Supplementary Information

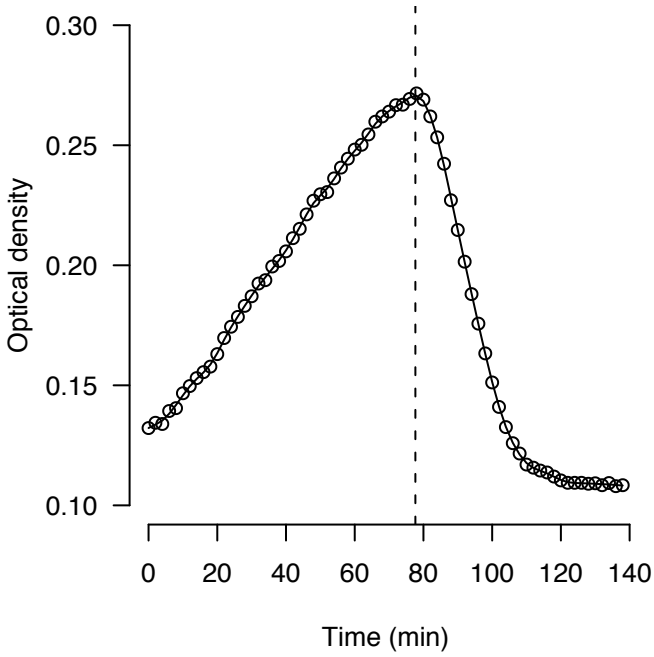

Figure S1: Example of an induction curve as measured in the plate reader (here with HK022/mEp234 double lysogens). 100 µl of bacterial culture was induced with 5 µg/ml mitomycin C at 0 min. The vertical line marks the peak of turbidity in the culture at 77.7 min (the estimate of lysis time), followed by a clearance of the culture due to cell lysis. Points are raw data from the plate reader; the curve is the fitted spline that was used to estimate lysis time.

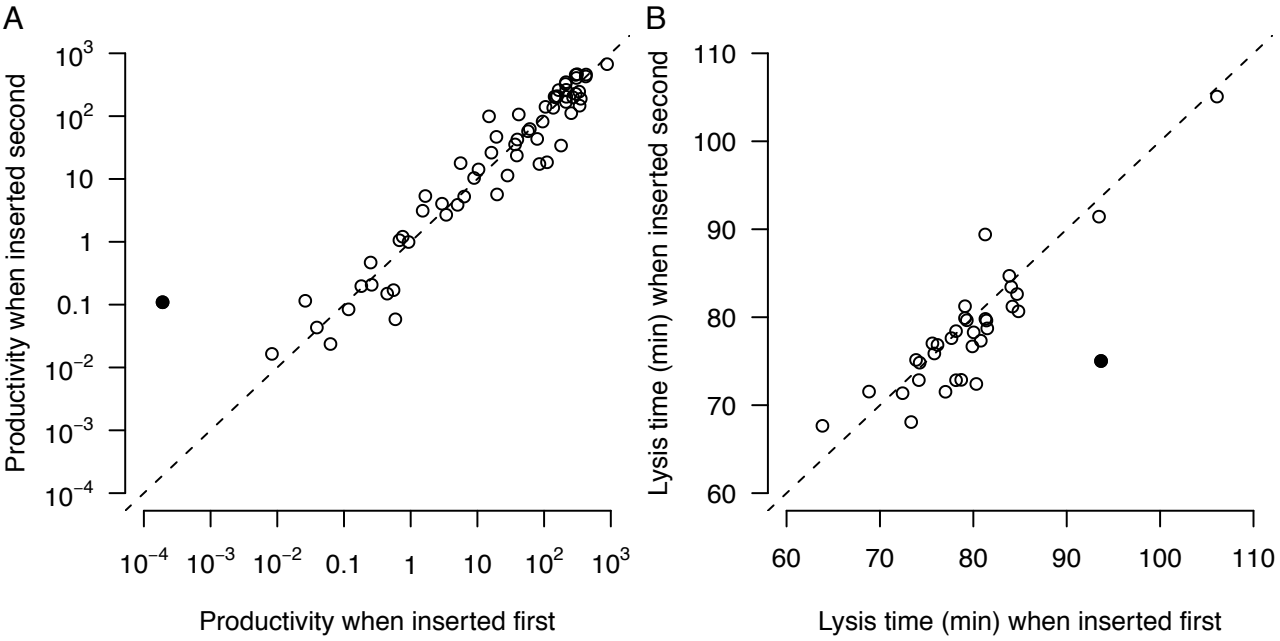

Figure S2: Effect of insertion order on phage productivity and lysis time. Double lysogens can be constructed by two different orders of phage insertion. The scatter plots show how phage productivity (A) and lysis time (B) in double lysogens changes if the order of phage insertion is reversed. Dashed lines are y = x. The closed circle is the λ/mEp213 lysogen, which showed strong variation in both lysis time and productivity of λ.

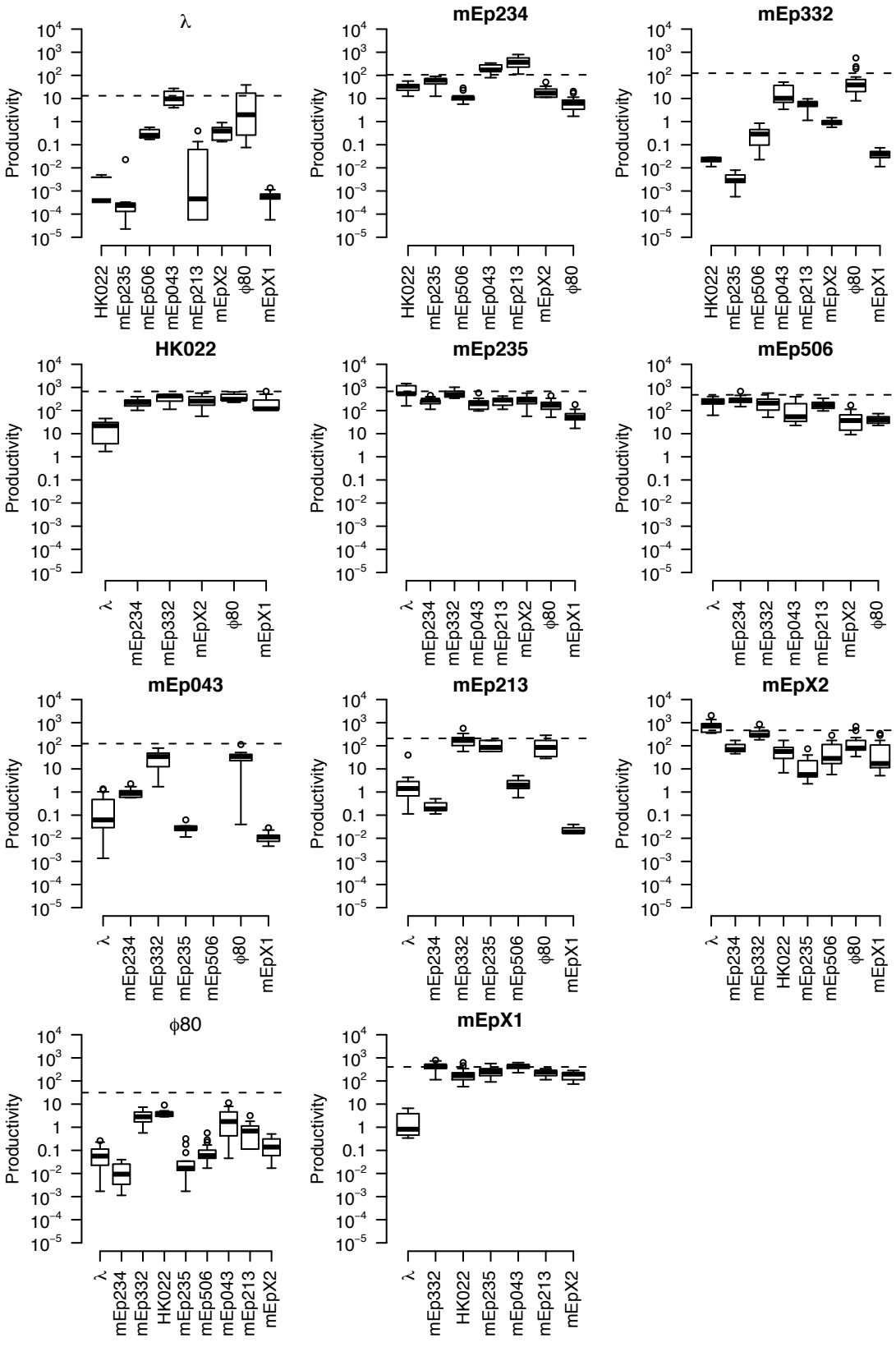

Figure S3: Productivity of individual phages in doubly infected cells. Every plot shows productivity of the phage indicated in the title of the plot in different double lysogens (listed along the x-axis). Dashed lines show the baseline productivity of the phage in a single lysogen.

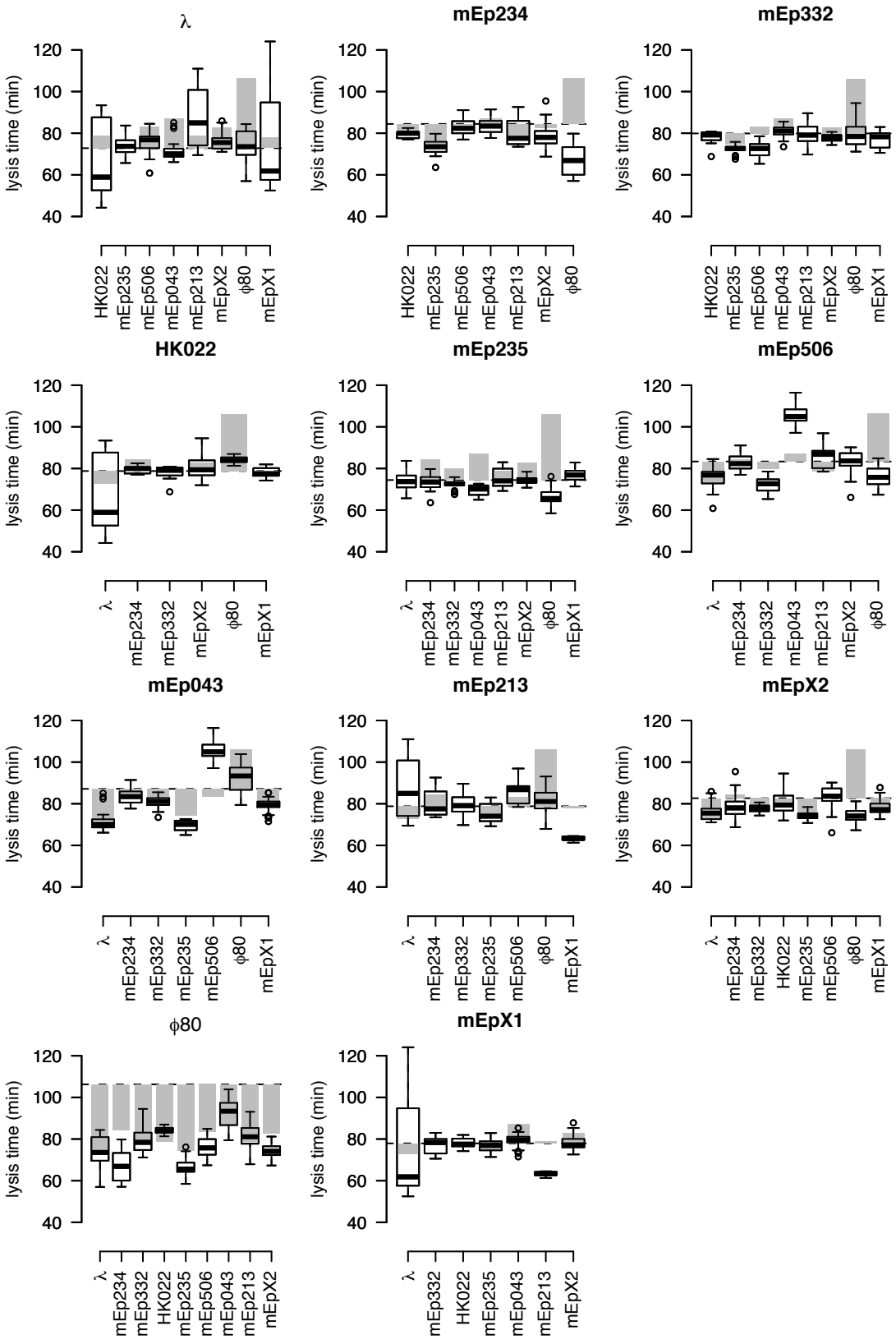

Figure S4: Lysis time of double lysogens. Each plot shows the lysis time of double lysogens of the phage indicated in the title together with the phage listed along the x-axis (all data are presented twice on separate plots). Dashed lines are the baseline lysis time of the phage given in the plot title. Gray bars extend from the dashed line to the baseline lysis time of the competitor (as listed on the x-axis). This allows assessing visually how lysis time of a double lysogen relates to the baseline lysis times of its phages.

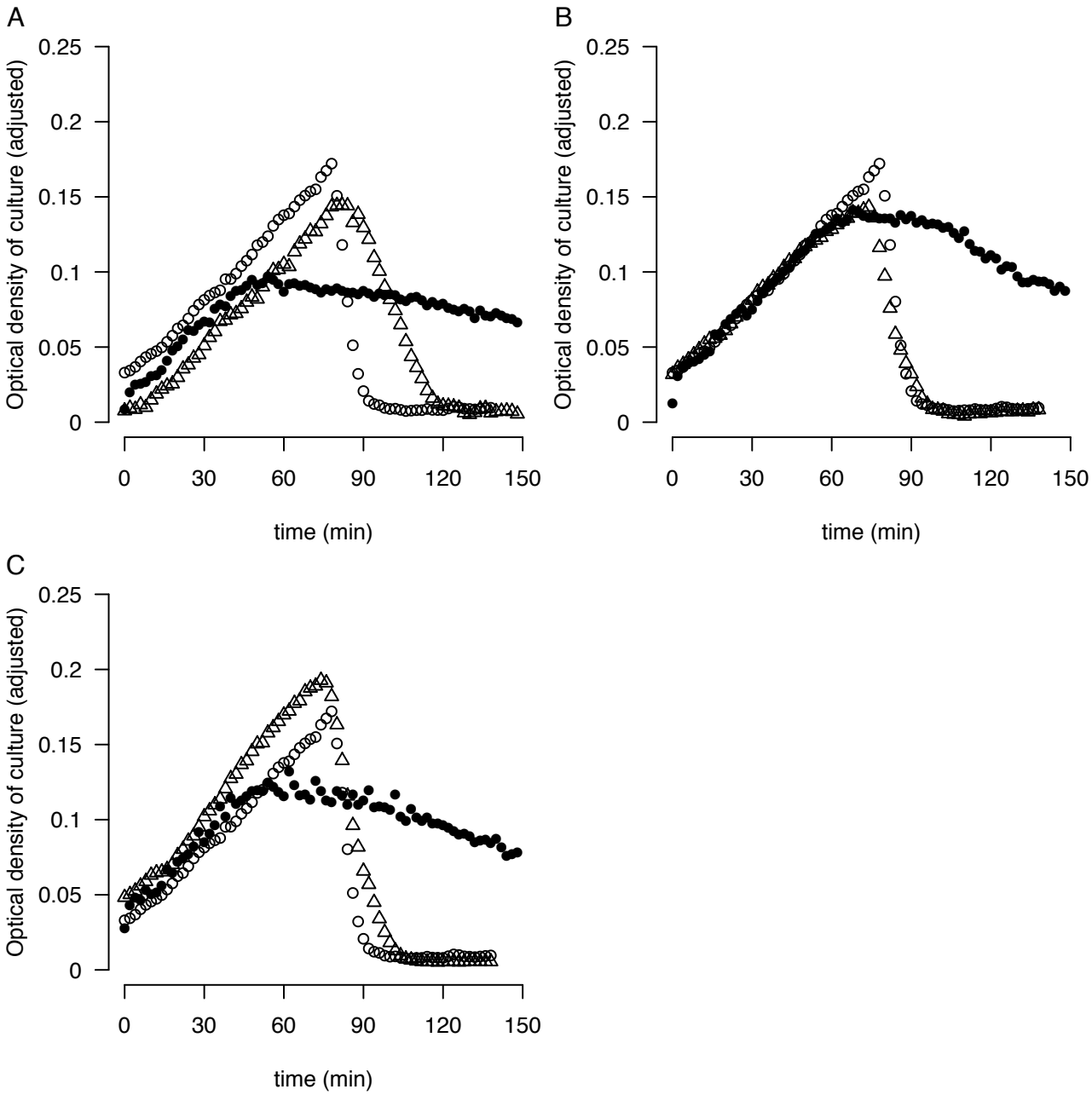

Figure S5: Induction curves of double lysogens that lyse incompletely. Each plot shows the induction curves of the double lysogen (closed circles; A) λ/HK022, B) λ/mEp213, C) λ/mEpX1) and the corresponding single lysogens (open circles: λ, open triangles: HK022, mEp213, and mEpX1 respectively).

Construction of plasmids that confer specific phage resistance

To obtain cells with a specific phage resistance, coding sequences of the repressor genes of phages λ, HK022 and Φ80 were PCR-amplified (Table S1) and ligated into plasmids using the pGEM®-T Easy vector system (Promega, Madison, WI). *E. coli* MG1655 was then transformed with these plasmids. Specific resistance was verified by plating phages on cells harboring the respective plasmid as well as on control cells without plasmids.

Table S1: Primer sequences that were used to amplify prophage repressor genes. Primers were designed with Primer3 (http://frodo.wi.mit.edu) and have an annealing temperature of 60 °C.

Phage	Primer sequences	Amplicon length (bp)
λ	5'-CCGACCAGAACACCTTGC-3'	848
	5'- TGCGTTGTTCCATACAACCT -3'	
HK022	5'-CCGTTCGTCTATGGGCTTAT-3'	916
	5'-TCGTTCATGCTTCTCTCCTG -3'	
Φ80	5'-CGTCTCTTCAGGCCACTAAA-3'	850
	5'-TGTTTTGCTCCGCTCATGT-3'	