A simulation of the life-cycle of myxobacteria

Bjorn Birnir¹

¹Center for Complex and Nonlinear Science Department of Mathematics, University of California, Santa Barbara CA 93106 USA

Myxobacteria swarm forms aggregates that develop into fruiting bodies in response to starvation. We develop an off-lattice model to simulate myxobacteria life cycle, which includes the swarming, the fruiting body and the sporulation stages, based on non-chemotactic cell-cell interactions. We in-corporate the Dynamic Energy Budget (DEB) into our model, which successfully links the dynamics of individual cell with the dynamics of the population. In addition, we utilize a logistic equation to model the level of C-signal molecules on each cell surface. Our simulation shows that the coupling of the DEB and the logistic equation can automate the transition from the swarming to the fruiting body stages and also the transitions between the stages of the fruiting body formation, starting from the initial aggregation up to and including the sporulation. Only one parameter, namely the food density, controls the entire life cycle.