...the injected vegetal cell is altered by Li+ or whether it acts as a local source of Li+. The restoration of bilateral symmetry in UV-irradiated embryos by Li+ microinjection prompted us to determine whether dorsal structures are duplicated in normal embryos when they are microinjected with Li+. We microinjected into vegetal lower-tier cells as this injection gave the best rescue of UV-irradiated embryos. From 112 embryos microinjected with Li+ into a vegetal, vegetal cell, we obtained 97 embryos that had duplication of dorsal-anterior structures (Fig. 4). Most of these embryos developed into 'James' twins' (Fig. 2c) that lack posterior development but consist of two heads which have normally formed eyes and cement glands. A small number (~5%) developed into twins which have a single posterior axis but with twinned heads, central nervous systems, notochords, and somites (Fig. 2d). Injection into a dorsal cell failed to duplicate dorsal structures. Out of 97 embryos injected into a dorsal, vegetal cell, 89 survived to form a single body axis. Most (~80%) developed normally, but the remainder developed enhanced dorsal-anterior structures, similar in external appearance to the 'imbalanced' embryos produced by Cooke.

To see whether dorsal rescue is specific for Li+, we microinjected 4 nl of 0.4 M solutions of NaCl, KCl, CaCl2, RbCl or NH4Cl, 50 mM solutions of CaC2O3 or MgC2O3, or a 10 mM solution of ZnCl2 (higher concentrations of the latter three salts usually killed the embryos). All solutions were made up in 200 mM Steinberg's solution which, when injected alone into UV-irradiated embryos, did not cause rescue. Among the controls tested, only Li+ was able to cause significant rescue of dorsal structures. Based on cell transplant experiments with germs, we showed that a vegetal, dorsal cell at the 32-cell stage carried sufficient information to promote complete dorsal development. This information is transmitted by inducible cell interactions during cleavage to form dorsal elements. Our experiments show that Li+ is able to cause expression of dorsalizing information in cells that otherwise lack or do not express this information. Thus, the potential for cells to undergo dorsal development exists radially around the embryo even after axis specification, and such development will occur when stimulated by Li+ at the appropriate time.

The ability to produce radial dorsal embryos with Li+ should facilitate investigations on the molecular and cellular differences between dorsal and ventral pattern formation in X. laevis.

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**Oral vaccination of the fox against rabies using a live recombinant virus vaccine**

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Rabies, a viral disease affecting all warm-blooded animals, is prevalent in most parts of the world, where it propagates amongst wild animals, particularly the fox and dog. The public health and economic impact on livestock and wildlife is well known. Attempts to control the disease by vaccinating wild carnivores with inactivated virus vaccines has been experimentally controversial, and we have instead evaluated here the potential of a recombinant vaccinal virus to protect fowls against the disease. We have found that the administration of vaccinal virus (V) or a recombinant harboring the rabies surface antigen gene (VYTVg3AAb) in intramuscular, subcutaneous and intravenous routes have been found to be able to confer complete protection to the infected animals.
The recombinant VVTGGRAB protein emitting red light was used to detect the concentration of VTTGGRAB in the field trials in progress in Switzerland, West Germany, and Canada (C. D. MacIntosh, personal communication).

However, the virus is often unstable and attenuated viruses retain pathogenicity for rodents and can revert to virulence. Furthermore, inactivated rabies virus is ineffective when administered orally. A novel vaccination strategy, in which a recombinant vaccinia virus bearing a foreign antigen coding sequence is used as the immunizing agent, has been used to hold antibodies for the prevention of foxes against rabies. The causative agent of rabies is a rhabdovirus and the glycoprotein (G) which traverses the envelope surrounding the virus is the sole viral protein capable of inducing and retaining with virus-neutralizing antibodies or of conferring protection against infection. The relative innocuity of vaccinia virus, which has been extensively used to control and eradicate smallpox in man, has stimulated its development as a cloning and expression vector, and derivatives expressing surface antigens from influenza, hepatitis B and herpes simplex have been used for vaccines. Additionally, recombinant vaccinia virus expressing rabies G protein was used to test the expression of recombinant virus VGGTRAB showing resistance against different types and field trials are in progress in Switzerland, West Germany, and Canada (C. D. MacIntosh, personal communication).