—Photogravure—

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

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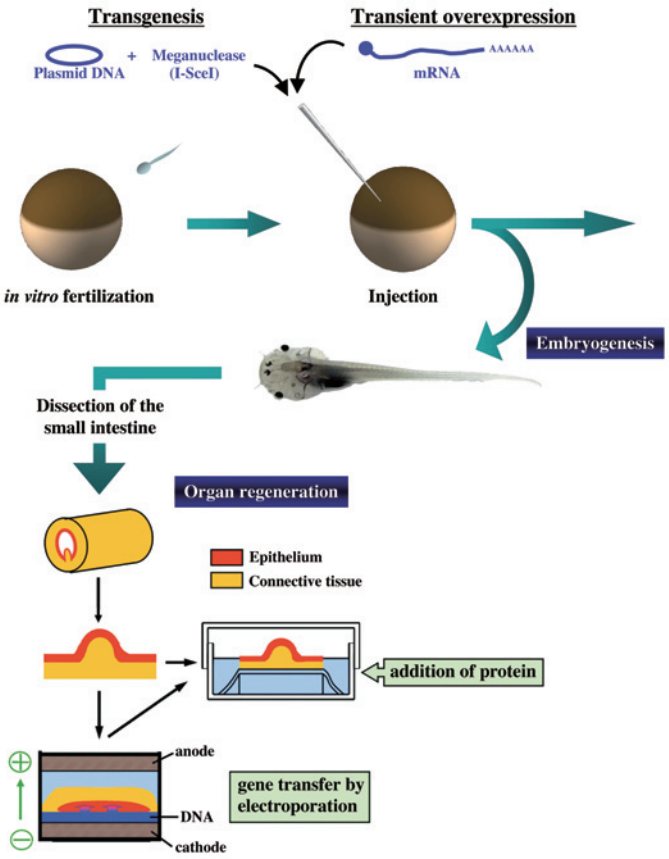

Fig. 1

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)**.

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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.

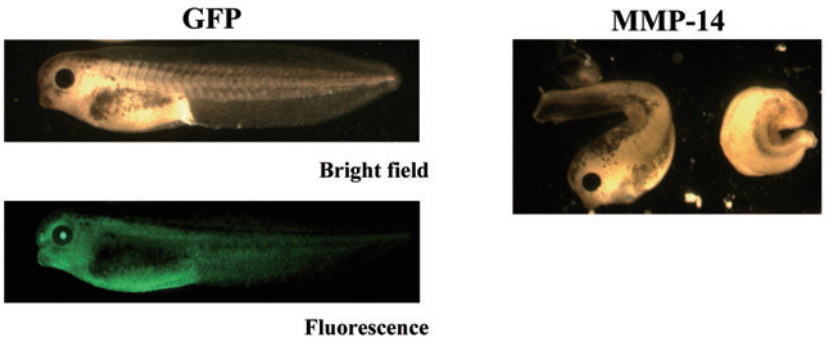

Fig. 2

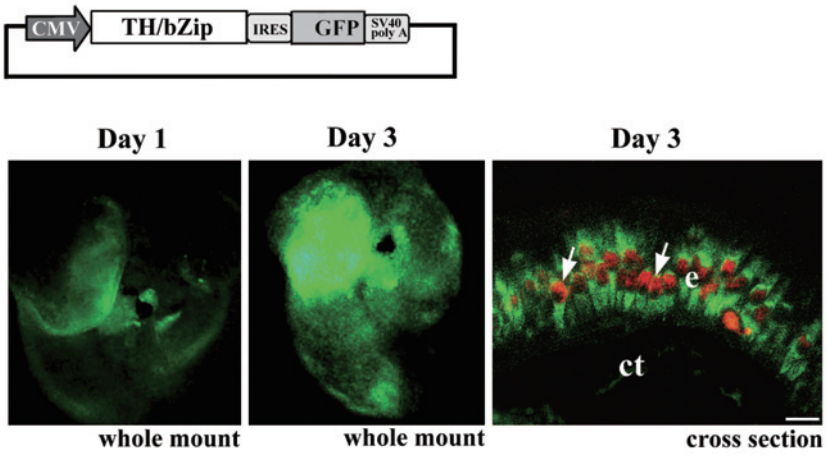

Fig. 3

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 μm.

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