Dartmouth researchers show effects of low dose arsenic on development

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A team of Dartmouth Medical School (DMS) researchers has determined that low doses of arsenic disrupt the activity of a hormone critical in development. The finding is further evidence that arsenic at low doses (at levels found in U.S. drinking water in some areas) can be harmful. The study appeared in the Oct. 26, 2007, online edition of the journal *Environmental Health Perspectives* (EHP), and it will be published in a forthcoming issue of the journal.

"Arsenic is a natural, yet pervasive, chemical in the environment; we can't seem to escape it," says Joshua Hamilton, one of the authors on this study and the director of the Center for Environmental Health Sciences at Dartmouth and Dartmouth's Superfund Basic Research Program on Toxic Metals. "By learning how it adversely affects biological processes and at what levels we should be concerned, we will hopefully someday be able to mitigate its impact on human health." Hamilton is also a professor of pharmacology and toxicology at DMS.

Hamilton and his team, in previous work, have learned that arsenic at low doses appears to suppress the ability of all critical steroid receptors, including those for estrogen and testosterone, to respond to their normal hormone signals. Chemicals that disrupt steroid hormone receptor signaling are called endocrine disruptors. Arsenic can disrupt these hormone pathways at extremely low doses equivalent to what many people in the U.S. have in their drinking water.

This study set out to see whether arsenic can also disrupt the activity of

two hormone receptors that are involved in normal development - the retinoic acid receptor and the thyroid hormone receptor, two important members of the larger nuclear hormone receptor family. While the researchers studied the impact on frog development, these two hormone receptors are also vital to human development.

"I believe this is the first demonstration in an animal model that arsenic actually disrupts a developmental process that is regulated by hormones, and it does this at extremely low doses that are directly relevant to human exposures of concern," says Hamilton.

Source: Dartmouth College