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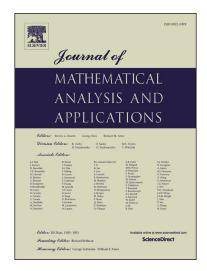
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Repulsion effects on boundedness in the higher dimensional fully parabolic attraction—repulsion chemotaxis system

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Abstract

This paper deals with an attraction–repulsion chemotaxis system

$$\begin{cases} u_t = \nabla \cdot (D(u)\nabla u) - \chi \nabla \cdot (u\nabla v) + \xi \nabla \cdot (u\nabla w), & x \in \Omega, \ t > 0, \\ \tau_1 v_t = \Delta v + \alpha u - \beta v, & x \in \Omega, \ t > 0, \\ \tau_2 w_t = \Delta w + \gamma u - \delta w, & x \in \Omega, \ t > 0 \end{cases}$$

under homogeneous Neumann boundary conditions in a smooth bounded domain $\Omega \subset \mathbb{R}^N$ $(N \geq 2)$, where parameters $\tau_i(i=1,2)$, χ , ξ , α , β , γ and δ are positive, and diffusion coefficient $D(u) \in C^2(0,+\infty)$ satisfies D(u) > 0 for $u \geq 0$, $D(u) \geq du^{m-1}$ with d>0 and $m\geq 1$ for all u>0. It is proved that the corresponding initial-boundary value problem possesses a unique global bounded classical solution for $m>2-\frac{2}{N}$. In particular in the case $\tau_1=\tau_2$ and $\chi\alpha=\xi\gamma$, the solution is globally bounded if $m>2-\frac{2}{N}-\frac{N+2}{N^2-N+2}$. Therefore, due to the inhibition of repulsion to the attraction, the range of $m>2-\frac{2}{N}$ of boundedness is enlarged and the results of [21] is thus extended to the higher dimensional attraction–repulsion chemotaxis system with nonlinear diffusion.

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