Thyroid Linked to Some Frog Defects

Since 1994, scientists across North America have been chronicling an epidemic of frog deformities, much of which seems to trace to something in lake water. Two studies now home in on some of the pollutants responsible and the means by which they wreak havoc.

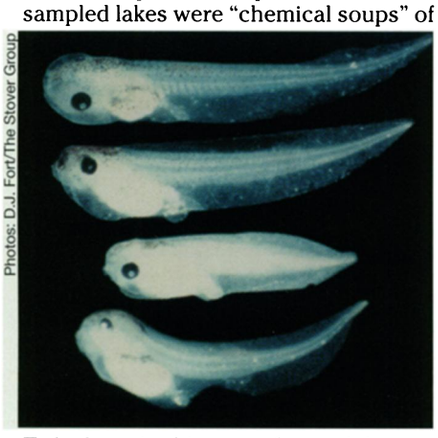
Toxicologist Douglas J. Fort of the Stover Group, a firm of toxicology consultants in Stillwater, Okla., and his colleagues collected samples from Minnesota and Vermont lakes. Half came from areas where frog-deformity rates were low, the rest from hot spots with high malformation rates.

The researchers then performed experiments on *Xenopus laevis* frogs—the African species that serves as the amphibian analog of a lab rat.

Frog embryos placed in a growth medium mixed with water from the low-deformity, or background, sites developed normally, Fort's team reports in the October Environmental Toxicology and Chemistry. However, those exposed to water from the hot spots came to display the same deformities seen in amphibians in the field. These include bent spines, malformed jaws, fewer-than-normal legs, and too many or too few eyes. Some tadpoles also failed to metamorphose.

Because thyroid hormones orchestrate much of vertebrate development, including the metamorphosis of tadpoles, Fort suspected the water pollutants were interfering with this endocrine system. In follow-up tests, his group showed that extra thyroid hormone usually prevented or ameliorated the toxicity.

In a second paper in the same journal issue, the scientists reported that what makes a hot spot hot is not simply that its water is polluted. Explains Fort, all the sampled lakes were "chemical soups" of pollutants—only their recipes differed.



Photos: D.J. Fort/The Stover Group

Tadpoles raised in water from a lake with a low frequency of frog abnormalities (top) and in increasingly higher concentrations of water from a deformity hot spot.

For instance, he notes, hot-spot lakes "contained chemicals that we did not find in our [background] sites," such as the pesticides maneb, permethrin, and propylthiourea. Though individually many lake pollutants can induce some deformities, the team found that limb deformities and bent spines were triggered only by maneb or propylthiourea.

Natural features of the water at certain sites—such as plant-breakdown products—proved capable of increasing some pollutants' toxicity, notes coauthor James G. Burkhart, a chemist at the National Institute of Environmental Health Sciences in Research Triangle Park, N.C.

The new findings reinforce what Martin Ouellet of McGill University in Montreal has seen. He says, "Our epidemiological data clearly show amphibian deformities occur only in sites subjected to pesticides"—often a soup of 10 to 20 such agents. Although a few studies have linked deformities to parasites (SN: 5/1/99, p. 277), experiments like those by Fort's team affirm that no single agent can explain all frog malformations worldwide, Ouellet adds.

Kinked spine in this Xenopus *traces to water from a Minnesota hot spot.*

Indeed, frog X rays are revealing several distinct syndromes, Michael Lannoo of Ball State University in Muncie, Ind., told Science News. Rare symmetrical pairs of extra legs at various sites trace to parasites, he finds, while symmetrically truncated hind legs occur after overexposure to ultraviolet light. Lannoo applauds Fort's team for mixing field observations and tests to investigate what's behind the typically asymmetrical defects at the sites it studied. —*J. Raloff*

Dancer gets first ovarian-tissue transplant

A 30-year-old ballet dancer leapt into the public eye this week when physicians announced that they had transplanted back some of her own ovarian tissue, restoring her ability to ovulate. The woman had had both ovaries removed for medical reasons but had the foresight to preserve tissue from one ovary.

The researchers have not yet shown that the dancer's eggs are fertile. Still, this first-of-its-kind operation raises the hope that women about to undergo radiation or chemotherapy, procedures that often destroy egg cells, might bank ovarian tissue and receive it later if they desire children.

The novel procedure, conducted by Kutluk Otkay of New York Methodist Hospital, also grabbed headlines because some scientists have speculated that ovarian-tissue transplants may one day allow women to delay menopause and extend their fertility.

When the dancer was 17, one of her ovaries developed cysts, so surgeons removed it. In 1998, the woman had her other ovary taken out for an undisclosed reason and began hormone-replacement therapy. Before that surgery, she asked her physicians to freeze egg-containing slices from the ovary.

Later displeased with the hormone therapy, the woman searched through the medical literature. She found that Otkay, working with Roger Gosden at the University of Leeds in England, had transplanted thawed human ovarian tissue into mice to study whether eggs would survive the procedure. In February, Otkay thawed and stitched together 80 of the woman's ovarian slices and positioned them near the site of the original ovary.

In June, he gave the dancer fertility hormones designed to stimulate the maturation and release of eggs. The woman ovulated and had one normal menstrual period, Otkay announced this week at the American Society for Reproductive Medicine meeting in Toronto.

In the past few years, some physicians have offered women facing radiation or chemotherapy the option of freezing ovarian tissue. While scientists have achieved a few pregnancies with mature eggs that were frozen, ovarian-tissue slices are easier to obtain, and the immature eggs within survive the freezing better.

It's unclear how long the woman's apparent fertility will last. Moreover, mouse studies have raised a concern that frozen ovarian tissue from a cancer patient might harbor roaming tumor cells, notes John J. Eppig of Jackson Laboratory in Bar Harbor, Maine, who studies how eggs develop in the ovaries. —*J. Travis*

Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to *Science News*. www.jstor.org