

Mathematical analysis of 1D tissue interaction model system for biological pattern formation

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Abstract

Experimental evidence indicates that tissue interaction plays an essential role during skin pattern formation. Here we focus on the mathematical aspects of specific tissue interaction models, *i.e.*, mechanochemical models. Mechanochemical models for biological pattern formation have been applied to the development of a variety of patterning problems, such as feather germ primordia and cartilage formation in the vertebrate limb. They consist of a reaction-diffusion model for the epiderms and a mechanochemical model for dermmis via certain interaction terms. We have a few results on them through linear analysis and numerical simulations, but no result from the exact mathematical analysis.

In this communication, we introduce typical models for them, and discuss the unique solvability of a generic model system proposed by Shaw and Murray (1990) in Sobolev–Slobodetskiĭ spaces in one spatial dimension, for simplicity.