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Numerical analysis of the pattern formation of chemotactic bacteria based on a kinetic transport model[1] SHUGO YASUDA, University of Hyogo — Pattern formation of chemotactic bacteria is investigated numerically and theoretically based on a Boltzmann-like kinetic transport equation for chemotactic bacteria, say a kinetic chemotaxis model. In the theoretical part, we discover a novel instability mechanism, i.e., stiff-response-induced instability [B. Perthame&S. Yasuda, Nonlinearity **31** (2018) 4065], where the uniform state of the bacterial population becomes unstable when the stiffness of the chemotactic response of bacteria is sufficiently large. Furthermore, the unstable modes are always bounded as is observed in Turing instability, so that the pattern formation occurs. A Monte Carlo method is also developed based on the kinetic chemotaxis model [S. Yasuda, J. Comput. Phys. **330** (2017) 1022] and the MC method is applied to the pattern formation problems of chemotactic bacteria in one- and two-dimensional spaces. The MC results illustrate the pattern formation mechanism of chemotactic bacteria induced by the stiff chemotactic response.

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