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DURHAM, N.H. -- A new study demonstrates for the first time that environmental contaminants could be a leading cause of frog deformities and declining amphibian populations.

Published by University of New Hampshire researchers in the November issue of Environmental Health Perspectives, the pilot study shows that frogs with developmental deformities, like missing or malformed limbs, also have irregular levels of hormones that are central to reproduction and development.

"It is clear that something is throwing off these frogs' hormones at a key developmental stage," says Stacia Sower, UNH professor of biochemistry and one of study's authors. "Previous research has shown that chemicals that interfere with the endocrine system by mimicking hormones or by blocking the action of hormones can cause reproductive dysfunction and abnormal development in several species, including fish and alligators. We suspect that these same chemicals are having similar effects on frogs."

The normal growth and development of amphibian larvae rely on healthy aquatic systems. Developing frogs are particularly susceptible to chemical contamination that accumulates in rivers, lakes and ponds. Potential sources of endocrine-disrupting chemicals include municipal sewage, pulp mill effluents, agricultural runoff (pesticides and herbicides), and petroleum from bilge water and two-cycle boats.

Kim Babbitt, UNH assistant professor of natural resources, laid the groundwork for these studies by her extensive survey of thousands of frogs in New Hampshire and Massachusetts in 1997 and 1998. Deformed green frogs (Rana clamitans) and bullfrogs (Rana catesbeiana) were found at 86 percent of sites sampled (31 or 35 sites). Deformity rates ranged from zero to 9.3 percent, and the average deformity rate was 4.9 percent for 1997 and 4.1 percent for 1998.

Most malformations involved absence of all or part of a digit or a limb, asymmetrical development of the limbs, and deformed eyes.

Sower, Babbitt and and post-doc Karen Reed then conducted a series of tests on normal and deformed frogs. They found that abnormal frogs had significantly lower concentrations of sex hormones called androgens and of a brain hormone called gonadotropin-releasing hormone (GnRH), which controls reproduction in vertebrates.

"These findings suggest that there may be significant interactions among environmental and endocrinological factors during the development of amphibian larvae that affect different processes including reproduction and limb development," says Sower. "We know, for example, that disruption of the GnRH system can produce infertility."

Sower says the study does not provide conclusive evidence that environmental contam-inants are causing the deformities. What it does show for the first time is that frogs with malforma-tions also have abnormal levels of several hormones vital for reproduction and development.

Many other hormones, she says, could also be affected. Further research is necessary to determine if endocrine-disrupting chemicals alone are causing the deformities, or if it is a synergistic interaction with other factors, like parasites or increased UV-B radiation caused by the thinning of the ozone layer.

"What we know is that the cause is not parasites or predators by themselves," says Sower.

"The potential role that malformities play in amphibian decline is not clear," adds Babbitt. "However, the results of our study suggest an increased effort to determine how malformities affect population growth is warranted."

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