## Supplementary File 1. Strains used in this study.

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| **Strain** | **Genotype and description** | **Reference** |
| ***Yersinia pestis* KIM6+** |
| WT | Wild type of KIM6+  | (Deng et al., 2002) |
| ∆*rcsD*N-term | Fragment between 1 and 1846 bp of *rcsD* deleted in KIM6+ | (Sun et al., 2008) |
| *rcsD*pe::*rcsD*pstb | *rcsD*pe substituted with *rcsD*pstb in KIM6+ | (Sun et al., 2008) |
| ∆*rcsD* | Fragment between 1 and 2530 bp of *rcsD* deleted in KIM6+ | This study |
| *∆rcsD*C-term | Fragment between 1898 and 2530 bp of *rcsD* deleted in KIM6+ | This study |
| ∆*rcsB* | *rcsB* gene deleted in KIM6+ | (Sun et al., 2008) |
| *rcsD*pe (H844A) | *rcsD*pemutated in KIM6+, at a site of conserved histindine of RcsD (RcsDH844A) | This study |
| ∆*rcsD*N-term (H844A) | *rcsD*pemutated in ∆*rcsD*N-term, at a site of conserved histindine of RcsD (RcsDH844A) | This study |
| *rcsD-hpt* (RBS\*) | The predicted RBSof *rcsD-hpt* mutated in KIM6+(C)AAAAGG > (A)ACAAAG) | This study |
| *rcsD* (ATT312**🡪**GGT) | The predicted translation start codonof *rcsD-hpt* mutated in KIM6+（ATT > GGT) | This study |
| *rcsD* (ATT-312**🡪**ATG) | The predicted translation start codonof *rcsD-hpt* mutated in KIM6+（ATT > ATG) | This study |
| *rcsD*pe (inserting stop codon before frameshift) | inserting stop codon before the 7T frameshift of *rcsD*pe | This study |
| ∆*rcsC* | *rcsC* gene deleted in KIM6+ | This study |
| *rcsD*pe::*rcsD*pstb ∆*rcsC*  | *rcsC* gene deletedin *rcsD*pe::*rcsD*pstb | This study |
| ∆*rcsF* | *rcsF* gene deleted in KIM6+ | This study |
| *rcsD*pe::*rcsD*pstb ∆*rcsF* | *rcsF* gene deletedin *rcsD*pe::*rcsD*pstb | This study |
| ∆*igaA* | *igaA* gene deleted in KIM6+ | This study |
| *rcsD*pe::*rcsD*pstb ∆*igaA* | *igaA* gene deletedin *rcsD*pe::*rcsD*pstb | This study |
| *rcsB* (D56Q) | *rcsD*pegenemutated in KIM6+, at a site of conserved aspartic acid of RcsB (RcsBD56Q) | This study |
| ***Yersinia pestis* biovar Microtus strain 201** |
| WT | Wild type of biovar Microtus strain 201 | (Song et al., 2004) |
| *rcsD*pe::*rcsD*pstb | *rcsD*pe substituted with *rcsD*pstb in strain 201 | This study |
| ∆*rcsB* | *rcsB* gene deleted in strain 201 | This study |