DEVELOPMENT

Mapping eye development

It is well accepted that retinoic acid (RA) is important for a range of processes during maturation of the nervous system, including early development of the eye. Sen and colleagues now show that RA is also required for later dorsoventral patterning of the chick retina and highlight the mechanisms of action of RA in this process.

During retinal development, the graded expression in the dorsoventral retina of two members of the EphB family of receptor tyrosine kinases, EphB2 and EphB3, and their ligand, ephrin B, has been implicated in the accurate dorsoventral mapping of adjacent retinal cells onto neighbouring regions in higher brain centres, such as the superior colliculus. RA distribution is polarized along the dorsoventral axis of the developing retina, and its synthesizing and degrading enzymes are expressed at a time point that is consistent with a role for RA activity in regulating the graded expression of these molecules.

Sen *et al.* studied the effects of expression of a dominant-negative form of the human RA receptor α in the developing chick retina. Blocking RA activity in this way resulted in a lack of ventral expression of EphB2 and EphB3 and dorsal expression of ephrin B2. Moreover, loss of RA activity did not affect expression of the transcription factor *VAX*, which is also involved in regulating EphB receptors and ephrin B ligands. However, misexpression of *VAX* resulted in loss of or ectopic expression of RA-synthesizing enzymes.

These findings suggest that RA acts in parallel with or downstream of VAX activity, and that it is crucial for controlling the expression of EphB/ephrin B molecules to form a topographic map of the dorsoventral retina during development.

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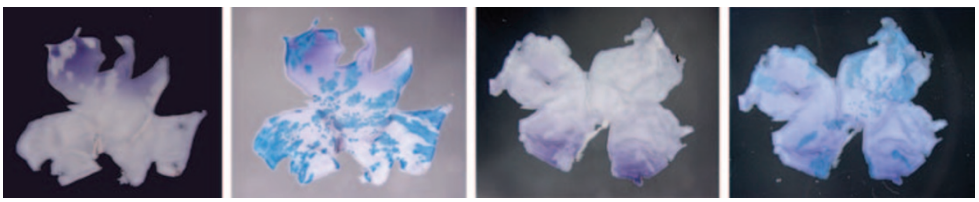
ORIGINAL RESEARCH PAPER Sen, J. *et al.* Retinoic acid regulates the expression of dorsoventral topographic guidance molecules in the chick retina. *Development* **132**, 5147–5159 (2005)



Expression of ephrin B2 (two left-hand images) and EphB2 (two right-hand images) in chick retinas that are infected with a replication-competent retroviral vector encoding a dominant-negative allele of the RA receptor α to block RA activity. *In situ* hybridization (purple) shows normal dorsal expression of ephrin B2 and ventral expression of EphB2, where RA is high. Co-staining with a probe for the virus (blue) shows a reduction in expression of ephrin B2 or EphB2. Image courtesy of J. Sen and C. Cepko, Harvard Medical School, USA.