DEVELOPMENT

Back talk

Specification of the dorso–ventral axis in many vertebrates requires signalling through the transforming growth factor-β (TGF-β) and Wnt pathways. In zebrafish, the programme for dorsal specification begins soon after fertilization, but the nature of the determinants that establish the dorsal axis has remained unresolved. Signalling by Nodal, a member of a subclass of the TGF-β superfamily, is known to induce the formation of the mesoderm and the endoderm in vertebrate embryos. Now, the Nodal-related morphogen Squint (Sqt) has been identified by Gore *et al.* in *Nature* as a possible dorsal determinant.

After their initial demonstration that maternal *sqt* transcripts were localized asymmetrically in four- and eight-cell embryos, the authors injected fluorescent *sqt* RNA into live one-cell embryos to study the dynamics of its localization *in vivo*. Localization occurred at the four-cell stage, similar to endogenous *sqt* RNA, and its movement required cytoskeletal microtubules.

Based on the knowledge that elements in the non-coding 5′ and 3′ untranslated regions (UTRs) mediate the localization of several transcripts in the embryos of other species, Gore *et al.* generated deletions in the UTRs of *sqt* RNA. They found that the dorsal localization of *sqt* RNA required the 3′ UTR, and that *sqt* RNA could be directed dorsally in zebrafish embryos, by zebrafish as well as human 3′ UTR elements.

The authors next asked if the dorsal axis could be specified by the four-cell to eight-cell stages, since *sqt* RNA localized asymmetrically to the dorsal cells by these stages. Their results show that removal of sqt-containing cells can lead to the loss of dorsal sturctures, which indicates that dorsal specification is initiated by cleavage stages. To confirm that maternal *sqt* does indeed have a role in dorsal specification, the authors injected embyros with *sqt* morpholinos to interfere with gene function, and showed that this was probably the case. Furthermore, they found that maternal *sqt* RNA localization was independent of β-catenin, a component of the Wnt signalling pathway that is well known for its involvement in dorsal specification.

Gore *et al.* have shown that Sqt, the maternally encoded morphogen, is a probable requirement for dorso–ventral axis specification in zebrafish. But could axis-specification pathways be conserved in vertebrates? The fact that dorsal specification occurs in the presence of sequence elements of either zebrafish or humans would seem to suggest so, but the authors acknowledge that further study is required.

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Link

Squint: http://us.expasy.org/uniprot/O13144

ORIGINAL RESEARCH PAPER Gore, A. V. *et al.* The zebrafish dorsal axis is apparent at the four-cell stage. *Nature* 15 Dec 2005 (doi:10.1038/nature04184)