

Egr1 expression and function during zebrafish retinal development

Abstract

Development of the zebrafish retina results in discrete layers of differentiated neurons. The young (yng) mutant lacks this lamination pattern, yielding a non-layered retina of partially differentiated neurons. The expression of several genes is altered in yng, including early growth response factor (egr1). Egr1 expresses more in the retina of yng at 36hpf than WT, and this pattern reverses at 52hpf and 60hpf. To see which natural perturbation, the upregulation of egr1 early in development or the downregulation of egr1 later in development, was responsible for the lack of lamination, an egr1 in situ hybridization time series was constructed. The spatial information combined with other yng- and egr1-related experiments suggested a dual role for egr1 which controls: 1) cell proliferation early in development, and/or 2) terminal differentiation later in development. To explore these roles, synthetic egr1 was injected into embryos at one-cell stage and the resultant embryos were characterized by histology, immunohistochemistry, and in situ hybridization. The perturbation resulted in larger and seemingly more differentiated retinas, suggesting that the injected egr1 was affecting both proliferation and differentiation. To further investigate the role of egr1 in neuronal differentiation, experiments were carried out to study its regulation of p35, a neurite outgrowth factor also affected by yng. In summary, this study has demonstrated that egr1 affects proliferation by maintaining cells in cell cycle, and affects differentiation by possibly regulating the expression of p35.