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Cnidarian and Bilaterian Promoters Can Direct GFP Expression in Transfected Hydra

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Abstract

Complete sexual development is not easily amenable to experimentation in hydra. Therefore, the analysis of gene function and gene regulation requires the introduction of exogenous DNA in a large number of cells of the hydra polyps and the significant expression of reporter constructs in these cells. We present here the procedure whereby we coupled DNA injection into the gastric cavity to electroporation of the whole animal in order to efficiently transfect hydra polyps. We could detect GFP fluorescence in both endodermal and ectodermal cell layers of live animals and in epithelial as well as interstitial cell types of dissociated hydra. In addition, we could confirm GFP protein expression by showing colocalisation between GFP fluorescence and anti-GFP immunofluorescence. Finally, when a FLAG epitope was inserted in-frame with the GFP coding sequence, GFP fluorescence also colocalised with anti-FLAG immunofluorescence. This GFP expression in hydra cells was directed by various promoters, either homologous, like the hydra homeobox *cnox-2* gene promoter, or heterologous, like the two nematode ribosomal protein S5 and L28 gene promoters, and the chicken *β-actin* gene promoter. This strategy provides new tools for dissecting developmental molecular mechanisms in hydra; more specifically, the genetic regulations that take place in endodermal cells at the time budding or regeneration is initiated.

Keywords

cnidaria; hydra; electroporation; transfection; GFP; ectoderm; endoderm; *cnox-2* promoter; *actin* promoter; *ribosomal* gene promoters

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