[Dev Biol.](http://www.ncbi.nlm.nih.gov/pubmed/26054700" \o "Developmental biology.) 2015 Sep 1;405(1):137-48. doi: 10.1016/j.ydbio.2015.05.025. Epub 2015 Jun 6.

**Dorsoventral patterning by the Chordin-BMP pathway: a unified model from a pattern-formation perspective for Drosophila, vertebrates, sea urchins and Nematostella.**

[Meinhardt H](http://www.ncbi.nlm.nih.gov/pubmed/?term=Meinhardt%20H%5BAuthor%5D&cauthor=true&cauthor_uid=26054700)1.

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**Abstract**

Conserved from Cnidarians to vertebrates, the dorsoventral (DV) axis is patterned by the Chordin-BMP pathway. However, the functions of the pathway's components are very different in different phyla. By modeling it is shown that many observations can be integrated by the assumption that BMP, acting as an inhibitory component in more ancestral systems, became a necessary and activating component for the generation of a secondary and antipodal-located signaling center. The different realizations seen in vertebrates, Drosophila, sea urchins and Nematostella allow reconstruction of a chain of modifications during evolution. BMP-signaling is proposed to be based on a pattern-forming reaction of the activator-depleted substrate type in which BMP-signaling acts via pSmad as the local self-enhancing component and the depletion of the highly mobile BMP-Chordin complex as the long-ranging antagonistic component. Due to the rapid removal of the BMP/Chordin complex during BMP-signaling, an oriented transport and "shuttling" results, although only ordinary diffusion is involved. The system can be self-organizing, allowing organizer formation even from near homogeneous initial situations. Organizers may regenerate after removal. Although connected with some losses of self-regulation, for large embryos as in amphibians, the employment of maternal determinants is an efficient strategy to make sure that only a single organizer of each type is generated. The generation of dorsoventral positional information along a long-extended anteroposterior (AP) axis cannot be achieved directly by a single patch-like organizer. Nature found different solutions for this task. Corresponding models provide a rationale for the well-known reversal in the dorsoventral patterning between vertebrates and insects.

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**KEYWORDS:**

BMP; Chordin; Dorsoventral axis; Nematostella; Organizer formation; Pattern formation; Sea urchin; Smad

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[Nat Commun.](http://www.ncbi.nlm.nih.gov/pubmed/26423516) 2015 Oct 1;6:8434. doi: 10.1038/ncomms9434.

**A deuterostome origin of the Spemann organiser suggested by Nodal and ADMPs functions in Echinoderms.**

[Lapraz F](http://www.ncbi.nlm.nih.gov/pubmed/?term=Lapraz%20F%5BAuthor%5D&cauthor=true&cauthor_uid=26423516)1, [Haillot E](http://www.ncbi.nlm.nih.gov/pubmed/?term=Haillot%20E%5BAuthor%5D&cauthor=true&cauthor_uid=26423516)1, [Lepage T](http://www.ncbi.nlm.nih.gov/pubmed/?term=Lepage%20T%5BAuthor%5D&cauthor=true&cauthor_uid=26423516)1.

[**Author information**](http://www.ncbi.nlm.nih.gov/pubmed/26423516)

**Abstract**

During development of chordates, establishment of the body plan relies on the activity of an organizing centre located on the dorsal side of the embryo that patterns the embryo and induces neural tissue. Intriguingly, the evolutionary origin of this crucial signalling centre remains unclear and whether analogous organizers regulate D/V patterning in other deuterostome or protostome phyla is not known. Here we provide evidence that the ventral ectoderm of the sea urchin embryo is a long-range organizing centre that shares several fundamental properties with the Spemann organizer: the ability to induce duplicated embryonic axes when ectopically induced, the ability to induce neural fate in neighbouring tissues and the ability to finely regulate the level of BMP signalling by using an autoregulatory expansion-repression mechanism. These findings suggest that the evolutionary origin of the Spemann organizer is more ancient than previously thought and that it may possibly be traced back to the common ancestor of deuterostomes.

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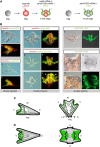
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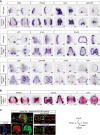
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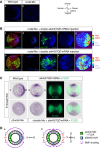
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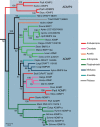
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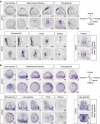
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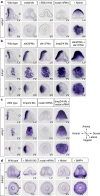
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