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Title (English)

Mathematical modeling of synchronous initiation of chromosome replication in an *Escherichia coli* cell

Title (Swedish)

Abstract

Initiation of chromosome replication in the bacterium *Escherichia coli* is a highly regulated process. In fast-growing cells, cell cycles overlap and the cells will harbour 2, 4 or 8 origins of replication. These multiple origins in a single wild-type cell are initiated synchronously at a constant cell mass and only once per generation. This tight regulation is owed to the initiator protein DnaA and DnaA titration to the *datA* locus, the methylation status of *oriC* and the SeqA protein, sequestering hemimethylated *oriC*. All these mechanisms are for the first time incorporated into a complete mathematical chromosome model. The model shows the initiation, replication and methylation events of the replication process for cells with both long and short generation times. For fast-growing cells the multiple origins are, as predicted, initiated synchronously and only once per generation.

Keywords: chromosome replication, DnaA, SeqA, synchronous initiation, chromosome model

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