

学 位 論 文 要 旨				
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論 文 題 目	A Computational Model of Cell Migration of Fish Keratocytes			
<p>Fish keratocytes usually show a circular shape; however, they change their shape to a half-moon shape when they begin migration. In order to understand the cell migration mechanism of keratocytes, it is important to clarify why the half moon shape is formed. The purpose of this research is to clarify the role of the half-moon shape on motor function of keratocytes by physical simulation experiments considering intracellular mechanism.</p> <p>Previous studies have reported that during cell migration actin molecules extend their head toward the cell membrane by actin polymerization (AP), which has been suggested as a source of the deformation of the cell membrane and propulsive force of the cell. Actin retrograde flow (ARF) that pulls the actin molecules back toward the stress fiber (SF), a bundle of actin fibers spreading from side to side of the rear part of the cell, has also been reported.</p> <p>In the computer simulation of this study, the cell membrane was modeled by a network of simple particles interacting with each other and placed on a cylindrical surface as an initial condition. Each particle of the membrane was assumed to receive elastic force from neighboring particles and receive repulsive force from actin molecules. Assuming that the polymerized actin molecule was initially a zero-length rod, AP and depolymerization were respectively expressed by one-end stochastic extension and contraction. The polymerization direction of the actin molecule was randomly determined, and the actin molecule in the initial state was arranged to be half donut shape. ARF was expressed by moving actin molecules towards SF stochastically. The position of the actin molecule was restricted so as to be corrected to the vicinity of the cell membrane when going outside the cell membrane.</p> <p>As a result, the actin molecule aggregated in a half-shape under the condition that the movement of actin molecule is controlled by ARF and it is difficult for divergence. Actin molecules could not aggregate a half-moon shape when conditions were changed, such as eliminating ARF and changing the ARF reference point to a point other than SF.</p>				