

A discrete model for computer simulations of the clustering dynamics of social amoebae is presented. This model incorporates the wavelike propagation of extracellular signaling of 3'–5'-cyclic adenosine monophosphate (cAMP), the sporadic firing of cells at early stage of aggregation, the signal relaying as a response to stimulus, and the inertia and purposeful random walk of the cell movement. It is found that the sporadic firing below the threshold of cAMP concentration plays an important role because it allows time for the cells to form synchronous firing right before the stage of aggregation, and the synchronous firing is critical for the onset of clustering behavior of social amoebae. A Monte-Carlo simulation was also run which showed the existence of potential equilibriums of mean and variance of aggregation time. The simulation result of this model could well reproduce many phenomena observed by actual experiments.