

# Clp ATPases differentially affect natural competence development in *Streptococcus mutans*

Satya Pandey<sup>1</sup> and Indranil Biswas<sup>1</sup>

<sup>1</sup>University of Kansas Medical Center

April 28, 2022

## Abstract

In naturally competent bacteria, DNA transformation through horizontal gene transfer is an evolutionary mechanism to receive extracellular DNA. Bacteria need to maintain a state of competence to accept foreign DNA and this is an energy-driven phenomenon that is tightly controlled. In *Streptococcus*, competence development is a complex process that is not fully understood. In this study, we used *Streptococcus mutans*, an oral bacterium, to determine how cell density affects competence development. We found that in *S. mutans* the transformation efficiency is maximum when the transforming DNA was added at low cell density and incubated for 2.5 h before selecting for transformants. We also found that *S. mutans* cells remain competent until the mid-logarithmic phase, after which the competence decreases drastically. Surprisingly, we observed that individual components of Clp proteolytic complexes differentially regulate competence. If the transformation is carried out at the early growth phase, both ClpP protease and ClpX ATPase are needed for competence. In contrast, we found that both ClpC and ClpE negatively affect competence. We also found that if the transformation is carried out at the mid-logarithmic growth phase ClpX is still required for competence but ClpP negatively affects competence. While the exact reason for this differential effect of ClpP and ClpX on transformation is currently unknown, we found that both ClpC and ClpE have a negative effect on transformation, which was not reported before.

## Hosted file

MB032021120535.pdf available at <https://authorea.com/users/479164/articles/567072-clp-atpases-differentially-affect-natural-competence-development-in-streptococcus-mutans>