

Modeling pattern formation of skull suture interdigitation

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Our skull consists of several bones, and the thin connective tissue sandwiched by the bones are called suture. The suture is wide and straight at birth, and later undergoes interdigitation, resulting in fractal-like complex structure. Various molecules are known to influence the pattern formation process, but how the interaction of these molecules result in interdigitation remain to be elucidated.

At first we simplify the known molecular circuit and formulated a two species reaction-diffusion model. The resulting model is equivalent to that studied by Ohta et al (1989). The model reproduced various experimentally observed patterns, and provided experimentally testable hypotheses. Next, we further extract the essence of the interaction and formulate a model which consist of interface equation and convolution kernel. The model can reproduce all the pattern formation features observed in vivo, and the mathematical analysis is much easier compared to previous reaction-diffusion based model. We also utilized this model for another experimental system, plant epidermal cell wall.