAGAGAAAGACAAAG ACCGGAAAACAAACTAAAGCGCCCTTGTGGCGCTTTAGTTT
RyjB	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aTCATCCGTCGTTGACTCCATGCCGATTCGGGTTAATCTGGTAGCGATCCCCGTCGATACTTTTGACGAAGGCGGCAGGGATCGCAGAAGGgttattgctctttgcc ggggataagcgctctgcttatccc
SgrS	pHMB1	PCR	*Eco*RI/*Xba*I	aGATGAAGCAAGGGGGTGCCCCATGCGTCAGTTTTATCAGCACTATTTTACCGCGACAGCGAAGTTGTGCTGGTTGCGTTGGTTAAGCGTCCCACAACGA

				TTAACCATGCTTGAAGGACTGATGCAGTGGGATGACCGCAATTCTGAAAGTTGACTTGCCTGCATCATGTGTGACTGAGTATTGGTGTAAAATCACCCGCC AGCAGATTATACCTGCTGGTTTTTTTTattctcgccgcgctaaaaagggaac
SibA	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGAGGGTTAGGGAGAGGTTTCCCCCTCCCCCTGGTGTTCTTAGTAAGCCTGGAAGCTAATCACTAAGAGTATCACCAGTATGATGACGTGCTTCATCATAA CCCTTTCCTTATTAAAAGCCCTCTTCTCCGGGAGAGGCTTTCCCgtttcagcgtcccgctgaaatcatc
SibB	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGAGGGTAGAGCGGGGTTTCCCCCGCCCTGGTAGTCTTAGTAAGCGGGGAAGCTTATGACTAAGAGCACCACGATGATGAGTAGCTTCATCATGACCCTT TCCTTATTTATGGCCCCTTCCTCGGGAGGGGctttcccgtttcagcgtcccgctgaaatcgt
SibC	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	AAGGGTAAGGGAGGATTGCTCCTCCCCTGAGACTGACTGTTAATAAGCGCTGAAACTTATGAGTAACAGTACAATCAGTATGATGACAAGTCGCATCATAAC CCTTCTCCTTCAAGCCCTCGCTTCGGTGAGGGCTTTACCgttacagccccatgctgccctgcca
SibD	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	ACAAGGGTGAGGGAGGATTTCTCCCCCCTCTGATTGGCTGTTAATAAGCTGCGAAACTTACGAGTAACAACACAATCAGTATGATGACGAGCTTCATCATAA CCCTTTCCTTCTGTAAGGCCCCCTTCTTCGGGAGGGGCTTTCCcgtttcagccccctgctgactcccc
SibE	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	ACAAGGGTAAGGGAGGATTTCTCCCCCCCTCTGATGAGTTGTTAGTAAGTCGGGAAACTTAACAGTAACAACACAACCAGTATGATGACGAGCTTCATCATA ACCCTTTCCTTATACAAGGCCCCTTCTTCGGGAGGGGCTTTCCcgtttcagcccccttgctgccccccg
SokA	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	AACTTTGATTTATAGTCAGGTGGGGCTTTTctctgtctgcctttcggtgaatacctgagacaaacagtct
SokB	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGCTAGGTTCATTCGTTGGCCTCGGTTGATAGAAATATCGGTCGGGGCCTTCGTCTTtctgattcccggttagcctgaaaacagaaagtctcaggca
SokC	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aGTTCAGCATATAGGAGGCCTCGGGTTGATGGTAAAATATCACTCGGGGCTtttctctatctgccgttcagctaatgcctgagacagacagcctca
SokE	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	AAGATGAAGCCCCAGGAGATATTTCTATCAACCCTGGGGCTGCCACTCCAAACCCGAACaatttggatggtagtcccttcttcgcatggaggcaatata
SokX	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aTTTGGGTTCGAACGCTGGCCTCAGGTTGATAGAAATATCGCCTGGGGCTTTTGTCCatctggaacctcgcgaatgcttaacgccagacagcctcaa
Spf	pHMB1	PCR	*Eco*RI/*Xba*I	aGTAGGGTACAGAGGTAAGATGTTCTATCTTTCAGACCTTTTACTTCACGTAATCGGATTTGGCTGAATATTTTAGCCGCCCCAGTCAGTAATGACTGGGGC GTTTTTTATTgggcgaaagaaaagatccgtaatgcctgatgcgc
SraA	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	atatggggatgtttcccccaCATTCAACGCCGAGAATAGAGGAAAAATTAAAGGGGAGATAAAATCCCCCCTTTTTGgttactaattgtatgggaatggtt
SroA	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aCACTAACGCCGTTCTCAACGGGGTGCCACGCGTACGCGTGCGCTGAGAAAATACCCGTCGAACCTGATCCGGATAACGCCGGCGAAGGGATTTGAGGC TCCTTctcaagtcctttgccactcttttt
SroC	pHMB1	PCR	*Eco*RI/*Xba*I	AAGGCACTGAACTAATTACAAGAACCAGGGGCGGAAATTCCAGCCCTCTCGATTGTTACGTAGCACGGACAGACTATACGCCTGATGGTCGTTCCCCATC GGGCCTGAAAACCGCAATACGCTGGGTAACAATCTTCGAGGGTAGCAGTTAACGCTGCTACCCTCTTTTTTCTggagtagatttatgtctatagactg
SroD	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	agaaaaattttgcgacgagaaTTACGTGACGAAGCGCGCGGCAAAGTGGACAATAAAGCCTGAGCGTTAAGTCAGTCGTCAGACGCCGGTTAATCCGGCGTTTTT TTTgacgcccactaaagagaaaacaat
SroE	pHMB1	PCR	*Eco*RI/*Xba*I	agttcagcaggttgaaaaataATAACGTGATGGGAAGCGCCTCGCTTCCCGTGTATGATTGAACCCGCATGGCTCCCGAAACATTGAGGGAAGCGTTGAGGGTTCA TTTTTATattcagaaagagaataaacgtggca
SroG	pHMB1	PCR	*Eco*RI/*Xba*I	aGCTTATTCTCAGGGCGGGGCGAAATTCCCCACCGGCGGTAAATCAACTCAGTTGAAAGCCCGCGAGCGCTTTGGGTGCGAACTCAAAGGACAGCAGAT CCGGTGTAATTCCGGGGCCGACGGTTAGAGTCCGGATGGGAGAGAGTAACGattctgtcgggcatggacccgctcacgttattttggctat
SroH	pHMB1	PCR	*Eco*RI/*Xba*I	aGAAAATAAGAACACATGTTCTCATCTTCCAGGATGCAGCAGACTGAAGAAATTCAGACATCCCGCAACCTGCGATTATCGCAAGGTCAAGGCAAAGTCCG GTAATGGCGTTCTGAATACCAGAGATAATTCTCTGGCGAAACCCACCTTAAGGTGGGTTTTgttattttgagggctgaggaagctg
SsrA	pHMB1	PCR	*Eco*RI/*Xba*I	aGGGGCTGATTCTGGATTCGACGGGATTTGCGAAACCCAAGGTGCATGCCGAGGGGCGGTTGGCCTCGTAAAAAGCCGCAAAAAATAGTCGCAAACGAC GAAAACTACGCTTTAGCAGCTTAATAACCTGCTTAGAGCCCTCTCTCCCTAGCCTCCGCTCTTAGGACGGGGATCAAGAGAGGTCAAACCCAAAAGAGATC GCGTGGAAGCCCTGCCTGGGGTTGAAGCGTTAAAACTTAATCAGGCTAGTTTGTTAGTGGCGTGTCCGTCCGCAGCTGGCAAGCGAATGTAAAGACTGA CTAAGCATGTAGTACCGAGGATGTAGGAATTTCGGACGCGGGTTCAACTCCCGCCAGCTCCAccaaaattctccatcggtgattaccaga
SsrS	pHMB1	PCR	*Eco*RI/*Xba*I	agaagacaaaATTTCTCTGAGATGTTCGCAAGCGGGCCAGTCCCCTGAGCCGATATTTCATACCACAAGAATGTGGCGCTCCGCGGTTGGTGAGCATGCTCG GTCCGTCCGAGAAGCCTTAAAACTGCGACGACACATTCACCTTGAACCAAGGGTTCAAGGGTTACAGCCTGCGGCGGCATCTCGGAGATTCccttcttatctggc accagccatga
SymR	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	AGTCATAACTGCTATTCTCCAGGAATAGTGATTGTGATTAGCGATGCGGGTGTGTTGGCGCACATCCGCACCGCGCTaaatacctgtatatatcatcagtaa
T44	pHMB1	PCR	*Eco*RI/*Xba*I	atttgtggtataaagcgcgcCGGACTTCCGATCCATTTCGTATACACAGACTGGACGGAAGCGACAATCTCACTTTGTGTAACAACACACACGTATCGGCACATATTC CGGGGTGCCCTTTGGGGTCGGTAATATGGGATACGTGGAGGCATAACCcaactttttatatagaggttttaatcatggcaactgtttc
Tp2	pHMB1	PCR	*Eco*RI/*Xba*I	ataatttttaccagaaaaatcACTAATTCTTTCGTTGCTCCAGACGACGCAGAGAACGCTCACGGCGGCTCTCTTCACGACTTCTGTCGAGCAAAATTTCTTCGATAA AGGCCAGATGGCGATGCGATGCTTCGCGCGCTTCTTCCGGCTTACCGGCCATAATCGCTTCAAATATGCGGGTgcggtgactactcaccagcggcagcatctcgcgacgc ga
Tpke11	pHMB1	Gene synthesis	*Eco*RI/*Xba*I	aagtcaaagacaaaaaataaTCGCCCTATAAACGGGTAATTATACTGACACGGGCGAAGGGGAATTTCCTCTCCGCCCGTGCATTCATCTAGGGGCAATTTAAAAA AGAtggctaagcaagattattacgagattttaggcgtttccaaa
Tpke70	pHMB1	PCR	*Eco*RI/*Xba*I	aaggaaaaaaccttaagaaaAAAGCCATAAAAACCATGAGGTTATTATGGCCGATTTGAGGAGGGAAAGAGTAAGAGCAGTTTGTTAAATGTACAACGACGATTCT

				CCCACCGGGCGCGTTTTAAAGCGACGGTGGATCCAGAGGTACTGCTCCGGTGCGCGCATGATCTCTTTCTCGATAATCTTGTTCATATAGGCAGCGGCTT GATTTTCATCTGTCGGGTAGCCTTCCATCTCTGGGGTGATGAACAAACGATATCCGCTGTAATCCGCTTTTCTTACCATCGTTACGGTCAACATGGCTGCGC CAGAGAGACGGGAGAGAACATAGGTGCCATTGGTTGTGGCGACATTTTCCACCGCAAAGAACGGCGCGAAGGAGCTGCCTTTACGACCATAATCCTGAT CGGGAGCAAACCATACCGCTTCACCTTTCTTCAGTGCACCGACAATGCCgcgcagattatttctgccgatcatcgctttgttagagcgc
pRNA	pHMB1	Oligo Annealing	*Eco*RI/*Xba*I	ATCGGCTCAGGGGACTGGCC
Och1	pHMB1	PCR	*Eco*RI/*Xba*I	aTGCCTTTGGTAGAGGAAAGTGCTAAATAATAATCAATTGTTAAATTATTGTGCATTTCACTACTGGAACTGTAATCAGAAAAGATAGACATGCTTAGCCAATC TCTATTTGATTGAATTGAAAGATGTTTGTTAAGGCATGGATGCAAGCTATAGATTCTGATACGGTCAATAAAAGAGAATTGCTTAACAATTTTGCAAAATGTATT GGCGAGTAAGAACCGCATTTGGTACTTTCCGGGCAACCGCCAGACGAttctttattggtaatgagaataattaacaattaaagagcg
Och2	pHMB1	PCR	*Eco*RI/*Xba*I	aTGCGCATCAGTAATAAATGACACACAGCAAAATGAATCCGTTTATTTGGGTACTTATAATCCTGATGACGCTAGACGCGCTGCGGGAATTGGCTGGCGCTT CGTCTATTTTAGGATGGCTATTAACGTTGGTTTGAGCTGGCAATAAGTCCGGACGGGTATTTACCGCAGTCCGGACTTATTTTTCAGgcgtgcagacgacgatgcaa acgcg
Och3	pHMB1	PCR	*Eco*RI/*Xba*I	ATATATAATTTATATTATTCAGGCAATGAATTACTTTTGCAAGCCATCGCATTCTCTTATGTTATTAATGAGTTATGCTGATTTGTTAAGCAGTTTTATCAGGCTTG AAATGGCGTCCAGCCCCGACAGGTGAATCGTCGGGGCTGATTTTTTCTTATTATTGCAGCAGAAACTTCTCGAGGAACTGGCGGGTGCGAGGCTGCTCG GGGTCGGCAAAT
Och4	pHMB1	PCR	*Eco*RI/*Xba*I	aCGATATATGTTTATTTTATGTAAAATCAATTTATGTAAAAAGTCACATCATTGTAGTTAAAAAGGTTGAGTTAGATCGCAGAAACGGGTACATATAGCCCCGCA AACGTGACCACGCCCGCAGATATTACTTAAATCAGAGCCATAGAGGCCACGCAGGCGAGGCATCAATCTTTACGATCTGTATAAAGACGGATTGTTGATGAT GTGTTAAAATTGATGTAAACAAATTGTGAAgtgaatgtgcttccggggaaaataagtgacttcattacaa
Och5	pHMB1	PCR	*Eco*RI/*Xba*I	ATCCTTGTCCGCTTAACCGTTTCAGTCAGCCTATCCTTGATGAAACCGCGAGCAAAGATAGGTGATTACGTCATGGTTTTACAGAAAATTACAGAAAAAGGA GGCAATATCGGGTAAAGGCATTAGCCCGACGAATACGTCGGGCTACAAATATTATTgtgctgcaggtgttttagcgggttg
Och6	pHMB1	PCR	*Eco*RI/*Xba*I	aGCGCCTTGAAAAGAGGCCAAAGCCTGCCATTTTTAGCTCAATTCGGCGATGACCTGGATCAATCGTCCCGGCCTGCTTTTATCAACTGCATAATCAATCAA AATTAccgaaatttcatgcataatcacataaatcacttttgctta
Och7	pHMB1	PCR	*Eco*RI/*Xba*I	aGGTGAGCACTGAACAATTAAGAACAGCGTATTACATTTACTTTCCCCAAGATATGCGAAGAGCTTTCCTGAAACATTAACCGATCGTATAAAACGAATGCCT GATAGTACTCCTGTCCGGCATTGTTATCACAAGTAGACTACGCTTATCACAGCTTTcccatcaagttcgatttttctgaaccgcctaaatcattc
Och8	pHMB1	PCR	*Eco*RI/*Xba*I	aCACGATCACTCTAAGAGGACATTCGCCTTGGACACACCCAGTAGATACTGGCTCACTATCCTGTCATCCAGGATCAACTCCTAAGGCTATCCCTTTTTGCT GATAGCCTTAGCGGTTGTCAGCGACCTCAATTTTTCCCGTCGCgctgagtcaggctgtttaatggtct
Och9	pHMB1	PCR	*Eco*RI/*Xba*I	ACCATCGTGCAAAAGGGCTGCACCACGATGTGAATGTTGCACCAATATAGTGCTTCAATGGAAACATTAAGCAccatgttggtgcaatgacctttgga
Och10	pHMB1	PCR	*Eco*RI/*Xba*I	ATACTAGCCACTGAAAATGCCGGTTCACTTTCTTCGAATCGGCTTTCAATGTGTATTTCACACAAATTAATCAACTTCCCCTTCCGAGGATCTGGCCTGAAA GGTCggataagatatgttaaacagtattttagtcatactctgct

Predicted sRNA sequences were indicated by capital letters.
An extra adenine nucleotide to facilitate efficient transcription was indicated by underline.

Supplementary Table 3. Oligonucleotides sequences used in this study

Name	Sequence (5' to 3')	Used for
BamHIss6F	CGGGATCCATAAATGTGAGCGGATAACATTGACAT TGTGAGCGG	Constructing pHMB1
HindIIIss6R	CCCAAGCTTGTCGACTCTAGAATTATATTGTTATCC GCTCACAATGTC	Constructing pHMB1
pHMB1oligo1	AATTCGAGCTCGCGTCTAGAGCCGGCAAGCTTGG AGTACGTAAAAACCCGCTTCGGCGGGTTTTTGCTT TTGGAGGGGC	Constructing pHMB1
pHMB1oligo2	AGCTGCCCCTCCAAAAGCAAAAACCCGCCGAAGC GGGTTTTTACGTACTCCAAGCTTGCCGGCTCTAGA CGCGAGCTCG	Constructing pHMB1
pHMB2 oligo1	GAGCGGATAACAATATAATGAACCCGGGCTCGCG TCTAGAGCCGGCAAG	Constructing pHMB2
pHMB2 oligo2	CTTGCCGGCTCTAGACGCGAGCCCGGGTTCATTA TATTGTTATCCGCTC	Constructing pHMB2
rnpB Xb1	ACTCCAAGCTTGCCGGCTCTAGA	Northern probe for modified rnpB T1
C0067Fw	GGC TGA ATT CAT AAG AGT TAG CTG T	C0067 cloning into pHMB1
C0067Rv	GGC TTC TAG AGA GTT AAA CCT CTA T	C0067 cloning into pHMB1
C0362Fw	GGC TGA ATT CAA GGG ATA TAA TCT C	C0362 cloning into pHMB1
C0362Rv	GGC TTC TAG AGT GTC GCG ATT ACG C	C0362 cloning into pHMB1
C0664Fw	GGC TGA ATT CAT GCC GAT GTA GGT G	C0664 cloning into pHMB1
C0664Rv	GGC TTC TAG ACG CGT TGG TTA GCG G	C0664 cloning into pHMB1
C0719Fw	GGC TGA ATT CAA GAG GAC TGA ACT G	C0719 cloning into pHMB1
C0719Rv	GGC TTC TAG ACC CCG GCA AGT TTT A	C0719 cloning into pHMB1
CsrBFw	GGC TGA ATT CAG TCG ACA GGG AGT C	CsrB cloning into pHMB1
CsrBRv	GGC TTC TAG AAA AAA CTG CCG CGA A	CsrB cloning into pHMB1
CsrCFw	GGC TGA ATT CAT AGA GCG AGG ACG C	CsrC cloning into pHMB1
CsrCRv	GGC TTC TAG AGG CGG AAT CTA ACA G	CsrC cloning into pHMB1
IS128Fw	AAG AGA GTA ATT ATT GTT TAT	IS128 cloning into pHMB2
IS128Rv	GGC TTC TAG ATG CAT TAC TAC GGT A	IS128 cloning into pHMB2
McaSFw	GGC TGA ATT CAC GAT ATT AAT AAT G	McaS cloning into pHMB1
McaSRv	GGC TTC TAG AAA TGC GGC TAT CTG C	McaS cloning into pHMB1
IsrBFw	GGC TGA ATT CAT GTC ATA TTA TAA G	IsrB cloning into pHMB1
IsrBRv	GGC TTC TAG AGA CTT CAC ATC TTC A	IsrB cloning into pHMB1
IsrCFw	GGC TGA ATT CAT AGC TCA ATA ATA G	IsrC cloning into pHMB1
IsrCRv	GGC TTC TAG ATT TCA TCA GCT TTT C	IsrC cloning into pHMB1
IstR2Fw	GGC TGA ATT CAG CAC TAA ATA CGT C	IstR2 cloning into pHMB1
IstR2Rv	GGC TTC TAG ACG TTT TGT ACT GAA T	IstR2 cloning into pHMB1
pRNAFw	AAT TCA TCG GCT CAG GGG ACT GGC CT	pRNA cloning into pHMB1
pRNARv	CTA GAG GCC AGT CCC CTG AGC CGA TG	pRNA cloning into pHMB1
PsrDFw	GGC TGA ATT CAT AGG CAT ATT TTT T	PsrD cloning into pHMB1
PsrDRv	GGC TTC TAG AAT TAA CTT TGT AAC G	PsrD cloning into pHMB1
RnpBFw	GGC TGA ATT CGA AGC TGA CCA GAC A	RnpB cloning into pHMB1
RnpBRv	GGC TTC TAG ACA AAA GCA AAA ACC C	RnpB cloning into pHMB1
RttRFw	GGC TGA ATT CAT CCC CCA CCA CCA T	RttR cloning into pHMB1
RttRRv	GGC TTC TAG ATT GCG GAT TCG CTT G	RttR cloning into pHMB1
RybAFw	GGC TGA ATT CAG CCT GTG CTA TAT C	RybA cloning into pHMB1
RybARv	GGC TTC TAG ATT TTC AGA CCA AAA C	RybA cloning into pHMB1
RydBFw	GGC TGA ATT CAC TAA TCG CAG TTT G	RydB cloning into pHMB1
RydBRv	GGC TTC TAG AAG AAA TAA GAA AAC C	RydB cloning into pHMB1
RyeFFw	GGC TGA ATT CAT TTT TAC CGT TGC A	RyeF cloning into pHMB1
RyeFRv	GGC TTC TAG AAG ATT CCT CTA ATT A	RyeF cloning into pHMB1
RyfAFw	GGC TGA ATT CAG CGG CCC TTT CCG C	RyfA cloning into pHMB1
RyfARv	GGC TTC TAG AGA CTT TAA ACA GAA T	RyfA cloning into pHMB1
RyfBFw	ACG TTA TTG AAG ATT TTG CTG	RyfB cloning into pHMB2
RyfBRv	GGC TTC TAG AAA GTT AAT TTA TAT A	RyfB cloning into pHMB2
RyfDFw	GGC TGA ATT CAA TCA AGA CGA TCC G	RyfD cloning into pHMB1
RyfDRv	GGC TTC TAG AAA GTG ATT GGG CAT C	RyfD cloning into pHMB1

SroCFw	GGC TGA ATT CAA GGC ACT GAA CTA A	SroC cloning into pHMB1
SroCRv	GGC TTC TAG ACA GTC TAT AGA CAT A	SroC cloning into pHMB1
SroEFw	GGC TGA ATT CAG TTC AGC AGG TTG A	SroE cloning into pHMB1
SroERv	GGC TTC TAG ATG CCA CGT TTA TTC T	SroE cloning into pHMB1
SroGFw	GGC TGA ATT CAG CTT ATT CTC AGG G	SroG cloning into pHMB1
SroGRv	GGC TTC TAG AAT AGC CAA AAT AAC G	SroG cloning into pHMB1
SroHFw	GGC TGA ATT CAG AAA ATA AGA ACA C	SroH cloning into pHMB1
SroHRv	GGC TTC TAG ACA GCT TCC TCA GCC C	SroH cloning into pHMB1
SsrAFw	GGC TGA ATT CAG GGG CTG ATT CTG G	SsrA cloning into pHMB1
SsrARv	GGC TTC TAG ATC TGG TAA TCA CCG A	SsrA cloning into pHMB1
SsrSFw	GGC TGA ATT CAG AAG ACA AAA TTT C	SsrS cloning into pHMB1
SsrSRv	GGC TTC TAG ATC ATG GCT GGT GCC A	SsrS cloning into pHMB1
TffFw	GGC TGA ATT CAT TTG TGG TAT AAA G	Tff cloning into pHMB1
TffRv	GGC TTC TAG AGA AAC AGT TGC CAT G	Tff cloning into pHMB1
Tp2Fw	GGC TGA ATT CAT AAT TTT TAC CAG A	Tp2 cloning into pHMB1
Tp2Rv	GGC TTC TAG ATC GCG TCG CGA GAT G	Tp2 cloning into pHMB1
Tpke70Fw	GGC TGA ATT CAA GGA AAA AAC CTT A	Tpke70 cloning into pHMB1
Tpke70Rv	GGC TTC TAG AGC GCT CTA ACA AAG C	Tpke70 cloning into pHMB1
DicFER1Fw	GGC TGA ATT CAT TTC TGG TGA CGT T	DicF cloning into pHMB1
DicFXb1Rv	GGC TTC TAG AGC GCT CAG CCG CAT T	DicF cloning into pHMB1
DsrAER1Fw	GGC TGA ATT CAA CAC ATC AGA TTT	DsrA cloning into pHMB1
DsrAXb1Rv	GGC TTC TAG ATG AAG TGA ATC GTT G	DsrA cloning into pHMB1
FnrSER1Fw	GGC TGA ATT CAG CAG GTG AAT GCA A	FnrS cloning into pHMB1
FnrSXb1Rv	GGC TTC TAG AGG GTA GAC GCT GAT A	FnrS cloning into pHMB1
GadYER1Fw	GGC TGA ATT CAC TGA GAG CAC AAA G	GadY cloning into pHMB1
GadYXb1Rv	GGC TTC TAG AGA TTA TAG AGT TTT A	GadY cloning into pHMB1
GcvBER1Fw	GGC TGA ATT CAC TTC CTG AGC CGG	GcvB cloning into pHMB1
GcvBXb1Rv	GGC TTC TAG AGA TCA GTA ATT CGC G	GcvB cloning into pHMB1
IS118ER1Fw	GGC TGA ATT CAG GTT CTG GAG GGG	IS118 cloning into pHMB1
IS118Xb1Rv	GGC TTC TAG ATT AAT TTA TAA AAT A	IS118 cloning into pHMB1
MgrRER1Fw	GGC TGA ATT CAG ATT CGT TAT CAG T	MgrR cloning into pHMB1
MgrRXb1Rv	GGC TTC TAG AAA GGG GCC TGA TTT T	MgrR cloning into pHMB1
MicAbluntFw	AGA AAG ACG CGC ATT TGT T	MicA cloning into pHMB2
MicAXb1Rv	GGC TTC TAG AGT GGC TGG AAA AAC A	MicA cloning into pHMB2
MicCER1Fw	GGC TGA ATT CAG TTA TAT GCC TTT A	MicC cloning into pHMB1
MicCXb1Rv	GGC TTC TAG ACT CTG GAT AAG GAT T	MicC cloning into pHMB1
MicFER1Fw	GGC TGA ATT CAG CTA TCA TCA TTA A	MicF cloning into pHMB1
MicFXb1Rv	GGC TTC TAG ATA ATG AAA AGT GTG T	MicF cloning into pHMB1
MicMER1Fw	GGC TGA ATT CAC ACC GTC GCT TAA A	MicM cloning into pHMB1
MicMXb1Rv	GGC TTC TAG AGG GAA TTT GCC GCA A	MicM cloning into pHMB1
OmrABER1Fw	GGC TGA ATT CAC CCA GAG GTA TTG AT	OmrAB cloning into pHMB1
OmrAXb1Rv	GGC TTC TAG ACG CGA GCG ACA GTA A	OmrA cloning into pHMB1
OmrBXb1Rv	GGC TTC TAG ATT ACT GTT ACA GAT T	OmrB cloning into pHMB1
OxySER1Fw	GGC TGA ATT CAG AAA CGG AGC GGC A	OxyS cloning into pHMB1
OxySXb1Rv	GGC TTC TAG AGC TTA TCG CCG GGC T	OxyS cloning into pHMB1
RprAER1Fw	GGC TGA ATT CAC GGT TAT AAA TCA A	RprA cloning into pHMB1
RprAXb1Rv	GGC TTC TAG ACG AGG TAG CGA AGC G	RprA cloning into pHMB1
RseXER1Fw	GGC TGA ATT CAT TTT TAT TAT TCT GT	RseX cloning into pHMB1
RseXXb1Rv	GGC TTC TAG AAT CAG GCG CAC ATT A	RseX cloning into pHMB1
RybBER1Fw	GGC TGA ATT CAC TGC TTT TCT TTG A	RybB cloning into pHMB1
RybBXb1Rv	GGC TTC TAG AGC AGG GTA GTA GAT A	RybB cloning into pHMB1
RybDER1Fw	GGC TGA ATT CAT ATC TGT AAT AAG	RybD cloning into pHMB1
RybDXb1Rv	GGC TTC TAG ACA GCG AAA ATC ATC G	RybD cloning into pHMB1
RydCER1Fw	GGC TGA ATT CAC TTC CGA TGT AGA C	RydC cloning into pHMB1
RydCXb1Rv	GGC TTC TAG ACG TAA ACG TTC CTG A	RydC cloning into pHMB1
SpfER1Fw	GGC TGA ATT CAG TAG GGT ACA GAG G	Spf cloning into pHMB1
SpfXb1Rv	GGC TTC TAG AGC GCA TCA GGC ATT A	Spf cloning into pHMB1
SgrSER1Fw	GGC TGA ATT CAG ATG AAG CAA GGG G	SgrS cloning into pHMB1
SgrSXb1Rv	GGC TTC TAG AGT TCC CTT TTT AGC G	SgrS cloning into pHMB1

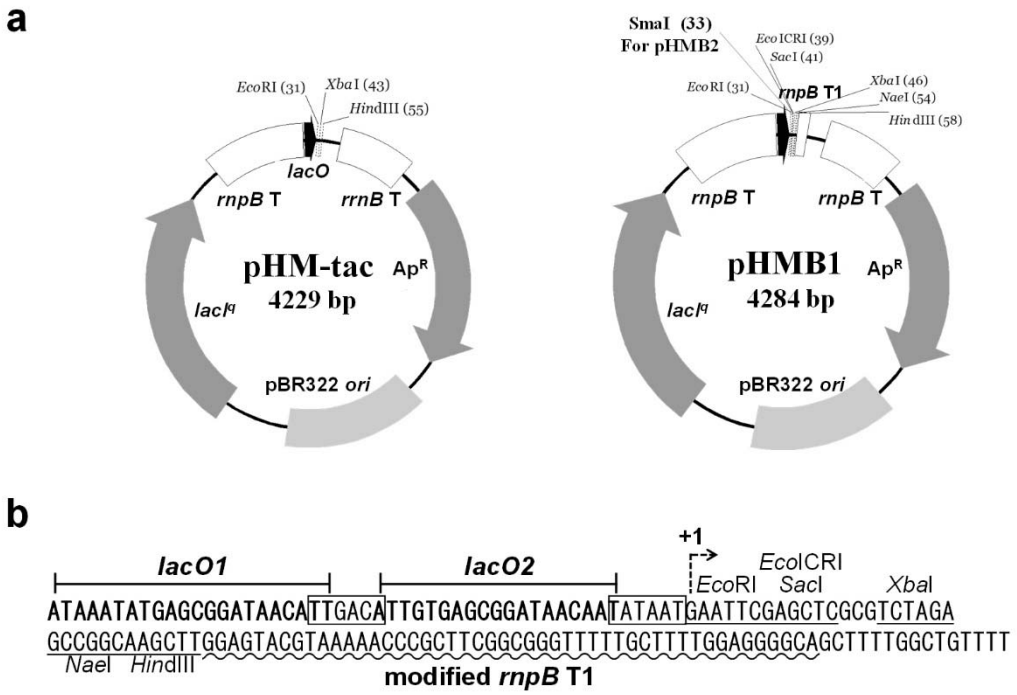
ArcZER1Fw	GGCCGAATTCGTGCGGCCTGAAAAAC	ArcZ cloning into pHM-tac
ArcZXb1Rv	GGC TTC TAG AGA AAG CGT GGG TGG C	ArcZ cloning into pHM-tac
GlmYER1Fw	CGGAATTC AGT GGC TCA TTC ACC GAC	GlmY cloning into pHM-tac
GlmYXb1Rv	GCTCTAGA CAGTTGTCGT AATGAGCG	GlmY cloning into pHM-tac
GlmZER1Fw	CGGAATTC GTA GAT GCT CAT TCC ATC	GlmZ cloning into pHM-tac
GlmZXb1Rv	GCTCTAGA AATAACCCGC CACAGTAG	GlmZ cloning into pHM-tac
PsrOER1Fw	CGGAATTC ATC TTC TGC GCA TCC TCG	PsrO cloning into pHM-tac
PsrOXb1Rv	GCTCTAGA CGTCGTAAAC TGCTCGAC	PsrO cloning into pHM-tac
RyhBER1Fw	CGGAATTC GCG ATC AGG AAG ACC C	RyhB cloning into pHM-tac
RyhBXb1Rv	GCTCTAGA GTTATTTACA CCTTAGCGC	RyhB cloning into pHM-tac
SdsRER1Fw	CGGAATTC GG CAAGGCAACT AAGC	SdsR cloning into pHM-tac
SdsRXb1Rv	GCTCTAGA ATAAAGTCAG CGAAGG	SdsR cloning into pHM-tac
RyeAER1Fw	CGGAATTC AAAGTCA GCGAAGGAAA TGC	RyeA cloning into pHM-tac
RyeAXb1Rv	GCTCTAGA CTGAAAAACT CTGTTAATTA CC	RyeA cloning into pHM-tac
CyaRER1Fw	CCG GAA TTC GCT GAA AAA CAT AAC	CyaR cloning into pHM-tac
CyaRXb1Rv	TGC TCT AGA TAG AAA CAG GAA GCC	CyaR cloning into pHM-tac
Och1Fw	GGCT GAATTC ATG CCT TTG GTA GAG GAA	Och1 cloning into pHMB1
Och1Rv	GGCT TCTAGA CGC TCT TTA ATT GTT AAT	Och1 cloning into pHMB1
Och2Fw	GGC TGA ATT CAT GCG CAT CAG TAA TAA A	Och2 cloning into pHMB1
Och2Rv	GGCT TCTAGA CGC GTT TGC ATC GTC GTC	Och2 cloning into pHMB1
Och3Fw	GCT GAA TTC ATA TAT AAT TTA TAT TAT TC	Och3 cloning into pHMB1
Och3Rv	GGCT TCTAGA ATT TGC CGA CCC CGA GCA	Och3 cloning into pHMB1
Och4Fw	GGC TGA ATT CAC GAT ATA TGT TTA TTT T	Och4 cloning into pHMB1
Och4Rv	GGCT TCTAGA TTG TAA TGA AGT CAC TTA	Och4 cloning into pHMB1
Och5Fw	GGC TGA ATT CAT CCT TGT CCG CTT AAC C	Och5 cloning into pHMB1
Och5Rv	GGCT TCTAGA CAA CCC GCT AAA ACA CCT	Och5 cloning into pHMB1
Och6Fw	GGC TGA ATT CAG CGC CTT GAA AAG AGG C	Och6 cloning into pHMB1
Och6Rv	GGCT TCTAGA TAA GCA AAA GTG ATT TAT	Och6 cloning into pHMB1
Och7Fw	GGC TGA ATT CAG GTG AGC ACT GAA CAA T	Och7 cloning into pHMB1
Och7Rv	GGCT TCTAGA GAA TGA TTT AGG CGG TTC	Och7 cloning into pHMB1
Och8Fw	GGCT GAATTC ACA CGA TCA CTC TAA GAG	Och8 cloning into pHMB1
Och8Rv	GGCT TCTAGA AGA CCA TTA AAC AGC CTG	Och8 cloning into pHMB1
Och9Fw	GGC TGA ATT CAC CAT CGT GCA AAA GGG C	Och9 cloning into pHMB1
Och9Rv	GGCT TCTAGA TCC AAA GGT CAT TGC ACC	Och9 cloning into pHMB1
Och10Fw	GGCT GAATTC ATA CTA GCC ACT GAA AAT	Och10 cloning into pHMB1
Och10Rv	GGCT TCTAGA AGC AGA GTA TGA CTA AAA	Och10 cloning into pHMB1
C0343_NP	GTC AGG CAT GGG TTG CGG GCG AGG	Northern probe for C0343
C0362_NP	GAC AAA CGC AAC ATT GCC TGA TGC	Northern probe for C0362
CsrB_NP	GCC TTT CCC TGA AAC ACC ATC CTG G	Northern probe for CsrB
CsrC_NP	GAT TCC ATT TCC GTT TAA TTA CGT CT	Northern probe for CsrC
CyaR_NP	GGT TCC TGG TAC AGC TAG CAT TTT ATG	Northern probe for CyaR
DsrA_NP	GTT ACA CCA GGA AAT CTG ATG TGT T	Northern probe for DsrA
FnrS_NP	GGA AGT AAG ACA ATA TGG AGC GCA A	Northern probe for FnrS
GadY_NP	GAG GAT AGT CTG CCG TCT CCA GAC TAA TAA	Northern probe for GadY
GcvB_NP	GCA TTC CGA TAA AAC TTT TCG TTC C	Northern probe for GcvB
IsrB_NP	GAA CAT ACT TTT CAG GAT TTT GCG C	Northern probe for IsrB
IstR-1_NP	GCA AAG CAC ACT GTA TTA TGT CAA C	Northern probe for IstR-1
IstR-2_NP	GCA CGA ATT TTG ACG TAT TTA GTG C	Northern probe for IstR-2
MgrR_NP	GTA AAC CGG CGG TGA ATG CTT GCA T	Northern probe for MgrR
OmrA_NP	AGA GCG TAC CGA ATA ATC TCA CCA A	Northern probe for OmrA
OmrB_NP	GCT CAA CCC GAA GTT GAC TTC ACC T	Northern probe for OmrB
OxyS_NP	GAA ACG GGC AGT GAC TTC AAG GGT	Northern probe for OxyS
PsrO_NP	GCT GAC GGC AGC AAT TCA CTG GAA A	Northern probe for PsrO
RseX_NP	GAT AAA AGG CTA ATA ACG GAA GCA T	Northern probe for RseX
RttR_NP	GCA GAA TAT TTA ATT GCG GAT TCG T	Northern probe for RttR
RybB_NP	ATG GGG ACA TCA AAG AAA AGC AGT	Northern probe for RybB
SdsR_NP	GGC TCT TGG GAG AGA GCC GTC G	Northern probe for SdsR
RyeF_NP	GAA TAT GAT TTA TTA CAA TGT AAT CAT T	Northern probe for RyeF
RyhB_NP	GCA ATG TCG TGC TTT CAG GTT CTC	Northern probe for RyhB

SokX_NP	TGA GGC CAG CGT TCG AAC CCA AA	Northern probe for SokX
Spf_NP	GAA GTA AAA GGT CTG AAA GAT AGA A	Northern probe for Spf
Och10_NP	GAT CCT CGG AAG GGG AAG TTG ATT A	Northern probe for Och10
ΔarcZFw	TACGCATCACACATTTAACTGATTCATGTAACAAAT CATTTAAGTTGTAGGCTGGAGCTGCTTCG	*arcZ* knockout
ΔarcZRv	GCTAGACCGGGGTGCGCGAATACTGCGCCAACAC CAGGGAAATCTTTCCGGGGATCCGTCGACC	*arcZ* knockout
ΔcsrBFw	TGTAAGCGCCTTGTAAGACTTCGCGAAAAAGACGA TTCTATCTTCTGTAGGCTGGAGCTGCTTCG	*csrB* knockout
ΔcsrBRv	GTATTCACAGCGCTCCCGGTTCGTTTCGCAGCATT CCAGCTACTTTTCCGGGGATCCGTCGACC	*csrB* knockout
ΔcsrCFw	TGGCGGTTGATTGTTTGTTTAAAGCAAAGGCGTAA AGTAGCACCCTGTAGGCTGGAGCTGCTTCG	*csrC* knockout
ΔcsrCRv	GATTTGCGGCGGAATCTAACAGAAAGCAAGCAAA GAAAAAAGGCGTTCCGGGGATCCGTCGACC	*csrC* knockout
ΔcyaRFw	AACCGATCACATACAGCTGCATTTATTAAGGTTAT CATCCGTTTCTGTAGGCTGGAGCTGCTTCG	*cyaR* knockout
ΔcyaRRv	GGACGTGACCAGAAATAAATCCTTTTATTTCATTGT ATTACGCGTTTCCGGGGATCCGTCGACC	*cyaR* knockout
ΔdicFFw	ATACGCTTAAGTGACAACCCCGCTGCAACGCCCT CTGTTATCAATTGTAGGCTGGAGCTGCTTCG	*dicF* knockout
ΔdicFRv	GTGCGCTCAGCCGCATTCACCACATCACAAAATTC ACTTTAAAAATTCCGGGGATCCGTCGACC	*dicF* knockout
ΔdsrAFw	GGGTGACGTGCGTCACATTTCTATTCATAAGTAGC GTTAATCATTTCCGGGGATCCGTCGACC	*dsrA* knockout
ΔdsrARv	ATAAAAAAATCCCGACCCTGAGGGGGTCGGGATG AAACTTGCTTATGTAGGCTGGAGCTGCTTCG	*dsrA* knockout
ΔfnrSFw	GCGAAGTCAATAAACTCTCTACCCATTCAGGGCAA TATCTCTCTTTGTAGGCTGGAGCTGCTTCG	*fnrS* knockout
ΔfnrSRv	TCATTGGGTGGACTCTTAAAGGGTAGACGCTGATA AATAACAGGCTTCCGGGGATCCGTCGACC	*fnrS* knockout
ΔgadYFw	AAAAAAATGGCTGATCTTATTTCCAGTAAAAGTTAT ATTTAACTTTGTAGGCTGGAGCTGCTTCG	*gadY* knockout
ΔgadYRv	AGGGGACCGGGAAGAGGATAGTCTGCCGTCTCCA GACTAATAAACTTCCGGGGATCCGTCGACC	*gadY* knockout
ΔgcvBFw	AAATTGTCCGTTGAGCTTCTACCAGCAAATACCTA TAGTGGCGGCTGTAGGCTGGAGCTGCTTCG	*gcvB* knockout
ΔgcvBRv	GATCGCAAGGTAAAAAAAAGCACCGCAATTAGGC GGTGCTACATTTTCCGGGGATCCGTCGACC	*gcvB* knockout
ΔglmYFw	CCAAACTATTTTCTTTATTGGCACAGTTACTGCATA ATAGTAACCTGTAGGCTGGAGCTGCTTCG	*glmY* knockout
ΔglmYRv	GAATAGCCTGATGCTAACCGAGGGGAAGTTCAGA TACAACAAAGCTTCCGGGGATCCGTCGACC	*glmY* knockout
ΔIS118Fw	AGTTAGTATATGTATCTATCACTGTTGATGATAATA TCAGCACTTTGTAGGCTGGAGCTGCTTCG	*IS118* knockout
ΔIS118Rv	AATTGCGCGCCAATCATGGCGCGCACAAGCTATA ATACCAACCTATTCCGGGGATCCGTCGACC	*IS118* knockout
ΔmcaSFw	TGAAGAAAATTGGCAACTAAAGGTTAAAACCGTTA TAACACAGTCTGTAGGCTGGAGCTGCTTCG	*mcaS* knockout
ΔmcaSRv	CATAAAAAAATAGAGTCTGTCGACATCCGCCAGAC TCTACAGTACTTCCGGGGATCCGTCGACC	*mcaS* knockout
ΔmicAFw	TAAAAATTTTCTGAACTCTTTCTTCCCAGGCGAGTC TGAGTATATTGTAGGCTGGAGCTGCTTCG	*micA* knockout
ΔmicARv	AAGAAAAAGGCCACTCGTGAGTGGCCAAAATTTCA TCTCTGAATTTTCCGGGGATCCGTCGACC	*micA* knockout
ΔmicCFw	AAATAAAAATTATACTTTTAATTTGCTATACGTTATT CTGCGCGGTGTAGGCTGGAGCTGCTTCG	*micC* knockout
ΔmicCRv	CTGGATAAGGATTATCCAATTCTAAAAAAAAAGCC CGGACGACTGTTCCGGGGATCCGTCGACC	*micC* knockout

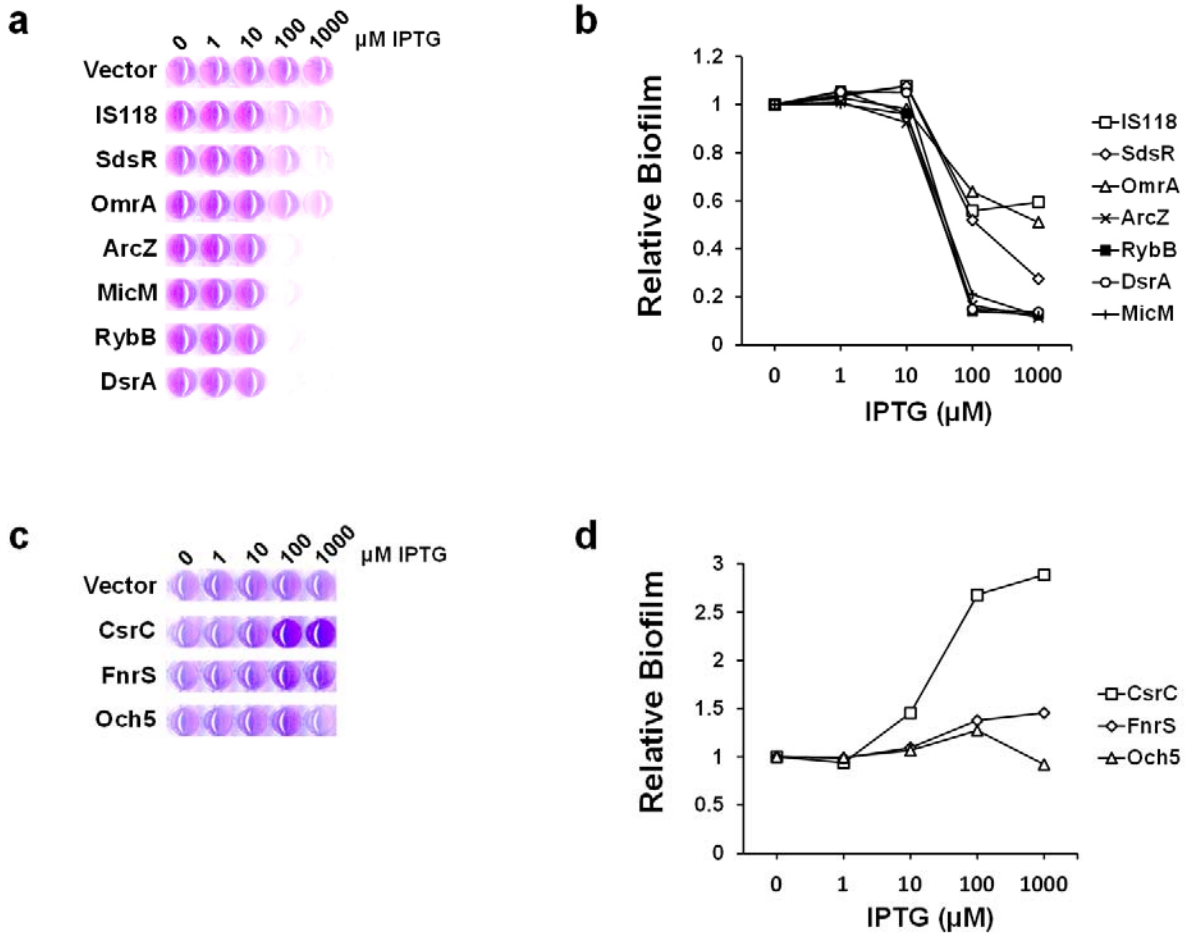
ΔmicMFw	CCTAAGAGTATTGGCAGGATGGTGAGATTGAGCG ACAATCGAGTTTGTAGGCTGGAGCTGCTTCG	*micM* knockout
ΔmicMRv	TGGCCAATATCGCTATTGGCCCGTCAAAGAGGAAT TTCATTTTTTTTCCGGGGATCCGTCGACC	*micM* knockout
ΔomrAFw	GTTTTCTCGCTGGCGAAGAGTCGTCGTGCAGACC ACAATCAAGATTGTAGGCTGGAGCTGCTTCG	*omrA* knockout
ΔomrARv	TAAAGAACGCGAGCGACAGTAAATTAGGTGCGAA AAAAAACCTGCTTCCGGGGATCCGTCGACC	*omrA* knockout
ΔomrBFw	ATTGACCGCTGGTGGCGTTTGGCTTCAGGTTGCT AAAGTGGTGATTGTAGGCTGGAGCTGCTTCG	*omrB* knockout
ΔomrBRv	CGAGGTGTGTAAATTGTCGGTTACTGTTACAGATT GATGACCGGCTTCCGGGGATCCGTCGACC	*omrB* knockout
ΔoxySFw	TGAACGATTATCCCTATCAAGCATTCTGACTGATA ATTGCTCACATGTAGGCTGGAGCTGCTTCG	*oxyS* knockout
ΔoxySRv	AAATTTGAGCCTGGCTTATCGCCGGGCTTTTTTAT GGCAAAAAAATTCCGGGGATCCGTCGACC	*oxyS* knockout
ΔrdlBFw	CGAGCGTCATATAGCCGCCTTGTTGTAATGACAAC ATTTTGCGGCTGTAGGCTGGAGCTGCTTCG	*rdlB* knockout
ΔrdlBRv	AATGTTGCGGGGGCTTTATCCCTGGTGGCATTGG TTGCTGGAAAGTTCCGGGGATCCGTCGACC	*rdlB* knockout
ΔrdlCFw	CGAGCGTCATATAGCCGCCTTGTTGTAATGACAAC ATTTTGCGGCTGTAGGCTGGAGCTGCTTCG	*rdlC* knockout
ΔrdlCRv	CGCAATGTTGCGGGGCTTTATCCCTGGTGGCATT GGTTGCTGGAATTCCGGGGATCCGTCGACC	*rdlC* knockout
ΔrprAFw	CATTCAGCTGGTAGTACCTGTCGCAAATTCTTTAC AGTTTTTTGTAGGCTGGAGCTGCTTCG	*rprA* knockout
ΔrprARv	TCAGCCTGCTGACGGCTTGAAGAGAGTCACAGTA TCTTGTGCAACTTCCGGGGATCCGTCGACC	*rprA* knockout
ΔrseXFw	ATTAATTCATTTAATCAATATATTAGCACTGATTACA ATTATACCTGTAGGCTGGAGCTGCTTCG	*rseX* knockout
ΔrseXRv	TGCGCCAAACGGCTGGTGTGATCAGGCGCACATT AATGAAGGCATTTCCGGGGATCCGTCGACC	*rseX* knockout
ΔrybBFw	ACAACCGCAGAACTTTTCCGCAGGGCATCAGTCTT AATTAGTGCCTGTAGGCTGGAGCTGCTTCG	*rybB* knockout
ΔrybBRv	AAGTTTTAGATAACAAAAAACCCATCAACCTTGAAC CGAAATGGCTTCCGGGGATCCGTCGACC	*rybB* knockout
ΔrydCFw	CAAGGATTATGGTTTTATTTATCATACAAATAAATA TAATAGGCGTGTAGGCTGGAGCTGCTTCG	*rydC* knockout
ΔrydCRv	ATTTAAAGAAAACGCCTGTACTAAAACCGACCCGT GGTACAGGCGTTCCGGGGATCCGTCGACC	*rydC* knockout
ΔsdsRFw	AAAACGCTGGACTCAGACAGTAGAGTGTGTGTTAT GGTTGACTATTGTAGGCTGGAGCTGCTTCG	*sdsR* knockout
ΔsdsRRv	TAAAATAGCCTTTTGATTTCCAATAAAAAAACCGCC TCAGTTCTTTTCCGGGGATCCGTCGACC	*sdsR* knockout
ΔryeFFw	GAAATGAAAGGAATCATTGAACGCCATCAGGCCAA ATGATTTTTATGTAGGCTGGAGCTGCTTCG	*ryeF* knockout
ΔryeFRv	AAAAACAATAACCCAATGCGTTTTTTCCCTCGCATA GATTCCTCTTTCCGGGGATCCGTCGACC	*ryeF* knockout
ΔryfAFw	CAAGCAAAAGAGAGTTATTATTGTTCTGTTAGTGTA TTATCCACTTGTAGGCTGGAGCTGCTTCG	*ryfA* knockout
ΔryfARv	GCCGCCCAAAGGGCGGCATTCGGGCTTACTTGCT GCTCTGAAGGTTTCCGGGGATCCGTCGACC	*ryfA* knockout
ΔryfBFw	AAGATTAACGTGACCGCCAATTCGTAAGTACATTA AAATTGGCTTTGTAGGCTGGAGCTGCTTCG	*ryfB* knockout
ΔryfBRv	TCACTAAGTTAATTTATATAGTATCTGCCCAGACAC TTATTTATATTCCGGGGATCCGTCGACC	*ryfB* knockout
ΔryfDFw	CCACCGGTCGTATGGCAAGTTTCATTTGGCTGATA TAACCTAAAGTGTAGGCTGGAGCTGCTTCG	*ryfD* knockout
ΔryfDRv	CTACTGGAGATTAAATGAGGTCATCCCTCAATTAT TCAAGGTTATTTCCGGGGATCCGTCGACC	*ryfD* knockout

ΔryhBFw	AAAAAGTGTTGGACAAGTGCGAATGAGAATGATTATTATTGTCTCTGTAGGCTGGAGCTGCTTCG	*ryhB* knockout
ΔryhBRv	AACACAAGCACTCCCGTGGATAAATTGAGAACGAAAGATCAAAAATTCCGGGGATCCGTCGACC	*ryhB* knockout
ΔsgrSFw	TTCCCTATATTAAGTCAATAATTCCTAACGATGAAGCAAGGGGGTTGTAGGCTGGAGCTGCTTCG	*sgrS* knockout
ΔsgrSRv	CGTCATTATCCAGATCATACGTTCCCTTTTTAGCGCGGCGAGAATTTCCGGGGATCCGTCGACC	*sgrS* knockout
ΔsroCFw	GCACTGTTCAAAGAACCGAATGACAAGGCACTGAACTAATTACAATGTAGGCTGGAGCTGCTTCG	*sroC* knockout
ΔsroCRv	GTAAAAAAATACCCCAGTTCCAGTCTATAGACATAAATCTACTCCTTCCGGGGATCCGTCGACC	*sroC* knockout
Δoch5Fw	TTGCGCATCTTTTTCGAAATAAAAATGTCCATCCCCCTCCCCCGCTGTAGGCTGGAGCTGCTTCG	*och5* knockout
Δoch5Rv	GTAGCCCGACGTATTCGTCGGGCTAATGCCTTTACCCGATATTGCTTCCGGGGATCCGTCGACC	*och5* knockout
T7-csgDFw	TAATACGACTCACTATAGGGCAGATGTAATCCATTAGTTT	*csgD* 5'-UTR *in vitro* transcription
csgDRv	GACTTCATTAAACATGATGAAACCC	*csgD* 5'-UTR *in vitro* transcription
T7-flhDFw	TAATACGACTCACTATAGGGGATTTAGGAAAAATCTTAGA	*flhD* 5'-UTR *in vitro* transcription
flhDRv	CTCGGAGGTATGCATTATTCCCACC	*flhD* 5'-UTR *in vitro* transcription
T7-och5Fw	TAATACGACTCACTATAGGGATCCTTGTCCGCTTAACCGTT	Och5 *in vitro* transcription
och5Rv	AATAATATTTGTAGCCCGACGTATTC	Och5 *in vitro* transcription
T7-dicFFw	TAATACGACTCACTATAGGGTTTCTGGTGACGTTTGGCGG	DicF *in vitro* transcription
dicF5Rv	GGGCGGCAGAGCAGTC	DicF *in vitro* transcription
T7-omrAFw	TAATACGACTCACTATAGGGCCCAGAGGTATTGATTGGTG	OmrA *in vitro* transcription
omrARv	AAAAAAAACCTGCGCATCCGC	OmrA *in vitro* transcription
T7-omrBFw	TAATACGACTCACTATAGGGCCCAGAGGTATTGATAGGTGA	OmrB *in vitro* transcription
omrBRv	AAAAAAAACCTGCGCATCTGCG	OmrB *in vitro* transcription
T7-rprAFw	TAATACGACTCACTATAGGGACGGTTATAAATCAACATATTGATTTATAAG	RprA *in vitro* transcription
rprARv	AAAAAAAGCCCATCGTGGGAG	RprA *in vitro* transcription
T7-ssrSFw	TAATACGACTCACTATAGGGATTTCTCTGAGATGTTCGCAAGC	6S *in vitro* transcription
ssrSRv	GAATCTCCGAGATGCCGC	6S *in vitro* transcription
T7-sdsRFw	TAATACGACTCACTATAGGGCAAGGCAACTAAGCCTGCAT	SdsR *in vitro* transcription
sdsRRv	AAAAAGAGACCGAACACGATTCCTG	SdsR *in vitro* transcription
T7-IS118Fw	TAATACGACTCACTATAGGGGGTTCTGGAGGGGGTTTG	IS118 *in vitro* transcription
IS118Rv	AAATTGCGCGCCAATCATGG	IS118 *in vitro* transcription
T7-sgrSFw	TAATACGACTCACTATAGGGGATGAAGCAAGGGGGTGC	SgrS *in vitro* transcription
sgrSRv	AAAAAAAACCAGCAGGTATAATCTGC	SgrS *in vitro* transcription

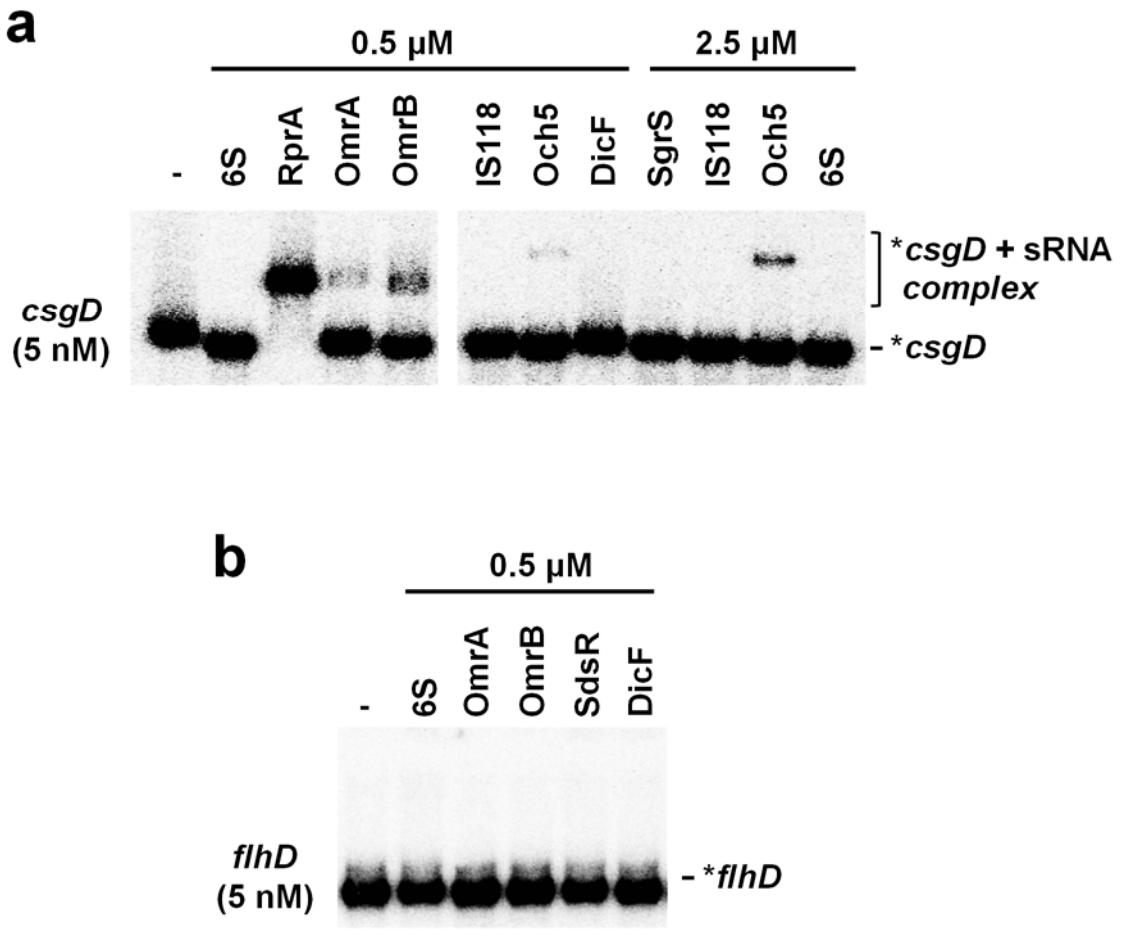
Supplementary Figures



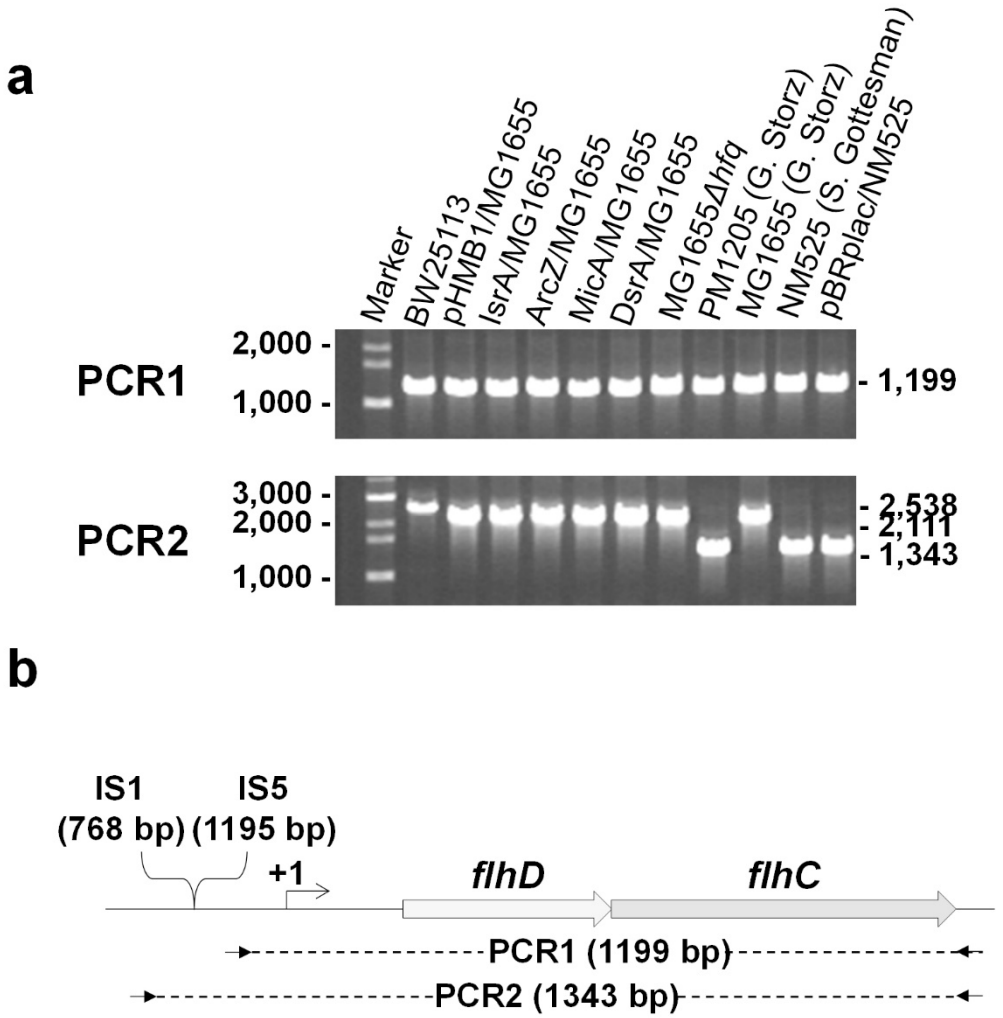
Supplementary Figure 1. sRNA expression vectors pHM-tac and pHMB1. (a) Schematic view of plasmids pHM-tac and pHMB1 containing the pBR322 replication origin, ampicillin resistance gene, and the tacO promoter, which is tightly controlled by the *lacI*^{q} gene on plasmids and induced by IPTG. pHMB1 was constructed by adding the modified *rnpB* T1 terminator in the region downstream of the multiple cloning site (MCS) of pHM-tac. pHMB2, a derivative of pHMB1, has the *Sma*I cloning site instead of *Eco*RI. (b) Schematic structure of the transcription unit region of the pHMB1 vector. Lac operator sequences are shown in bold, and designated *lacO1* and *lacO2*. The putative transcription start site is indicated with an arrow, and the -35 and -10 regions of the tac promoter with boxes. Unique recognition sites for each restriction enzyme in MCS are underlined.



Supplementary Figure 2. Dosage effects of sRNAs on biofilm formation. (a, c) *E. coli* MG1655 strains containing each sRNA-expressing plasmid were grown in LB complemented with different IPTG concentrations at 30°C for 12 h. The biofilm attached to 96-well round bottom polystyrene microtiter plates was determined by crystal violet staining and dissolved with 30% acetic acid. (b, d) The level of biofilm formation of each strain (OD_{550}/OD_{595}) was normalized to the level of the condition with no IPTG, and termed 'relative biofilm'.



Supplementary Figure 3. Binding assay of sRNAs with *flhD* or *csgD* 5'-UTR RNA. ^{32}P-labeled 5'-UTR RNA (5 nM) was incubated at 25°C for 20 min with sRNAs (0.5 or 2.5 µM) in TMN binding buffer. After incubation, samples were separated on 5% non-denaturing polyacrylamide gels at 4°C. *csgD* 5'-UTR RNA (a) and *flhD* 5'-UTR RNA (b). 6S RNA was used as negative control. Asterisks indicate ^{32}P 5'-end labeled RNA species.



Supplementary Figure 4. PCR for detecting IS elements upstream of the *flhDC* operon. (a) Two amplified products were generated from chromosomal DNA of several *E. coli* strains. The 2,111 bp and 2,538 bp (bottom panel) products signify insertion of the IS1 or IS5 element, respectively. (b) Schematic view of the amplified region. The transcription start site of the *flhDC* operon is designated +1. Primer positions are indicated with arrows, and the expected PCR products (PCR1 and 2) with dashed lines.

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