GENOME EVOLUTION

# How old are Hox genes?

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Hox genes and their relatives are involved in several developmental processes in diverse animals, but when did they first arise? The genome sequence of the sponge *Amphimedon queenslandica* shows that early metazoans possessed several Hox-like genes of the NK family, but Hox genes themselves arose and expanded only after sponges split from other metazoans. This expansion might have contributed to the subsequent diversification of body plans in the Cambrian explosion.

In the evolution of metazoans, sponges diverged first, followed by cnidarians (jellyfish and corals). Nearly all other metazoans are bilaterians — so named because they have bilateral symmetry. Previous studies have shown that the last common ancestor of cnidarians and bilaterians had about 26 Hox-like (ANTP) genes. Larroux and colleagues used the recently available *A. queenslandica* genome to estimate how many such genes were present in the genome of the last common ancestor of sponges and other metazoans. Their conclusion of six or seven ANTP genes suggests that there was a substantial expansion after the divergence of sponges.

All the *A. queenslandica* ANTP genes are members of the NK family, and there are no true members of the Hox family itself. This is in contrast to cnidarians, which have homologues of bilaterian Hox genes. However, the sponge NK genes do form a cluster, in a similar manner to Hox genes in bilaterians. The authors suggest that Hox genes in bilaterians and cnidarians arose from an expansion of the NK cluster in the common ancestor they share with sponges.

All metazoans need to pattern cells along a body axis, so this function might be fulfilled by the ancestral NK cluster or other homeobox genes. The authors suggest that the expansion of this cluster and the origin of Hox genes in cnidarians and bilaterians allowed refinement of these patterning mechanisms and possibly also the diversification of bilaterian body plans in the Cambrian explosion.

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**ORIGINAL RESEARCH PAPER** Larroux, C. *et al.* The NK homeobox gene cluster predates the origin of Hox genes. *Curr. Biol.* **17**, 1–5 (2007)
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