

## *Xenopus laevis* as a Model for the Functional Analysis of Genes Involved in Embryogenesis and Postembryonic Organ Regeneration

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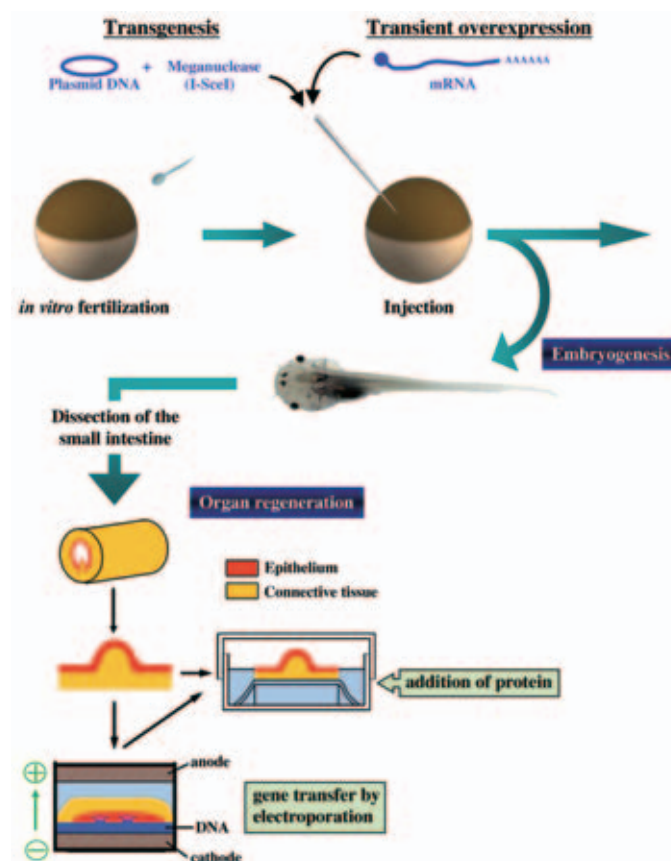


Fig. 1

The overexpression study is one of the most useful methods for investigating the function of a gene of interest, and this can be easily achieved by using the frog system. Either plasmid DNA digested by meganuclease or synthetic mRNA is injected into *Xenopus laevis* fertilized eggs to generate transgenic tadpoles or tadpoles transiently overexpressing certain gene(s), respectively (**Fig. 1**).

The expression of injected mRNA brings about various effects on embryogenesis according to its function (**Fig. 2**). In addition, frog metamorphosis serves as a good model for studying organ regeneration because the organs after metamorphosis bear many similarities to their mammalian counterparts. We established a gene transfer system (**Fig. 1**) and showed the function of genes involved in regeneration of the *Xenopus* intestine (**Fig. 3**). This system, combined with the use of transgenic frogs, has shed light on the molecular mechanisms of organ regeneration conserved across the animal species.

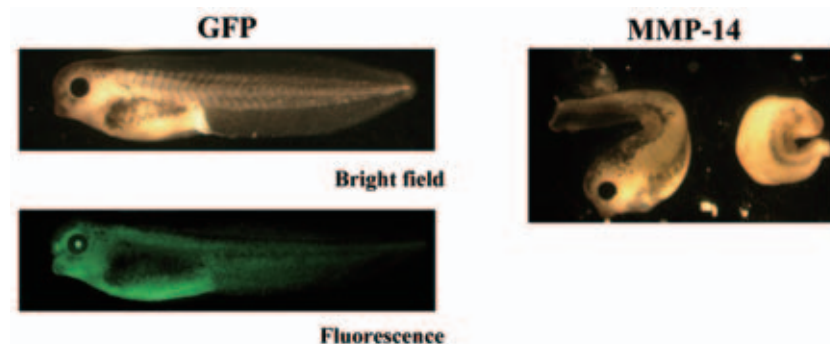


Fig. 2

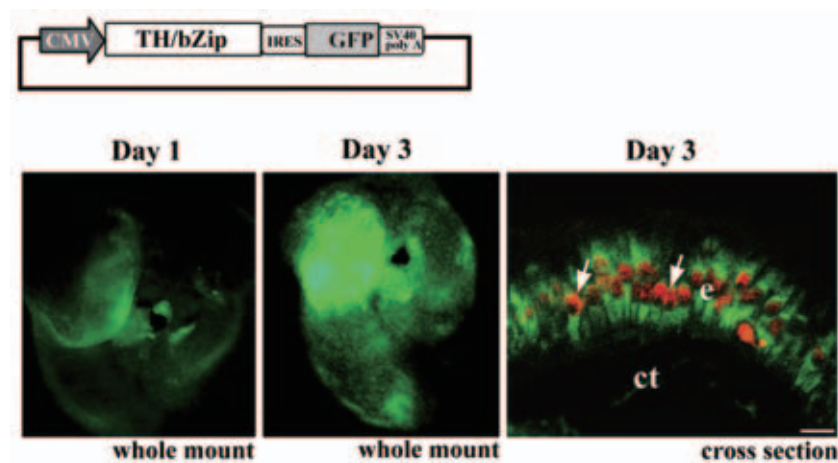


Fig. 3

- Fig. 1** Strategy for the functional analysis of genes involved in embryogenesis and postembryonic organ regeneration.
- Fig. 2** Transient overexpression of GFP and matrix metalloproteinase (MMP)-14 injected into eggs. Overexpression of MMP-14 (right) but not GFP (left) causes severe developmental defects.
- Fig. 3** Intestines transfected with plasmids expressing both a thyroid hormone-responsive basic leucine zipper-containing transcription factor (TH/bZip) and GFP. Overexpression of the transgene causes an increase in number of proliferating cells positive for proliferating cell nuclear antigen (**arrows**) in the epithelium (e) but not in connective tissue (ct). Scale bar, 20  $\mu$ m.