【理学系様式３】

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論文題目	A Computational Model of Cell Migration of Fish Keratocytes			

Fish keratocyte changes the circle shape to the half-moon shape and migrates with keeping its shape. It is not clear that how half-moon shape contributes to cell migration of keratocytes. The purpose of this research is to clarify how keratocyte forms a half-moon shape by physical simulation experiment considering Intracellular mechanism.

Cell migration is done by actin molecule polymerizing (AP) and pushing the cell membrane from inside. At the same time that AP is carried out, a force pulled from backward the cell membrane acts on the actin molecule. This is an intracellular mechanism called actin retrograde flow (ARF), but the details on ARF are not clear.

The actin molecule was assumed to be an object like a rod and modeled so that it polymerizes only at one end based on physiological findings. The initially determined polymerization direction is random. The extracellularly extended actin molecule is repositioned inside the cell membrane. ARF was modeled to pull while correcting the polymerization direction of actin molecule, assuming that force is generated from a certain reference point in the rear part of the cell. We observed how the actin molecules combining AP and ARF affect the shape of the cell membrane.

As a result of the simulation, the agglutination of actin molecules was formed in a shape close to a half moon shape under the condition that the reference point of ARF is 2 points and the polymerization frequency is high in places where the actin molecule density is high. Furthermore, it was found that ARF also contributes to maintaining the shape of the cells. However, if actin molecule is pulled continuously, actin molecule stagnates on the spot, so if there is no other intracellular mechanism besides AP and ARF, a half moon shape will not be formed.