A Monte Carlo simulation on the basis of the kinetic theory for chemo-tactic bacteria

Shugo YASUDA
University of Hyogo, Japan
yasuda@sim.u-hyogo.ac.jp

A Monte Carlo simulation for chemo-tactic bacterial suspensions is developed on the basis of a kinetic model proposed by J. Saragosti, et.al., PNAS **108**, 16235 (2011). In this simulation method, the spatial domain is divided into a lattice mesh system and macroscopic transports of chemical entities are calculated on the lattice mesh system. The population density and collective migration velocity of bacteria are calculated from the distribution of simulation particles which create run-and-tumble motions described by the transition kernel of the kinetic equation depending on the local gradients of chemical cues in each lattice site. The present method can successfully reproduce a traveling concentration wave of chemo-tactic bacteria, which is reported previously in the reference. The purpose of this study is to develop a new simulation method on the basis of the kinetic theory for chemo-tactic bacteria and validate the method by comparing the results obtained by the present method with those obtained in the previous studies.