Supplementary Table S1. Primers used in this study

Primer name	Nucleotide sequence (5' to 3')	Purpose of amplification
Cas1-UF	ACTTGCGTTCAATACCCT	*Cas1* upstream homologous arm
Cas1-UR	TCCCCCGGGGTTCCCGTTCCAAGTAAA	
Cas1-DF	TCCCCCGGGATGGTTTAGCGGCAACAACACT	*Cas1* downstream homologous arm
Cas1-DR	TAACGGCGAGCAATCCTT	
Cas2-3-UF	CTGTGGGTTCTTGGGATT	*Cas2-3* upstream homologous arm
Cas2-3-UR	TCCCCCGGGCTGGGTGATTACAGTTTGC	
Cas2-3-DF	TCCCCCGGGTAAGGCTGCGATTCACTAT	*Cas2-3* downstream homologous arm
Cas2-3-DR	TTTTCTGGAACTGGGATG	
Csy1-UF	TACATTTGTTGCGGGAGC	*Csy1* upstream homologous arm
Csy1-UR	TCCCCCGGGATTCGGCAGCCAGTTTTC	
Csy1-DF	TCCCCCGGGATCCCAATCCAGTAGCCT	*Csy1* downstream homologous arm
Csy1-DR	CACAACACCAACCGCAGA	
Csy2-UF	ACAGCATCAAACATCCCACT	*Csy2* upstream homologous arm
Csy2-UR	TCCCCCGGGCAACACCAACCGCAGAAA	

Csy2-DF	TCCCCCGGGACTCCTCATCGCTTTGCT	*Csy2* downstream homologous arm
Csy2-DR	AAGTGGCGTGGCTTTATC	
Csy3-UF	ATGCCTTATCGTTTGGAG	Csy3 upstream homologous arm
Csy3-UR	TCCCCCGGGCTGAACCCAATGAACAAGTA	
Csy3-DF	TCCCCCGGGGGGAAAAGCGTTTAGGAC	*Csy3* upstream homologous arm
Csy3-DR	TTAGTGGAAGCCAGAGTATGT	
Cas6f-UF	TTTTGATACTTGGGCACG	*Cas6f* upstream homologous arm
Cas6f-UR	TCCCCCGGGAAGGCTTTGTGGAGATTG	
Cas6f-DF	TCCCCCGGGAAATCAGGCAATACAAGGC	*Cas6f* upstream homologous arm
Cas6f-DR	AGTGAGATGGTGGCAAATA	
CRISPR-UF	AGCGTATCAAACGGGCAAAG	CRISPR upstream homologous arm
CRISPR-UR	TCCCCCGGGTTAGTGAGATGGTGGCAAA	
CRISPR-DF	TCCCCCGGGGCTCCAGTTATTCGTGATG	CRISPR downstream homologous arm
CRISPR-DR	GCTGGCGAACAAAAGACT	
hb-Cas1-F-SacI	CGAGCTCaggaggaattcaccATGGAAATACTAACAGACTTAAAAG	The construction of Complementary strain of *cas1*
hb-Cas1-R-XbaI	GCTCTAGATCGGCAAAAGCATCTAAG	

hb-Cas2-3-F-SacI	CGAGCTCaggaggaattcaccATGATGGTTATTTTTGTTTCCC	The construction of Complementary strain of *cas2-3*
hb-Cas2-3-R-XbaI	GCTCTAGACAAGTTCAGTCATATCCGA	
hb-Csy1-F-SacI	CGAGCTCaggaggaattcaccATGTTTGATCCAGCAATTAC	The construction of Complementary strain of *csy1*
hb-Csy1-R-XbaI	GCTCTAGACCAATGGTGAAAGGGCTG	
hb-Csy2-F-SacI	CGAGCTCaggaggaattcaccATGAGAAGTAACCTGATTTTATTGC	The construction of Complementary strain of csy2
hb-Csy2-R-XbaI	GCTCTAGACATCCGATGGTACCAATT	
hb-Csy3-F-SacI	CGAGCTCaggaggaattcaccATGACTAAAAAAGAACACATAGC	The construction of Complementary strain of csy3
hb-Csy3-R-XbaI	GCTCTAGACATTAACACTGGGGTTGTA	
hb-Cas6f-F-SacI	CGAGCTCaggaggaattcaccATGGATCATTATTTAGATATATCTATTCTT	The construction of Complementary strain of cas6f
hb-Cas6f-R-XbaI	GCTCTAGATAACCTATCGAACTCAAGGA	
hb-CRISPR-F-SacI	CGAGCTCaggaggaattcaccCTTAAAATCAATTGGTTATAAATTAGCT	The construction of Complementary strain of CRISPR
hb-CRISPR-R-XbaI	GCTCTAGACAATTACACTCATTTCCATGG	
207-F	TGATCCGGGCTTATCGACTG	Test the correct construction of Complementary strain
207-R	ACCGCTTCTGCGTTCTGATTT	
Cas1-qF	CTTGGGATTCCTCACGGCTT	*cas1* gene expression detection for qPCR
Cas1-qR	CCTTGGCGCAGATAAATGCC	

Cas2-3-qF	TGCTTCACCATGCTCGCTTA	*cas2-3* gene expression detection for qPCR
Cas2-3-qR	AAGCCTGCTTTGGCGATTTG	
Csy1-qF	ATCCCAATCCAGTAGCCTTCCAG	*csy1* gene expression detection for qPCR
Csy1-qR	CGTTCAGCCTCACCCAACATAGT	
Csy2-qF	CTGTGATGTTTTCTGCGGTTGGT	*csy2* gene expression detection for qPCR
Csy2-qR	CGGGCTTCTTCAATAAATGATGGT	
Csy3-qF	ACTAACGAAGTTGACAGTTTGGC	*csy3 gene expression detection for qPCR*
Csy3-qR	CAGCACTAACTCTTCACTGGGAT	
Cas6f-qF	TACTCTGGCTTCCACTAACATCG	*cas6f gene expression detection for qPCR*
Cas6f-qR	CCTCACAATAACCAATCATACCG	
CRISPR-qF	TCGCCGTACTCGTTCAAGTT	CRISPR expression detection for qPCR
CRISPR-qR	TTGTTGATTGTCGCAACGCA	
dotA-qF	ACGGAACGGGAAGCCAGATA	*dotA* gene expression detection for qPCR
dotA-qR	CGAAGGTGGAACGAAGAGGA	
dotB-qF	TCCGCTGTAGTAAGCCAATC	*dotB* gene expression detection for qPCR
dotB-qR	TCACGACATTCACCCACCAT	

dotC-qF	CCCAATGTCACTCTACTCCC	*dotC* gene expression detection for qPCR
dotC-qR	CATACCGCCGAAATCTTCTT	
dotD-qF	GCTGCGCTGGAACAATGAAA	*dotD* gene expression detection for qPCR
dotD-qR	GACCAATCGACACTGGCTCT	
icmV-qF	GTGGTTATGATCGCATTGGT	*icmV* gene expression detection for qPCR
icmV-qR	AACCCTTGCCTGTACCATTC	
icmW-qF	TAGGGCAAGAACTTGATGAT	*icmW* gene expression detection for qPCR
icmW-qR	GCTACCAGGATGGACTGTAT	
icmX-qF	TACCAATCCAGCACCACTAC	*icmX* gene expression detection for qPCR
icmX-qR	TGACTTGAGCACTTGCGTAT	
icmS-qF	CTTATGACGAGTCTGAGGGA	*icmS* gene expression detection for qPCR
icmS-qR	GGAGTATAATCACGGCTTGG	
icmK-qF	GCAACTGCGAATGCTACAAC	*icmK* gene expression detection for qPCR
icmK-qR	GCCCGCATTTGCTGTTTGAT	
icmB-qF	ACACGCTCCTCTGCACAATA	*icmB* gene expression detection for qPCR
icmB-qR	TTTATGACCCTGCGGAAGCA	

icmH-qF	AGCAATACCCGTCCTCACTT	*icmH* gene expression detection for qPCR
icmH-qR	CCTCTACTGGAGGTAAAGAA	
icmF-qF	AACTCCATATCGCTGCCTAC	*icmF* gene expression detection for qPCR
icmF-qR	TCATTGGCTAAGGAGGGAAG	
lvgA-qF	TCCATTAGCGATAGTGGAGC	*lvgA* gene expression detection for qPCR
lvgA-qR	CCAGGTATCAGTTCGGGTTC	
flaA-qF	CCACGGCAACAGGAACAGAAGTA	*flaA* gene expression detection for qPCR
flaA-qR	ATCCCGGCATCGTTGATAGCCG	
pilA-qF	TGAAACGGCTATTACCAACAACG	pilA gene expression detection for qPCR
pilA-qR	CTATGGTACCACCACCTGCTGA	
pilB-qR	TCGTATTACAGCACGTATCAAGG	*pilB* gene expression detection for qPCR
pilB-qF	TACCAGAATCAAGAACCCGCATA	
pilC-qR	AGAGAAAGCAGCAATTGCTAGA	*pilC* gene expression detection for qPCR
pilC-qF	TGCTGTCCTGTTGCAACTTC	
pilD-qR	CCTCACTTTAGGGCTCTTATGGA	*pilD* gene expression detection for qPCR
pilD-qF	TCCCATACCTACTTTACCTGTCA	

pilQ-qR	TGCTGGAACACCAAGGAATGTT	*pilQ* gene expression detection for qPCR
pilQ-qF	AGGAGGCAACATCAAGTGGAGCG	
pilP-qR	GATCAATAGGCTTGAATGGATTTCGC	*pilP* gene expression detection for qPCR
pilP-qF	TGGTTCTATTACTTAGTGCCTGCTC	
pilO-qR	TGCATATAGGATCCGACAATCGTA	pilO gene expression detection for qPCR
pilO-qF	ATGAACGCTTTGGGACTATGCTA	
pilN-qR	GGTTCTGTATCCAGACATTAGCCTC	*pilN* gene expression detection for qPCR
pilN-qF	CTGCAGTCAACAAGAACTTTAATGG	
pilM-qR	TGCACTACTTTACTGATAACAGCCG	*pilM* gene expression detection for qPCR
pilM-qF	AGAAATACCTGCCTCTGCCTTAG	
gyrB-qF	AATCCCACTGCAGCAAAATC	Reference gene *gyrB* for qPCR
gyrB-qR	TGGTAAACCGGCAATATCCA	

Note. [a]Underlined sequences are restriction site adapters. The sequence in lowercase represents Ribosome Bind Site (RBS).

Supplementary Table S2. The bacterial strains and plasmids used in gene editing studies

Strains / Plasmids	Genotypes and relevant information
L. pneumophila	
WX48	Isolated strain possessing a Type I-F CRISPR-Cas system
ATCC 33152	*L. pneumophila* reference strain Philadelphia-1
ΔCas1	WX48 *cas1*::Km^r
ΔCas2-3	WX48 *cas2-3*::Km^r
ΔCsy1	WX48 *csy1*::Km^r
ΔCsy2	WX48 *csy2*::Km^r
ΔCsy3	WX48 *csy3*::Km^r
ΔCas6f	WX48 *cas6f*::Km^r
ΔCRISPR	WX48 CRISPR::Km^r
Hb-Cas1	WX48 (pMMB207*cas1*)
Hb-Cas2-3	WX48 (pMMB207*cas2-3*)
Hb-Csy1	WX48 (pMMB207csy1)
Hb-Csy2	WX48 (pMMB207*csy2*)
Hb-Csy3	WX48 (pMMB207*csy3*)
Hb-Cas6f	WX48 (pMMB207*cas6f*)
Hb-CRISPR	WX48 (pMMB207CRISPR)
E. coli	
DH5a	*supE*44 Δ *lac*U169 (ϕ80*lacZ* Δ M15) *hsdR*17 *recA*1 *endA*1 *gyrA*96 *thi*-1 *relA*1
Plasmids	

pGEM-T Easy	Amp^r
pLAW344	*oriT* (RK2) *oriR* (ColE1) *sacB* Cmr Apr
pUT-mini-Tn5 Km	Km^r
pMMB207	RSF1010 derivative, *lncQ lacIq* Cmr P*tac oriT*
pMMB207-Cas/CRISPR	pMMB207 carrying *cas1* or *cas2-3* or *csy1* or *csy2* or csy3 or cas6f or CRISPR
pT-Cas/CRISPR	pGEM-T Easy carrying *cas1* or *cas2-3* or *csy1* or *csy2* or csy3 or cas6f or CRISPR
pT-Cas/CRISPR-Km	pT-Cas/CRISPR carrying *cas1*::Km^r or *cas2-3*::Km^r or *csy 1*::Km^r or *csy2*::Km^r or *csy3*::Km^r or *cas6f*::Km^r or CRI SPR::Km^r
pLAW344-Cas/CRISPR-Km	pLAW344 carrying *cas1*::Km^r or *cas2-3*::Km^r or *csy1*::Km^r or *csy2*::Km^r or *csy3*::Km^r or *cas6f*::Km^r or CRISPR::Km^r

Note. Ap^r, ampicillin resistance. Km^r, kanamycin resistance. Cm^r, chloramphenicol resistance.