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Global solvability to a coupled chemotaxis-fluid model with mixed boundary conditions.

(Chinese. English summary) [Zbl 07494985]


Summary: This paper is concerned with the following chemotaxis-fluid model

\[
\begin{aligned}
    n_t + u \cdot \nabla n &= \Delta n^m - \chi \nabla \cdot (n \nabla c), \\
    c_t + u \cdot \nabla c &= \Delta c - cn, \\
    u_t + u \cdot \nabla u &= \Delta u - \nabla \pi + n \nabla \varphi, \\
    \nabla \cdot u &= 0
\end{aligned}
\]

with mixed boundary value conditions. We mainly study the global existence and uniform boundedness of weak solutions in a bounded domain of \(\mathbb{R}^2\). Firstly, we prove the global existence of uniformly bounded weak solutions for the porous medium slow diffusion model \((m > 1)\) with non-homogeneous boundary conditions. Then we also consider the linear diffusion case \((m = 1)\) with homogeneous boundary conditions, and prove the existence of global bounded classical solutions.

MSC:

35M12 Boundary value problems for PDEs of mixed type
35B30 Weak solutions to PDEs
92C17 Cell movement (chemotaxis, etc.)

Keywords:
chemotaxis-fluid model; mixed boundary; weak solution; classical solution; uniform boundedness

Full Text: DOI