Localized Ectopic Expression of Dpp Receptors in a Drosophila Embryo

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Abstract:
Receptor-mediated bone morphogenic protein (BMP) degradation has been seen to play an important role in allowing for the formation of relatively stable (PMad) patterns of biological tissues. To the extent that receptors act as a "sink" for BMPs, one would predict that the localized over-expression of signaling receptors would cause a net flux of freely diffused BMPs toward the ectopic, i.e., abnormally high concentration, receptor site. One possible consequence would be a depression of BMP signaling in adjacent areas since less BMPs are now available for binding with the same normal concentration of receptors at the adjacent areas. However, recent experiments designed to examine this possible effect were inconclusive. In this talk, we investigate the possibility of depression of Dpp signaling outside the area of elevated tkv receptor concentration in a Drosophila embryo by modeling mathematically the basic biological processes at work in terms of a system of nonlinear reaction diffusion equations with spatially varying (and possibly discontinuous) system properties. The steady state signaling morphogen gradient is investigated by the method of matched asymptotic expansions and by numerical simulations.

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