【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 while maintaining its shape. How half-moon shape contributes to cell migration of keratocytes is not clear. 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 purpose of this research is to clarify how keratocyte forms a half-moon shape by physical simulation experiment considering AP and ARF.

Actin molecules acting on AP and ARF and cell membrane molecules receiving repulsive force from the actin molecule were placed in the simulation space. The AP in the simulation was set to extend in a random direction and to extend better in the area with more actin molecules. The ARF investigated cases where there is one and two reference points where the force pulling the actin molecule occurs. When the actin molecule is pulled by ARF, the direction of polymerization of actin molecule is changed.

As a result of the simulation, the cell membrane of this model could not form a half moon shape. However, the aggregation of actin molecules was formed into a shape close to a half moon shape because the polymerization direction was adjusted by ARF. 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.