Blow-up, Quench, Aggregation and Collapse in a Chemotaxis Model

Liu Wei-An*
School of Mathematics and Statistics, Wuhan University
Wuhan 430072, P.R.China

Abstract In this talk, we are concerned with the following chemotaxis equation with a ratio-dependent logistic reaction term

$$\begin{cases} \dfrac{\partial u}{\partial t} = D\nabla(u\nabla \ln \dfrac{u}{w}) + u(a - b\dfrac{u}{w}) & (x,t) \in Q_T \\ \dfrac{\partial w}{\partial t} = \beta u - \delta w & (x,t) \in Q_T \\ u\nabla \ln(\dfrac{u}{w}) \cdot \vec{n} = 0 & (x,t) \in \Gamma_T \\ u(x,0) = u_0(x) > 0 & x \in \bar{\Omega} \\ w(x,0) = w_0(x) > 0 & x \in \bar{\Omega} \end{cases} \tag{1}$$

We show that the solution will exist globally if $b + \beta \geq 0$ and will blow up or quench in finite time if $b + \beta < 0$. And we show that blow-up, quenching, aggregation and collapse will occur in various relations of coefficients.

*Email: liuweian@public.wh.hb.cn