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STABILIZATION FOR SMALL MASS IN A QUASILINEAR PARABOLIC–ELLIPTIC–ELLIPTIC ATTRACTION-REPULSION CHEMOTAXIS SYSTEM WITH DENSITY-DEPENDENT SENSITIVITY: REPULSION-DOMINANT CASE

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Abstract. The quasilinear attraction-repulsion chemotaxis system

$$\begin{cases} u_t = \nabla \cdot \big((u+1)^{m-1}\nabla u - \chi u(u+1)^{p-2}\nabla v + \xi u(u+1)^{q-2}\nabla w\big), \\ 0 = \Delta v + \alpha u - \beta v, \\ 0 = \Delta w + \gamma u - \delta w \end{cases}$$

is considered in a bounded domain $\Omega \subset \mathbb{R}^n$ ($n \in \mathbb{N}$) with smooth boundary $\partial\Omega$, where $m, p, q \in \mathbb{R}$, $\chi, \xi, \alpha, \beta, \gamma, \delta > 0$. In the case that $m = 1$ and $p = q = 2$, when $\chi\alpha - \xi\gamma < 0$ and $\beta = \delta$, Tao–Wang (Math. Models Methods Appl. Sci.; 2013; 23; 1–36) proved that global bounded classical solutions toward $(\overline{u_0}, \frac{\alpha}{\beta}\overline{u_0}, \frac{\gamma}{\delta}\overline{u_0})$ via the reduction to the Keller–Segel system by the transformation $z := \chi v - \xi w$, where $\overline{u_0} := \frac{1}{|\Omega|}\int_\Omega u_0$. However, since the above system involves nonlinearities, the method is no longer valid. The purpose of this paper is to establish that global bounded classical solutions converge to $(\overline{u_0}, \frac{\alpha}{\beta}\overline{u_0}, \frac{\gamma}{\delta}\overline{u_0})$.

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