Analysis of long-term solution of chemotactic model with indirect signal consumption in three-dimensional case

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Abstract

In this paper, we consider the chemotaxis model u_t&=\Delta u-\nabla\cdot(u\nabla v),& \qquad x\in\Omega,\,t>0,v_-t&=\Delta v-vw,& \qquad x\in\Omega,\,t>0,w_t&=-\delta w+u,& \qquad x\in\Omega,\,t>0,under homogeneous Neumann boundary conditions in a bounded and convex domain $\Om\subset \mathbb{R}^3$ with smooth boundary, where $\delta>0$ is a given parameter. It is shown that for arbitrarily large initial data, this problem admits at least one global weak solution for which there exists $T>0$ such that the solution (u,v,w) is bounded and smooth in $\Om\times(T,\infty)$. Furthermore, it is asserted that such solutions approach spatially constant equilibria in the large time limit.

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