Lyu, Wenbin
Asymptotic stabilization for a class of chemotaxis-consumption systems with generalized logistic source. (English) Zbl 07472457

Summary: This paper is concerned with a chemotaxis-consumption system
\[
\begin{align*}
\frac{du}{dt} &= \nabla \cdot (\nabla u - uS(x, u, v) \cdot \nabla v) + \rho u - \mu u^l, \\
\frac{dv}{dt} &= \Delta v - uv,
\end{align*}
\]
under no-flux boundary conditions in a smooth bounded domain \(\Omega \subset \mathbb{R}^n \) \(n \geq 1\), where the chemotactic sensitivity tensor \(S \in C^2(\Omega \times [0, +\infty)^2; \mathbb{R}^{n \times n})\) fulfills that there exists some nondecreasing function \(S_0\) on \([0, +\infty)\) such that
\[|S(x, u, v)| \leq S_0(v)\] for all \((x, u, v) \in \Omega \times [0, +\infty) \times [0, +\infty)\).

We show that for any \(\rho, \mu > 0\) and \(l > 1\), any generalized solution of the above system asymptotically approaches to the nontrivial spatially homogeneous steady state
\[
\left( \left( \frac{\rho}{\mu} \right)^{\frac{1}{l-1}}, 0 \right)
\]
as \(t \to +\infty\).

MSC:
35B40 Asymptotic behavior of solutions to PDEs
35B35 Stability in context of PDEs
35K51 Initial-boundary value problems for second-order parabolic systems
35K59 Quasilinear parabolic equations
92C17 Cell movement (chemotaxis, etc.)

Keywords:
stabilization; chemotaxis-consumption; generalized logistic source; no-flux boundary conditions

Full Text: DOI

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