CDB SEMINAR

Hiroshi Watanabe

Centre for Organismal Studies (COS), University of Heidelberg

Monday, December 2, 2013

14:00~15:00 C1F CDB Auditorium

Deciphering basic signaling architectures patterning animal body axes

Summary

Understanding the origin of complex morphological traits in multicellular organisms is a major challenge in evolutionary biology. Bilaterian animals show asymmetric patterns along their anterior-posterior, dorsal-ventral (DV) and left-right (LR) body axes. In contrast, basal animals such as cnidarians (hydras, corals, sea anemones) exhibit a radial symmetry with a major oral-aboral axis. In most cnidarians, this radial symmetry exhibits features in their colonial branching patterns that are known as biradiality. Since Cnidaria is a sister group to all bilaterians, the genetic basis of this biradial morphogenesis is thus of interest for understanding the evolution of animal body axes, and yet is largely unexplored.

To understand how cnidarian biradial axis is induced, we employed the simplest cnidarian model Hydra that forms lateral branches in an asymmetric manner from the body column. We found in Hydra that a Nodal-related gene (HmNdr) is essential for setting up an axial asymmetry for giving rise to the lateral buds. Expression of HmNdr is upregulated by beta-catenin signalling in the lateral bud anlage, and induces the asymmetric expression of a downstream target HmPitx. This is reminiscent of their essential function in the induction of secondary body axes (DV and LR) in bilaterian context. These data enable us to propose an evolutionary scenario in which the beta-catenin/Nodal/Pitx pathway was already functional as a "core signaling cassette" to break symmetry on the primary body axis for generating secondary body axes in the common cnidarian-bilaterian ancestor.

Host:
Shigeru Kuratani
Evolutionary Morphology, CDB
saizo@cdb.riken.jp
Tel: 078-306-3064 (ext: 4543)