

Global and Non-Global Existences and Asymptotical Behavior of Solutions to Othmer-Stevens Model

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Abstract

In this talk, we consider the following Othmer-Stevens model with ratio-dependent logistic reaction term

$$\begin{cases} \frac{\partial u}{\partial t} = D\nabla \cdot (\nabla u - u \frac{\beta}{\alpha + \beta w} \nabla w) + u(a - b \frac{u}{\alpha + \beta w}) & x \in \Omega, t > 0 \\ \frac{\partial w}{\partial t} = \mu u - \delta w & x \in \Omega, t > 0 \\ u \frac{\partial}{\partial n} \ln(\frac{u}{\alpha + \beta w}) = 0 & x \in \partial\Omega \\ u(x, 0) = u_0(x) > 0 & x \in \Omega \\ w(x, 0) = w_0(x) > 0 & x \in \Omega \end{cases} \quad (1)$$

where $\alpha > 0, \beta > 0$.

It is shown that the solution to the problem exists globally if $b + \beta\mu \geq 0$ and will blow-up or quench if $b + \beta\mu < 0$ by function transformation and comparative method. Various asymptotical behavior related different coefficients is discussed also.

Key Words chemotaxis ratio-dependence reproduction term blow up quench sup-solution sub-solution

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