

# Two Species Competition with an Inhibitor Involved

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## Abstract

The dynamics of the solution flow of a two-species Lotka-Volterra competition model with an extra equation for simple inhibitor dynamics is investigated. The model fits into the abstract framework of two-species competition systems (or  $K$ -monotone systems), but the equilibrium representing the extinction of both species is not a repeller. This feature distinguishes our problem from the case of classical two-species competition without inhibitor (classical case for short), where a basic assumption requires that equilibrium to be a repeller. Nevertheless, several results similar to those in the classical case, such as competitive exclusion and the existence of a “thin” separatrix, are obtained, but differently from the classical case, coexistence of the two species or extinction of one of them may depend on the initial conditions. As in almost all two species competition models, the strong monotonicity of the flow (with respect to a certain order on  $\mathbb{R}^3$ ) is a key ingredient for establishing the main results of the paper.

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