Supporting Material for

"**Phage DNA Dynamics in Cells with Different Fates**"

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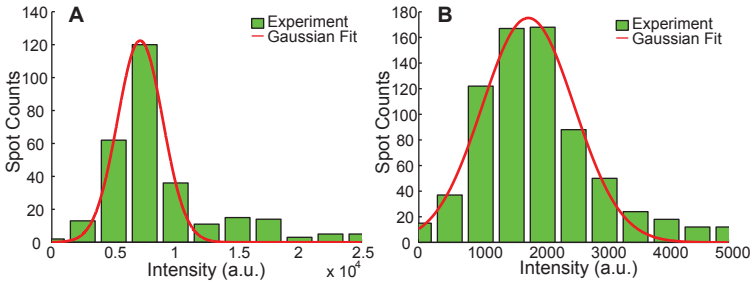

Fig. S1 Histograms of phage intensity (green bars are the experimental data, and red curve is a Gaussian fit). The spot intensity is well fitted by a Gaussian distribution. (A) λ_{LZ1} with a Gaussian mean of 7136. (B) λ_{LZ2} with a Gaussian mean of 1767, which is about ¼ of that of λ_{LZ1}.

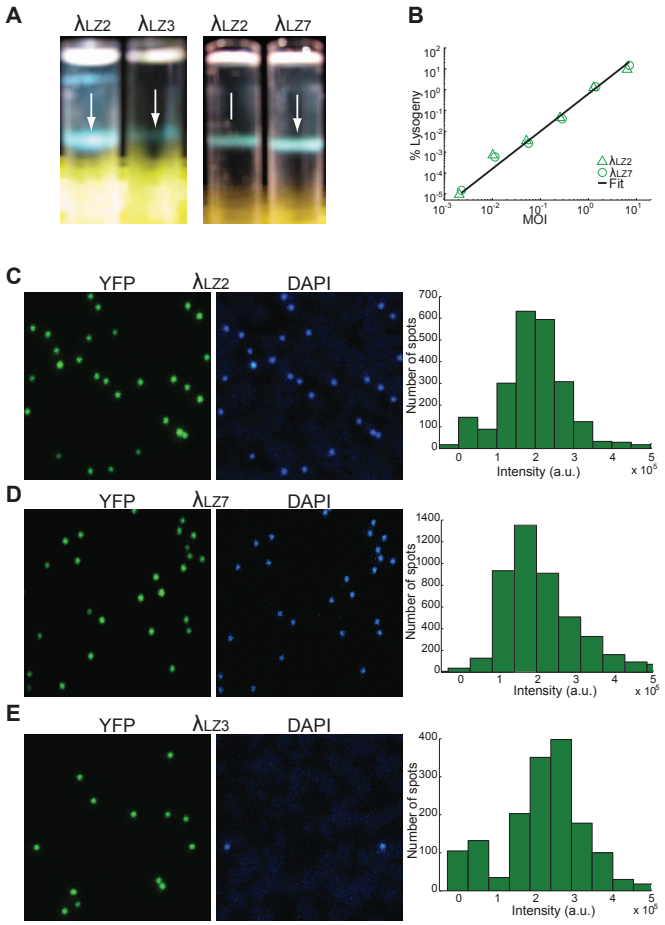

Fig. S2 Phage bands after ultracentrifuge and the DNA packaging efficiency test of the fluorescent phages. (**A**) Phage bands after ultracentrifuge through CsCl equilibrium gradients. Arrows point to the phage bands, containing ~ 10^{12} pfu phage particles. The fluorescent gpD-mosaic phage (λ_{LZ3}) is slightly lighter than the fluorescent gpD-mosaic phage (λ_{LZ2}), which indicates the ratio of gpD-EYFP over gpD proteins of λ_{LZ3} is higher than that of λ_{LZ2}. The fluorescent gpD-mosaic phage (λ_{LZ7}) is slightly heavier than the fluorescent gpD-mosaic phage (λ_{LZ2}), which indicates the ratio of gpD-EYFP over gpD

proteins of λ_{LZ7} is lower than that of λ_{LZ2}. (**B**) Bulk assay of lysogenization probability as a function of MOI. Δ: fluorescent gpD-mosaic (λ_{LZ2}); ○: fluorescent gpD-mosaic (λ_{LZ7}). Line: theoretical prediction based on the single-cell lysogenization response combined with a Poisson collision statistics between individual bacteria and phages. The experimental data was shifted to accommodate for the imperfect adsorption and infection efficiencies. The fluorescent gpD-mosaic λ_{LZ7} phage exhibits the same MOI-response as λ_{LZ2}. (**C**), (**D**) and (**E**) Fluorescence and DNA packaging efficiency of the fluorescent gpD-mosaic phage (λ_{LZ2}, λ_{LZ7} and λ_{LZ3}). DAPI (4',6-diamidino-2-phenylindole) was used to label the phage genome. Left two panels: YFP and DAPI signals from the phages under the fluorescence microscope. Individual phages are easily distinguishable. YFP and DAPI signals co-localize very well for λ_{LZ2} (~0.5%, 12 out of 2300 YFP spots lack of DAPI signal, 0%, 0 out of 2300 DAPI signal lack of YFP) (**C**) and λ_{LZ7} (~0.4%, 15 out of 3800 YFP spots lack of DAPI signal, 0%, 0 out of 3800 DAPI signal lack of YFP) (**D**). Many YFP signals lack DAPI signals for λ_{LZ3} (~27%, 567 out of 2103 YFP spots lack of DAPI signal, 0%, 0 out of 2103 DAPI signal lack of YFP) (**E**). Right panel: the intensity histogram of the YFP signals (on average of $2x10^5$, $1.8x10^5$ and $2.5x10^5$ for λ_{LZ2}, λ_{LZ7} and λ_{LZ3} respectively).

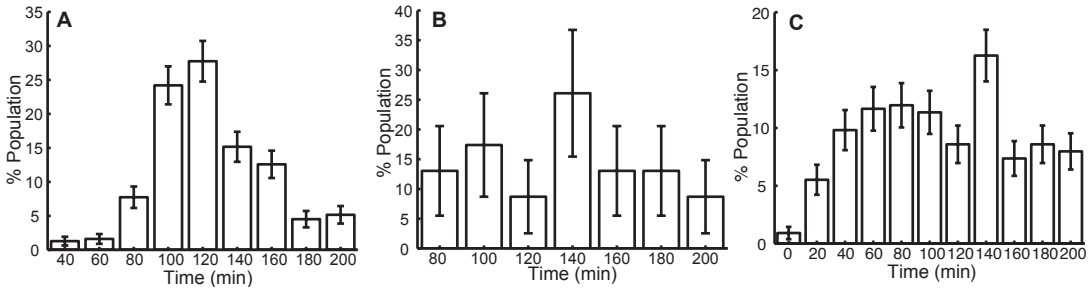

Fig. S3 Cell division time. (A) Histogram of the lysis time of a mean of 125 minutes (N=303 lytic cells). (B) Histogram of the lysogen division time with a mean of 140 minutes (N=35 lysogenic cells). (C) Histogram of the normal (uninfected) cells division time of 110 minutes (N=326 uninfected cells). Error bar is the counting error.

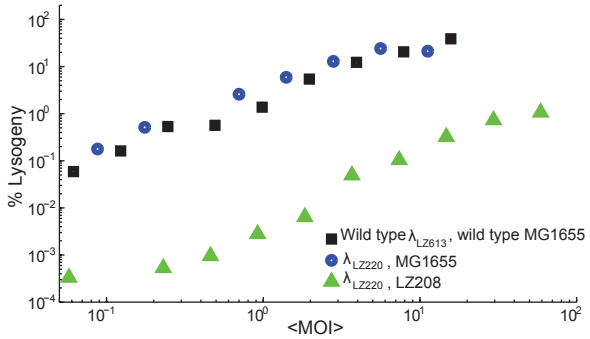

Fig. S4 Lysogenization frequency of fully methylated fluorescent phage λ_{LZ220} in *dam*$^-$ LZ208 (green triangle) is almost 2 orders of magnitude lower than that in the normal *dam*$^+$ strain, MG1655 (blue circle) which is similar to the wild type phage λ_{LZ613} in MG1655 (black square).

Movie S1: A time-lapse movie for a typical lytic cell. At time = 0 min, a cell was infected by a phage (appear as a green dot) at a polar position. At time = 5 min, a SeqA-ECFP focus corresponding to the ejected phage DNA appeared. Later on, this focus converted to two foci corresponding to two hemimethylated phage DNAs. Occasionally the number of foci became one or zero since the fluorescent spots move out of focal plane. Finally the cell lysed.

Movie S2: A time-lapse movie for a typical lysogenic cell. At time = 0 min, a cell was infected by a phage (appear as a green dot) around a quarter position. At time = 5 min, a SeqA-ECFP focus corresponding to the ejected phage DNA appeared. Later on, this focus converted to two foci corresponding to two hemimethylated phage DNAs. Occasionally the number of foci became one or zero since the fluorescent spots move out of focal plane. At a later time, the two foci are divided into two daughter cells.