BaeSR, Involved in Envelope Stress Response, Protects against Lysogenic Conversion by Shiga Toxin 2-Encoding Phages - DTU Orbit (14/12/2018)

BaeSR, Involved in Envelope Stress Response, Protects against Lysogenic Conversion by Shiga Toxin 2-Encoding Phages

Infection and lysogenic conversion with Shiga toxin-encoding bacteriophages (Stx phages) drive the emergence of new Shiga toxin-producing Escherichia coli strains. Phage attachment to the bacterial surface is the first stage of phage infection. Envelope perturbation causes activation of envelope stress responses in bacterial cells. Although many external factors are known to activate envelope stress responses, the role of these responses in the phage-bacterium interaction remains unexplored. Here, we investigate the link between three envelope signaling systems in E. coli (RcsBC, CpxAR, and BaeSR) and Stx2 phage infection by determining the success of bacterial lysogenic conversion. For this purpose, E. coli DH5 wild-type (WT) and mutant strains lacking RcsBC, CpxAR, or BaeSR signaling systems were incubated with a recombinant Stx2 phage (933W). Notably, the number of lysogens obtained with the BaeSR mutant was 5 log10 units higher than with the WT, and the same differences were observed when using 7 different Stx2 phages. To assess whether the membrane receptor used by Stx phages, BamA, was involved in the differences observed, bamA gene expression was monitored by reverse transcription-quantitative PCR (RT-qPCR) in all host strains. A 4-fold-higher bamA expression level was observed in the BaeSR mutant than in the WT strain, suggesting that differential expression of the receptor used by Stx phages accounted for the increase in the number of lysogenization events. Establishing the link between the role of stress responses and phage infection has important implications for understanding the factors affecting lysogenic conversion, which drives the emergence of new pathogenic clones.

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