Comparison of four standard bacterial transformation protocols
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Introduction
Bacterial transformation plays an important role in molecular genetics, but tends to be a source of great frustration when carried out by students in a teaching laboratory situation. This study compared four commonly used transformation protocols to assess efficiency/reliability, cost, time and survivability upon storage.

Methods
Escherichia coli JM109 was used as the recipient strain to uptake pACYC184, which contains the chloramphenicol acetyltransferase gene (CmR), in all transformations performed.

The protocols tested were the single step TSS method (Chung et al. 1989), the ethanol-mediated TSS method (Sharma et al. 2007), the manganese chloride method (Lacks et al. 1974), and the electroporation process (Dower et al. 1988). To ensure a direct comparison between transformation efficiencies all transformations were performed in parallel using four replicates.

Half the volume of competent cells prepared by each method was used in transformation reactions immediately following their preparation; the other half was preserved in 10% glycerol, frozen rapidly by submersion in liquid nitrogen, and then stored for 24 h at -70°C prior to using for transformation.

Successful transformants were selected by plating 100 µL of the cell suspension on LB plates containing 35 µg/mL Cm and plates were incubated for 12 hr at 37°C.

Results

- Figure 1: The transformation efficiency using different methods and the effects of competent cell storage
- Figure 2: Comparison of the cost of cell preparation
- Figure 3: Comparison of cell preparation time
- Figure 4: Gel electrophoreses of isolated plasmids from transformants

Conclusion
In the hands of students, the TSS single step method is an appropriate method to induce competency in Escherichia coli as it has the highest transformation rate and is the least time consuming and least expensive. However, its low reproducibility and decreased efficiency upon storage may deter students from using it. The Manganese Chloride method on the other hand provides competent cells practically unaffected by storage and has a relatively low cost but is the most time consuming.

References

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