

Extramural papers of the month

By Nancy Lamontagne

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Read the current
Superfund Research Program
Research Brief. New issues
are published on the first
Wednesday of each month.

Prenatal DDT exposure associated with high blood pressure in adults

NIEHS grantees report that women who experienced high levels of prenatal exposure to the pesticide dichlorodiphenyltrichloroethane (DDT) were more likely to develop hypertension as adults. Other studies have linked DDT exposure with hypertension, but the new finding suggests the association might originate in early development.

More than 40 years after the U.S. Environmental Protection Agency banned the use of DDT, the pesticide remains an important and persistent environmental exposure. In the United States, traces of DDT can still be found in some foods — primarily fatty animal products — and the pesticide is still used to control malaria in other parts of the world, including India and South Africa.

The researchers examined concentrations of p,p'-DDT and o,p'-DDT and its metabolite p,p'-DDE in blood samples collected from 527 women who were pregnant between 1959 and 1967, and part of the Child Health and Development Studies birth cohort. The researchers also surveyed the adult daughters of those women, to learn if they had developed hypertension. The investigators found that, even after adjusting for other hypertension risk factors, prenatal p,p'-DDT exposure was associated with hypertension.

Citation: La Merrill M, Cirillo PM, Terry MB, Krigbaum NY, Flom JD, Cohn BA. (<http://www.ncbi.nlm.nih.gov/pubmed/23591545>) 2013. Prenatal exposure to the pesticide DDT and hypertension diagnosed in women before age 50: a longitudinal birth cohort study. *Environ Health Perspect*; doi:10.1289/ehp.1205921 [Online 12 March 2013].

Blocking glucocorticoid receptor prevents arsenic-induced birth defects

NIEHS grantees used computational analysis, followed by laboratory testing, to identify the glucocorticoid receptor pathway as a key mediator in metal-induced birth defects. This systems biology approach could be useful for predicting other biological pathways involved in environmentally-induced birth defects.

The researchers selected arsenic, cadmium, chromium, lead, mercury, nickel, and selenium for a computational analysis that predicted genes and pathways associated with both metal exposure and developmental defects. This analysis predicted the glucocorticoid receptor pathway was a key mediator of multiple metal-induced birth defects.

The researchers then evaluated this pathway with a whole chick embryo culture assay and an *in vitro* assay. In the chick embryo model, inhibiting the signaling of the glucocorticoid receptor pathway prevented structural malformations induced by inorganic arsenic. For the *in vitro* assay, inhibiting the glucocorticoid receptor resulted in partial to complete toxicity protection from inorganic arsenic and cadmium.

Citation: Ahir BK, Sanders AP, Rager JE, Fry RC. (<http://www.ncbi.nlm.nih.gov/pubmed/23458687>) 2013. Systems biology and birth defects prevention: blockade of the glucocorticoid receptor prevents arsenic-induced birth defects. *Environ Health Perspect* 121:332–338.

Community beliefs regarding dioxin exposure pathways

A study, partially funded by NIEHS, found that residents of communities with known dioxin contamination made incorrect assumptions about how and where they might be exposed to dioxins. Despite the fact that dioxins aggregate, rather than disperse, in water, 79.3 percent of survey respondents incorrectly believed that dioxins could be found in river water, even after the removal of all soil and sediment. The study shows the importance of clearly communicating the specific exposure pathways of contaminants.

The researchers mailed surveys to 904 Michigan residents who lived in communities where dioxin contamination had occurred. The research team pointed out that residents have repeatedly heard that industrial discharge into the river was the source of most of the dioxin contamination. As a result, the residents concluded the river water was tainted, even though dioxins were likely to quickly bind to particles in water and accumulate in sediment at the bottom.

For future communication with residents, the researchers suggested using an analogy, such as dioxins are more like oil than water, to help mitigate concerns about drinking water and contact with river water.

*Citation: Zikmund-Fisher BJ, Turkelson A, Franzblau A, Diebol JK, Allerton LA, Parker EA. (<http://www.ncbi.nlm.nih.gov/pubmed/23391895>) 2013. The effect of misunderstanding the chemical properties of environmental contaminants on exposure beliefs: A case involving dioxins. *Sci Total Environ* 447:293-300.*

BPA exposure in the NICU

A study, supported in part by NIEHS, identified medical devices as a potential source of exposure to bisphenol A (BPA), among premature infants in neonatal intensive care units. BPA is used to manufacture polycarbonate plastics, which are used in medical devices, such as intravenous administration sets, syringes, and catheters.

The researchers looked at urinary BPA concentration for 55 infants, and categorized each infant's medical device use as low or high, based on the number and invasiveness of devices. They found that the median urinary total BPA concentration of infants, who had required four or more medical devices, for three previous days, was significantly higher than for infants requiring three or less devices. The researchers also collected and analyzed breast milk or formula samples, and found that increased BPA concentration was not associated with the infants' nutritional intake.

*Citation: Duty SM, Mendonca K, Hauser R, Calafat AM, Ye X, Meeker JD, Ackerman R, Cullinane J, Faller J, Ringer S. (<http://www.ncbi.nlm.nih.gov/pubmed/23420909>) 2013. Potential sources of bisphenol A in the neonatal intensive care unit. *Pediatrics* 131(3):483-489.*

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(97KB)

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