

# Collapse-preventing mechanisms in chemotaxis models

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In understanding and describing the biological phenomenon of chemotactic cell movement, the *Keller-Segel model*

$$\begin{cases} u_t = \nabla \cdot (\phi(u)\nabla u) - \nabla \cdot (\chi(u, v)\nabla v) + g(u, v), \\ \epsilon v_t = D_v \Delta v + h(u, v), \end{cases}$$

( $u$ : density of cells;  $v$ : concentration of signal substance)

either in this, or simplified, or closely related forms has attracted considerable interest in the past decades. However, apparently no consensus has been found yet whether the effect of spatial cell aggregation must be reflected by blow-up in the mathematical model, or should rather be described by global solutions which, for instance, stabilize towards a correspondingly structured spatial profile. The talk focuses on some mechanisms that are thought to prevent, or at least inhibit, the tendency to blow-up in the Keller-Segel model. In particular, we separately consider some specialized versions incorporating the effects of

- a logistic-type growth dampening by choosing  $g(u, v)$  appropriately;
- the so-called *volume-filling* phenomenon which can be modeled by certain decay assumptions on  $\phi(u)$  and  $\chi(u, v)$  for large values of  $u$ ;
- density-dependent sensitivity functions of the classical form  $\chi(u, v) = u\chi(v)$  that are suitably small at large values of the chemoattractant concentration  $v$ .