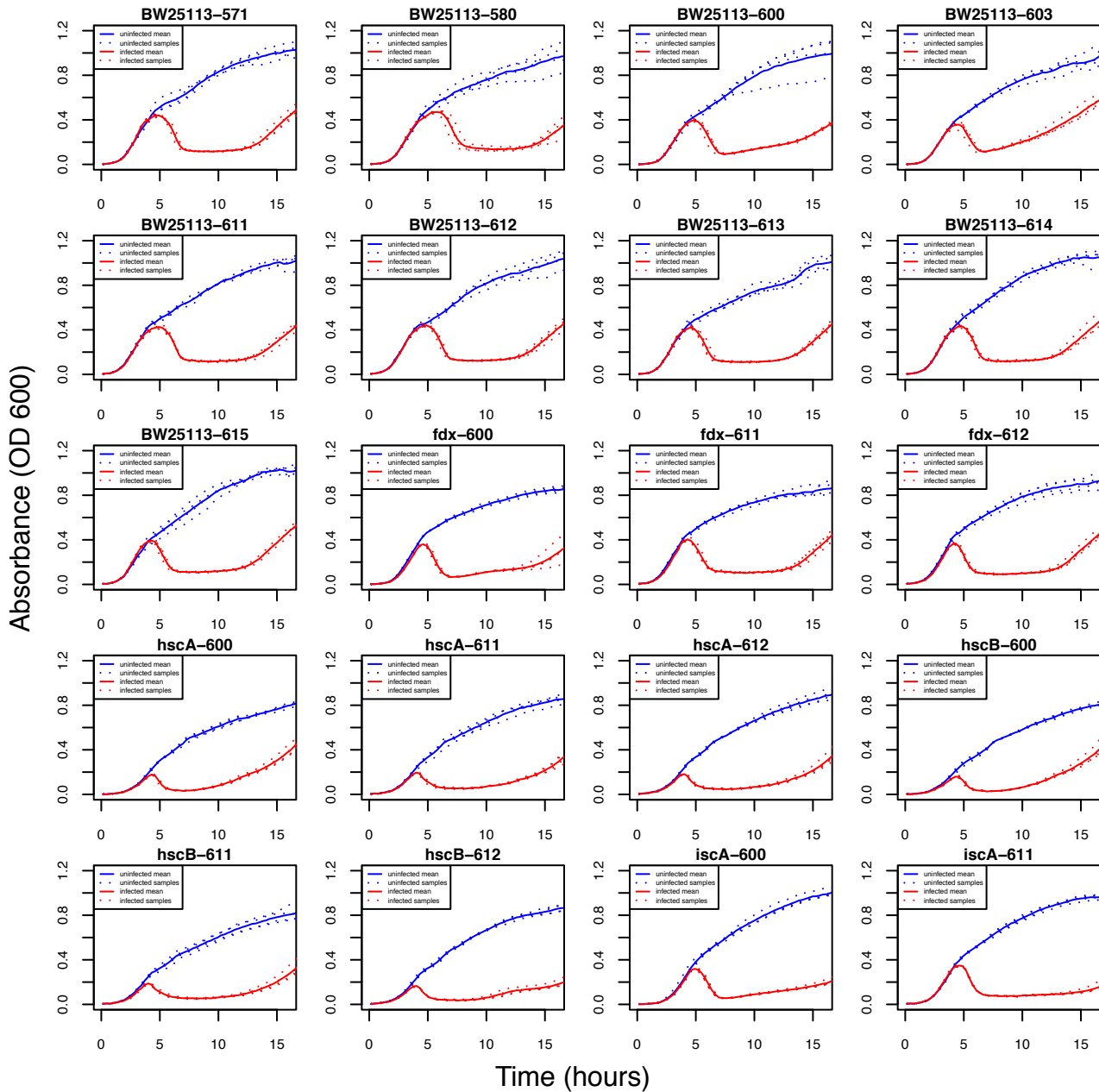
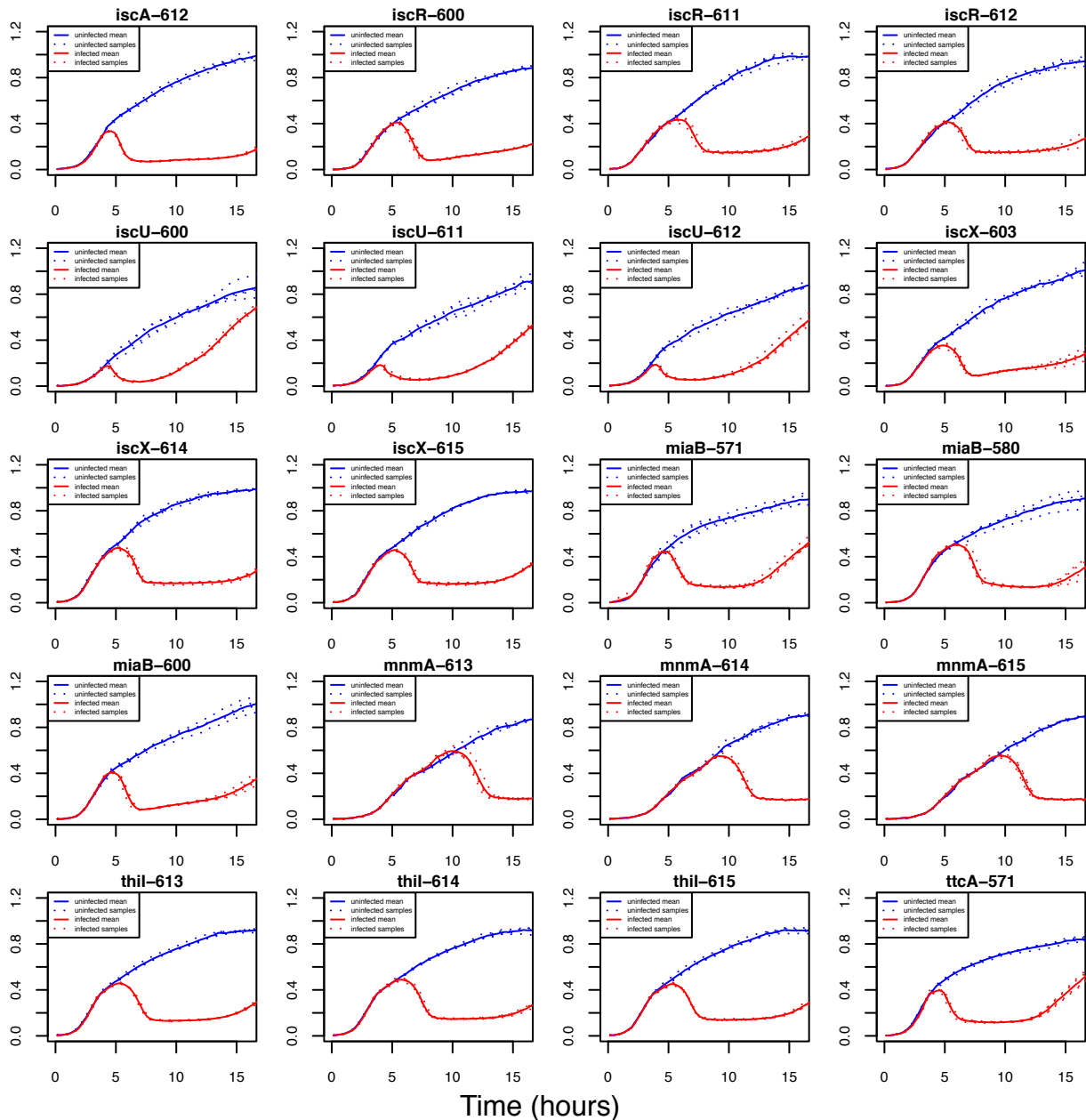
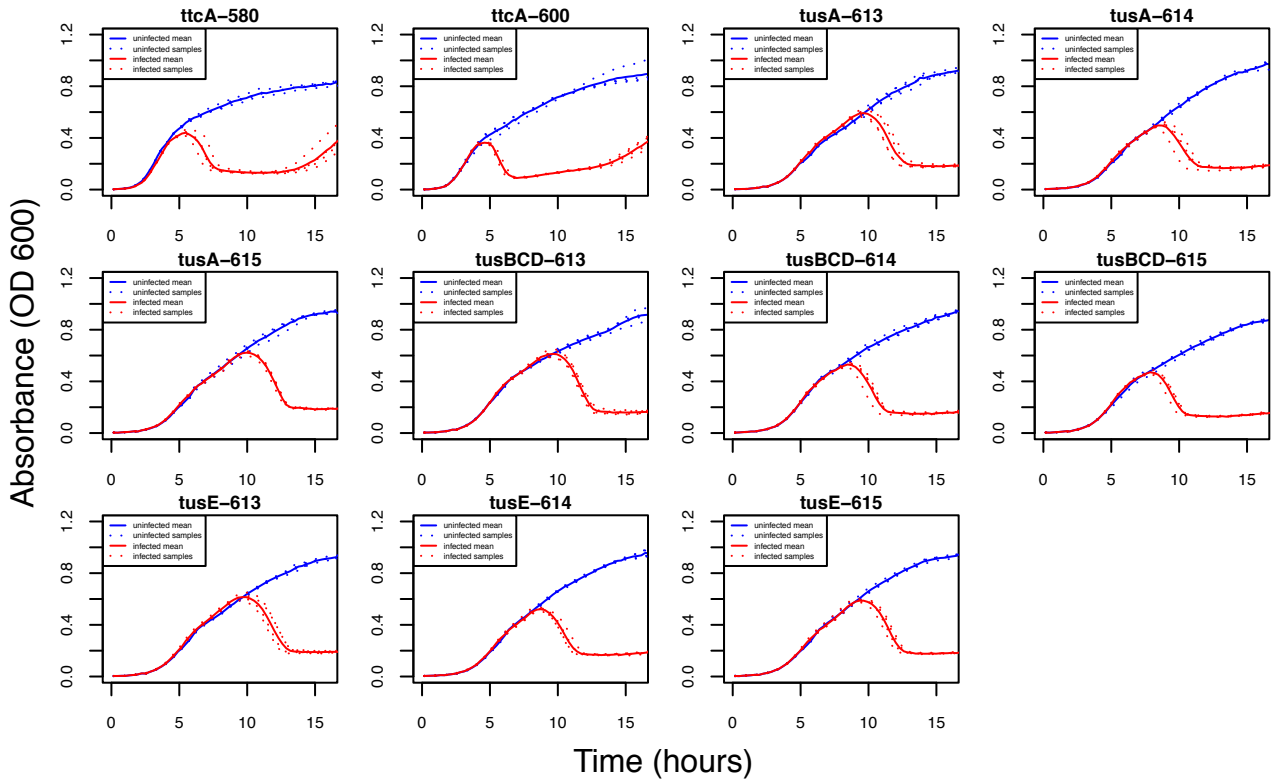


# Supplementary Information



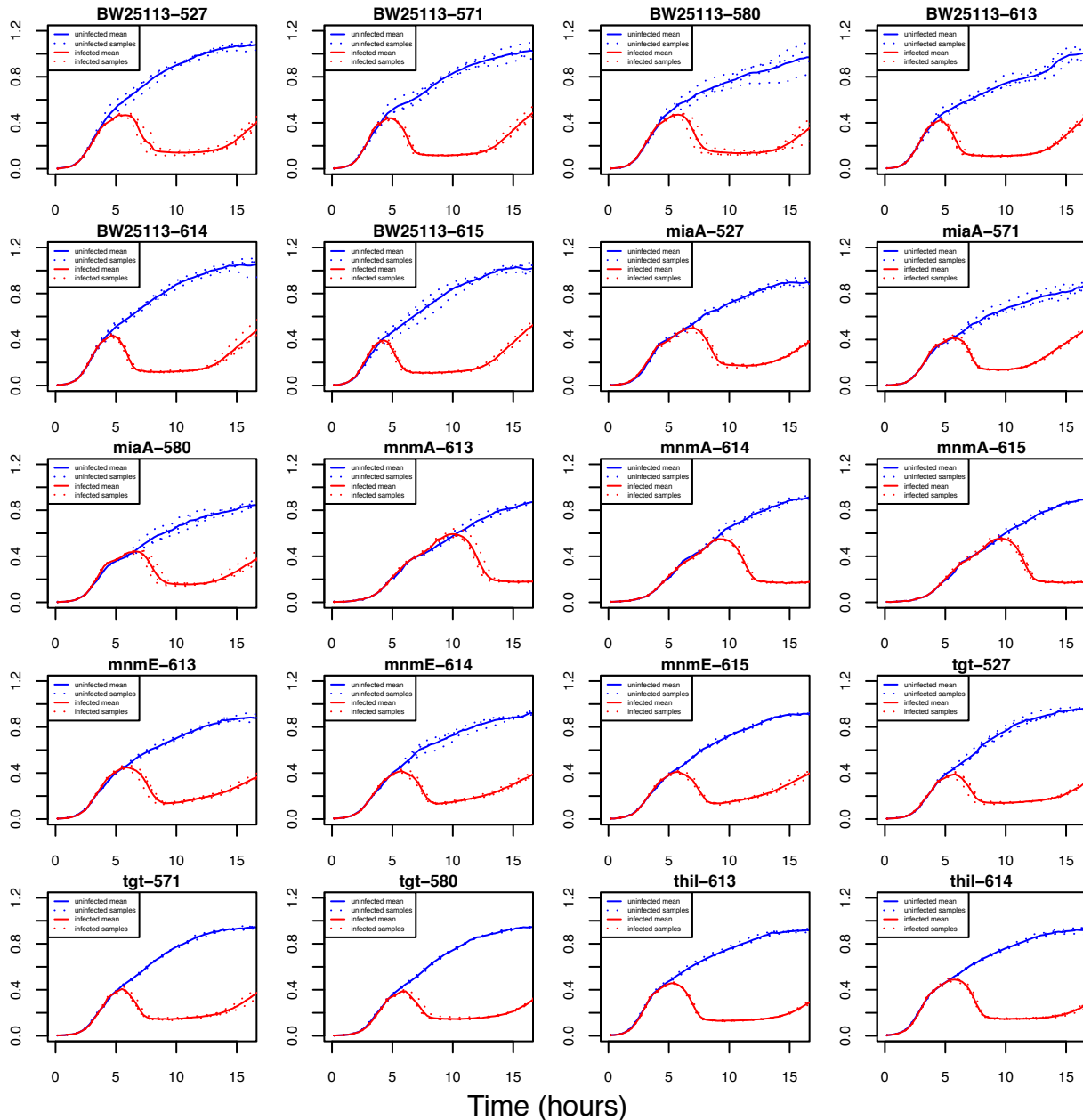
Absorbance (OD 600)





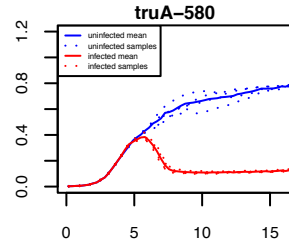
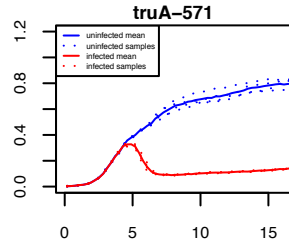
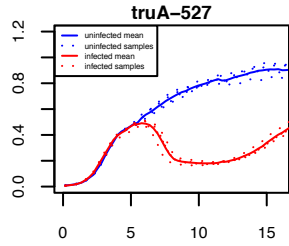
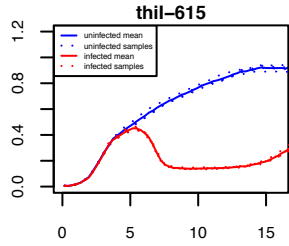
**Supplementary Figure 1: Cell-culture Infection Dynamics for TUS and ISC Pathway Knockout Strains Infected with Lambda Phage.**

Absorbance (OD 600)



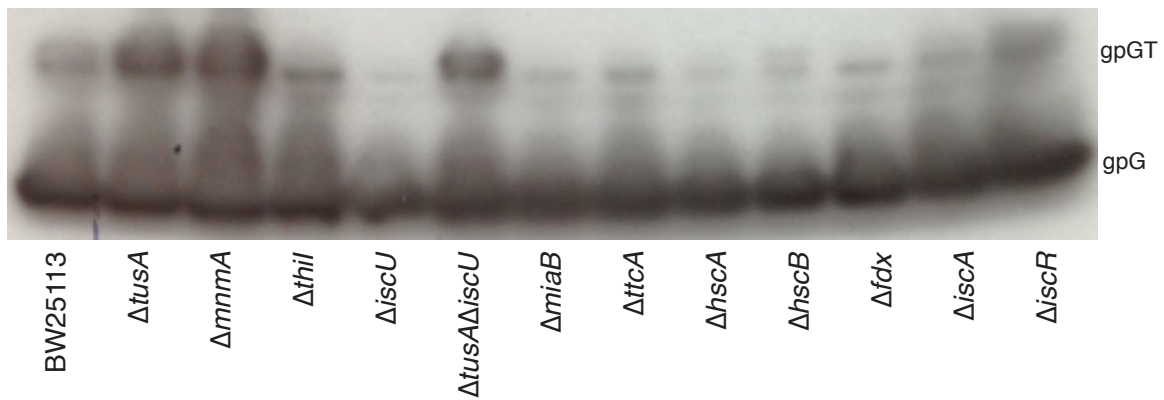
Time (hours)

Absorbance (OD 600)



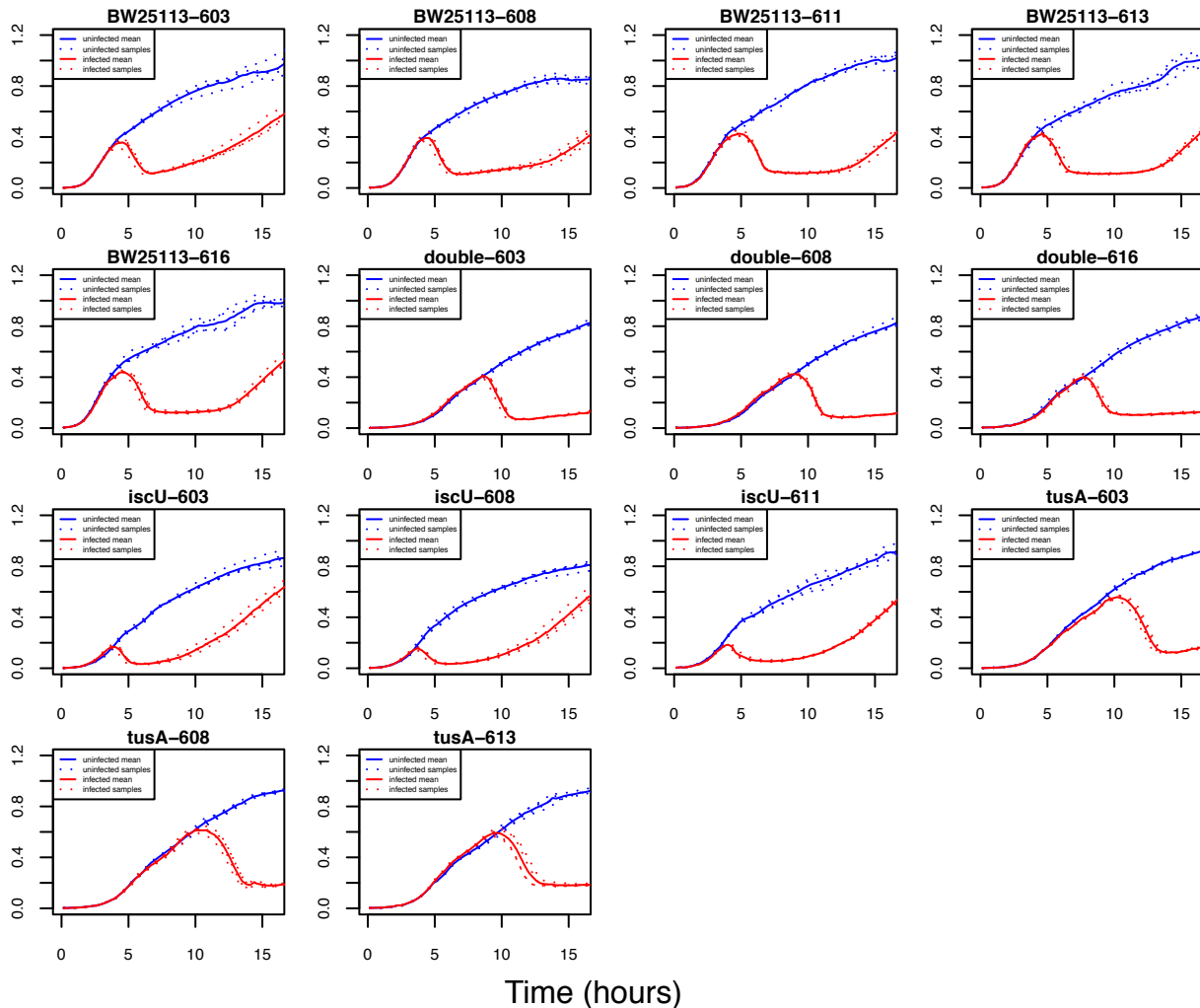
Time (hours)

**Supplementary Figure 2: Cell-culture Infection Dynamics for *E. coli* Knockouts of Genes Known to Affect Frameshifting.**



**Supplementary Figure 3: Immunoblotting of pBAD- $\lambda$ GT in BW25113, and Several Strains from both the TUS and ISC Pathways.** We induced expression of the pBAD- $\lambda$ GT transcript with 0.02% L-arabinose for 2 hours and assessed the gpG and gpGT protein levels by immunoblotting against the Xpress Epitope tag. We found a decrease in gpGT levels in  $\Delta iscU$ ,  $\Delta hscA$ ,  $\Delta hscB$  and possibly  $\Delta iscU$ . We found an increase in gpGT levels in  $\Delta iscU$ ,  $\Delta mnmA$ ,  $\Delta thil$  and  $\Delta tusA\Delta iscU$  and possibly in  $\Delta iscR$ .  $\Delta miaB$ ,  $\Delta ttcA$ ,  $\Delta fdx$ , and  $\Delta iscA$  showed gpGT levels similar to wild-type BW25113.

Absorbance (OD 600)



**Supplementary Figure 4: Cell-culture Infection Dynamics for *E. coli* Knockouts for *tusA*, *iscU*, and *tusA,iscU* Double Knockout.**

## Supplementary Table 1: Description of Parameters in Competitive Inhibition

### Model vs. Independent Effect Model.

|   | Competitive Inhibition Model | Independent Effect Model  | Value                               |
|---|------------------------------|---------------------------|-------------------------------------|
| Dissociation constant for IscS and cysteine         | $k_{d, \text{IscS-Cys}}$     | N/A                       | $2.7 \cdot 10^{-6}$                 |
| Dissociation constant for IscS and IscU             | $k_{d, \text{IscS-IscU}}$    | $K_{d, \text{IscS-IscU}}$ | $2 \cdot 10^{-6}$                   |
| Dissociation constant for IscS and TusA             | $k_{d, \text{IscS-TusA}}$    | $K_{d, \text{IscS-TusA}}$ | $1.2 \cdot k_{d, \text{IscS-IscU}}$ |
| Forward rate of IscS and cysteine interaction       | $k_1$                        | N/A                       | $10^5$                              |
| Reverse rate of IscS and cysteine interaction       | $k_{-1}$                     | N/A                       | $k_1 \cdot k_{d, \text{IscS-Cys}}$  |
| Rate of formation of thiolated IscS                 | $k_2$                        | N/A                       | 0.1417                              |
| Forward rate of thiolated IscS and IscU interaction | $k_3$                        | $k_{1f}$                  | $10^5$                              |
| Reverse rate of thiolated IscS and IscU interaction | $k_{-3}$                     | $k_{1r}$                  | $k_3 \cdot k_{d, \text{IscS-IscU}}$ |
| Irreversible rate of formation of thiolated IscU    | $k_4$                        | N/A                       | $k_{-3}$                            |
| Forward rate of thiolated IscS and TusA interaction | $k_5$                        | $k_{2f}$                  | $10^5$                              |
| Reverse rate of thiolated IscS and TusA interaction | $k_{-5}$                     | $k_{2r}$                  | $k_5 \cdot k_{d, \text{IscS-TusA}}$ |
| Irreversible rate of formation of thiolated TusA    | $k_6$                        | N/A                       | $k_4$                               |
| Irreversible rate of sISC modification              | $k_7$                        | $k_{3f}$                  | $10^5$                              |
| Irreversible rate of sTUS modification              | $k_8$                        | $k_{4f}$                  | $k_7$                               |
| Rate of lambda infection (normalized)               | $k_i$                        | $k_i$                     | 0.25                                |
| Frequency of lambda lytic decision                  | $f$                          | $f$                       | 0.93                                |
| Lysogen growth rate (normalized)                    | $\mu^*$                      | $\mu^*$                   | 0.3                                 |
| Lysogen carrying capacity (normalized)              | $K^*$                        | $K^*$                     | 0.4                                 |
| Rate of lysogen induction                           | $k_s$                        | $k_s$                     | 0                                   |



|   |     |     |   |
|---|-----|-----|---|
| (normalized)                                |     |     |   |
| Burst rate for competitive inhibition model | $b$ | N/A | $10 \cdot \frac{sTUS + sTUS_{WT}}{sTUS_{WT}}$   |
| Burst rate for independent effect model     | N/A | $b$ | $10 \cdot \frac{sTUS + sTUS_{WT}}{sTUS_{WT}} - 50 \cdot \frac{sISC - sISC_{WT}}{sISC_{WT}}$ |