On a model of competition between plasmid-bearing and plasmid-free organisms in a chemostat with distinct removal rates and an external inhibitor

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Abstract

In this talk, a mathematical model of competition between plasmid-bearing and plasmid-free organisms for a single limiting resource in a chemostat with distinct removal rates and in the presence of an external inhibitor is presented and analyzed. This model was previously introduced in the special case where the growth rate functions and the absorption rate of the inhibitor follow the Monod kinetics and the removal rates are the same as the dilution rate. Here, we consider the general case of monotonic growth functions and distinct removal rates. Through the three operating parameters of the model, represented by the dilution rate, the input concentrations of the substrate, and the inhibitor, we give necessary and sufficient conditions for the existence and stability of all equilibria. By means of operating diagrams, we describe the asymptotic behavior of the model with respect to those operating parameters. Numerical simulations are carried out to illustrate the mathematical results.

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