Wang, Rongxiang; Yan, Lijun
Global boundedness in an nonlinear attraction-repulsion chemotaxis system with nonlinear productions. (Chinese. English summary) [Zbl 07448785]

Summary: In this paper, we study the attraction-repulsion chemotaxis system with nonlinear productions and logistic source,
\[ u_t = \nabla \cdot (D(u) \nabla u) - \nabla \cdot (\Phi(u) \nabla v) + \nabla \cdot (\Psi(u) \nabla w) + f(u), \]
\[ 0 = \Delta v + \alpha u^k - \beta v, \]
\[ 0 = \Delta w + \gamma u^l - \delta w, \]
in bounded domain \( \Omega \subset \mathbb{R}^n (n \geq 1) \), subject to the homogeneous Neumann boundary conditions, \( D, \Phi, \Psi \in C^2[0, +\infty) \) nonnegative, with \( D(s) \geq (S + 1)^p \) for \( s \geq 0, \Phi(s) \leq \chi s^q, \Psi(s) \geq \xi s^g \) for \( s > 1 \), and \( f \) satisfying \( f(s) \leq s(a - bs^d) \) for \( s > 0, f(0) \geq 0 \). It is proved that if the attraction is dominated by one of the repulsion, logistic source and the nonlinear diffusion mechanisms with \( q + k < \max\{g + l, d + 1, \frac{2}{n} + p + 1\} \), then the solutions would be globally bounded. Moreover, under the three balance situations with \( q + k = g + l = d + 1, q + k = g + l > d + 1 \) or \( q + k = d + 1 > g + l \), the boundedness of solutions would be determined by the sizes of the coefficients involved.

MSC:
35Q92 PDEs in connection with biology, chemistry and other natural sciences
35M30 Mixed-type systems of PDEs

Keywords:
nonlinearity; chemotaxis; logistic source; attraction-repulsion; global boundedness