Concentration phenomena in some chemotaxis system with local sensing

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In this talk, we consider the following chemotaxis system with local sensing:

$$\begin{cases} u_t = \Delta(e^{-v}u), \\ \tau v_t = \Delta v - v + u, \end{cases}$$

in the two-dimensional setting, where $\tau \in \{0, 1\}$. This system was introduced to describe a chemotaxis movement taking account of the local sensing effect ([3]). This system is also a simplified one introduced in [4].

This system resembles the well-known Keller–Segel system. Under suitable setting, they share the same set of equilibria and have the same Lyapunov functional. However, while finite-time blowup solutions can be constructed for the Keller–Segel system, in our system solutions exist globally in time independently of the magnitude of mass and we observe "delayed blowup": infinite-time blowup solutions. More precisely, a critical-mass phenomenon was observed that with any sub-critical mass, the global solution is uniformly-in-time bounded while with certain super-critical mass, the global solution will blow up at time infinity ([1, 2]). In this talk, we will construct the infinite-time blowup solutions and discuss their behaviour. This talk is based on a joint work with Takasi Senba (Fukuoka University).

References

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