MECHANISMS OF PLASMID STABLE INHERITANCE

Summary

The stable inheritance of bacterial plasmids is achieved by a number of different mechanisms. Among them are: resolution of plasmid multimers into monomers, selective killing of plasmid-free segregants and active plasmid partitioning into dividing cells. The first two mechanisms are discussed in this article. The multimer resolution systems (*mrs*) consist of a site specific recombinase (resolvase) and the defined nucleotide sequence *res* located on the plasmid. By specific recombination between repeated *res* sequences the recombinase resolves plasmid oligomers to monomers. This maximizes the number of plasmid units prior to cell division and considerably contributes to stable maintenance of plasmid in bacterial cells. The post-segregational killing systems involve a stable poison and an unstable antidote. The antidotes nautralize their cognate poisons or prevent their synthesis. The different decay rates of the poisons and the antidotes underlie the molecular mechanisms of poison activation in plasmid-free cells. By killing and eliminating plasmid-free cells from the population of plasmid-bearing ones the poison-antidote couples act therefore as plasmid addiction systems. While the *mrs* maximize the random plasmid distribution into the dividing cells addiction systems assure better-than-random plasmid distribution.