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A model of competition between plasmid-bearing and plasmid-free organism in a chemostat with different removal rates and an external inhibitor

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Abstract

In this work, we consider a model of plasmid-bearing and plasmid-free in a chemostat competing for a single resource in the presence of an external inhibitor and with different removal rates is considered. This model was previously introduced in the case where the growth rate functions and the absorption rate of inhibitor follows the Monod kinetics and removal rates are the same as dilution rate. In this work, we consider the general case of monotonic functions and different removal rates. Through the three operating parameters of the system represented by the dilution rate and 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 behaviour of the model with respect to those operating parameters. Some examples are given to illustrate the mathematical results.

keywords : Chemostat, competition, inhibitor, operating diagram, plasmid.

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