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論 文 題 目	A Computational Model of Cell Migration of Fish Keratocytes			

Fish keratocytes usually show a circular shape; however, they change their shape to a half-moon shape when they begin migration. This phenomenon suggests that the deformation of the cell shape is a key feature to realize cell migration of keratocytes. The purpose of this research is to clarify the intracellular mechanism that forms a half-moon shape by physical simulation experiments considering intracellular mechanism.

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 the propulsive force of the cell. The 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.

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 repulsive force from actin molecules. Actin molecules were modelled by a simple rod, and AP and depolymerization were expressed by stochastic elongation of one end of the rod and contraction of the other end, respectively. As an initial condition, actin molecules have no length and were randomly distributed in a U-shaped region.and the direction of the AP of each molecule was randomly determined. As the effect of ARF, actin molecules were assumed to move toward the SF stochastically.

As a result, the actin molecule aggregated into a half-moon shape under the above conditions. The direction the ARF pulls the AP affects the form. The direction in which ARF pulls AP is an element that affects the shape of the cell membrane and the strength of ARF is a factor that has a role of preventing excessive expansion of cell membranes.