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Study of DNA uptake locations in single *E. coli* cells C. SHAN XU, L. MEADOW ANDERSON, Department of Chemistry, University of California at Berkeley, HAW YANG, Department of Chemistry, University of California, Physical Biosciences Division, Lawrence Berkeley National Laboratory — Artificial gene transfer of bacteria, such as *E. coli*, has become the main stream technique in genetic engineering and molecular cell biology studies. In spite of the great improvements in transformation efficiency, some fundamental questions remained to be answered. For instance, what are the DNA uptake channels and how do they form and function under external stimuli? Furthermore, where are these channels located on the cell membrane? Here we report a study aimed at DNA uptake locations in the two widely used gene transformation techniques: electroporation and heat shock. A direct visualization of the settling location of single DNA molecules inside individual *E. coli* cells was obtained by fluorescence imaging and spectroscopy. Electroporation and heat shock exhibit two distinct characteristics of DNA uptake locations. A preferential distribution toward cell poles during electroporation is consistent with earlier experiments and previously proposed models. However, the result from heat shock is unanticipated in which the majority of DNA enters the cell near the center. Such observation suggests that uptake channels form preferentially where newly-synthesized membrane is located under cation and low temperature treatment

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