Integration of Maternal Signals via Substrate Competition in Early Patterning of *Drosophila* Embryo

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Development of an organism relies on the complex patterning of a naïve collection of cells. A given patterning event requires a non-uniform distribution of a cellular determinant. A morphogen is such a determinant which generates positional information through its long ranged distribution. While morphogen gradients are always one-dimensional systems, the developing tissue need to be patterned in a multi-dimensional fashion which is done through the integration of several morphogen systems. Traditionally this process was shown to be guided by two subsequent events: first the establishment of independent and orthogonal morphogen gradients and second their integration through a solid device such as target genes which ensures a dose dependent combinatorial interpretation of the inputs [1].

In the present work, we use the maternal patterning of the *Drosophila* embryo as a model system to show that signal integration during the development is already present at the level of morphogen establishment. Previously considered as independent patterning systems, the anterior and terminal morphogens are intertwined through a bidirectional biochemical network. This mechanism is based on quantitative imaging of the terminal signaling in the wild-type embryo, a simple mathematical model, and experimental tests of this model in mutant genetic backgrounds. Our results suggest that the complex patterning of a developing tissue has to be considered more in terms of a system level crosstalk than a linear solid integration.

[1] G. Liaw and J. Lengyel. *Mech. Dev.* 40, 47 (1992).