

FAQ: How should I calculate the transformation efficiency (C3019)?

Transformation efficiency is defined as the number of colony forming units (cfu) which would be produced by transforming 1 µg of plasmid into a given volume of competent cells. The term is somewhat misleading in that 1 µg of plasmid is rarely actually transformed. Instead efficiency is routinely calculated by transforming 100 pg-1 ng of highly purified supercoiled plasmid under ideal conditions. If you plan to calculate efficiency to compare cells or ligations, keep in mind the many variables which affect this metric.

Transformation efficiency (TE) equation:

$TE = \text{Colonies}/\mu\text{g}/\text{Dilution}$

Colonies = the number of colonies counted on the plate

µg = the amount of DNA transformed expressed in µg

Dilution = the total dilution of the DNA before plating

TE calculation example:

Transform 2 µl (100 pg) of control pUC19 DNA into 50 µl of cells, outgrow by adding 250 µl of SOC and dilute 10 µl up to 1 ml in SOC before plating 30 µl. If you count 150 colonies on the plate, the TE is:

Colonies = 150

µg DNA = 0.0001

Dilution = $10/300 \times 30/1000 = 0.001$

$TE = 150/0.0001/0.001 = 1.5 \times 10^9 \text{ cfu}/\mu\text{g}$

Links to this resource

Products: [NEB 10-beta Competent *E. coli* \(High Efficiency\)](#)