Existence of weak solutions to a parabolic-elliptic Keller-Segel system with nonlinear degenerate diffusion

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Abstract

We consider the parabolic-elliptic chemotaxis system

$$\begin{cases} \dfrac{\partial b}{\partial t} - \Delta D(b) + \nabla \cdot (K(b,c) b \nabla c) = 0 \quad \text{in } (0,\infty) \times \Omega, \\ -\Delta c + c = b \quad \text{in } (0,\infty) \times \Omega. \end{cases}$$

Marinoschi [1] established an abstract approach to give existence of local solutions to this system with sufficiently small initial data in the case $0 < D_0 \le D'(r) \le D_\infty < \infty$ and $(r_1, r_2) \mapsto K(r_1, r_2) r_1$ is Lipschitz continuous on $\mathbb{R}^2$. The smallness assumption on the initial date was recently removed by the authors [2]. However the case of non-Lipschitz and degenerate diffusion, such as $D(r) = r^m$, is left incomplete. This talk presents the local solvability with non-Lipschitz and degenerate diffusion by applying the previous work [2] to an approximate system.

References

[1] G. Marinoschi, *Well-posedness for chemotaxis dynamics with nonlinear cell diffusion*, J. Math. Anal. Appl. **402** (2013), 415–439.

[2] T. Yokota, N. Yoshino, *Existence of solutions to chemotaxis dynamics with Lipschitz diffusion and superlinear growth*, J. Math. Anal. Appl. **419** (2014), 756–774.

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