

An Investigation of Potential Gene Over-Expression and siRNA Methods for Causing Cell Lysis and Stasis

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This research determined methods for both cell lysis and cell stasis based on simple methods in metabolic engineering. These methods could be useful to maximize the amount of product produced by cells and to allow for the extraction of products that cannot exit the cell. One method, using small interfering RNA to bind to targeted mRNA and thus blocking production of targeted proteins, rendered no lysis or stasis with any of combinations of genes related to cell wall production. The other method, over-expressing individual genes using plasmids from the ASKA collection, found multiple successful options. Over-expression of *dacB* was found to cause cell lysis at early and middle stages of *E. coli* growth and showed a similar effect to adding ampicillin. Two similar genes, *dacA* and *dacB*, showed similar results but took longer to take effect. Over-expression of *sulA* was found to cause cell stasis at all stages of growth. In addition, the concentration of IPTG (the inducer) added to the flasks of *E. coli* was optimized. Among other genes tested, *ypjF* and *mrdA* also showed interesting results. Tests measuring the concentration of L-Phenylalanine in the cultures did not show a clear correlation between the time at which *sulA* was over-expressed and the L-Phenylalanine concentration, contrary to what was predicted.