

Engineering synthetic morphogen systems that can program multicellular patterning

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Engineering synthetic morphogens

Morphogens provide positional information during tissue development. For this behavior to occur, morphogens must spread out and form a concentration gradient; however, their mechanism of transport remains a matter of debate. Stapornwongkul *et al.* now show that in the presence of extracellular binding elements (binders), the inert green fluorescent protein (GFP) can form a detectable concentration gradient by diffusion in the developing fly wing (see the Perspective by Barkai and Shilo). When combining the expression of nonsignaling binders and receptors engineered to respond to GFP, a synthetic GFP gradient can substitute for a natural morphogen to organize growth and patterning. In related work, Toda *et al.* also show that GFP can be converted into a morphogen by providing anchoring interactions that tether the molecule, forming a gradient that can be recognized by synthetic receptors that activate gene expression. These synthetic morphogens can be used to program de novo multidomain tissue patterns. These results highlight core mechanisms of morphogen signaling and patterning and provide ways to program spatial tissue organization independently from endogenous morphogen pathways.

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