MedicalXpress

Pilot study relates phthalate exposure to less-masculine play by boys

November 16 2009

A study of 145 preschool children reports, for the first time, that when the concentrations of two common phthalates in mothers' prenatal urine are elevated their sons are less likely to play with male-typical toys and games, such as trucks and play fighting.

The University of Rochester Medical Center-led study is published in the *International Journal of Andrology*.

Because testosterone produces the masculine brain, researchers are concerned that fetal exposure to anti-androgens such as phthalates - which are pervasive in the environment - has the potential to alter masculine brain development, said lead author Shanna H. Swan, Ph.D., professor of Obstetrics and Gynecology, director of the URMC Center for Reproductive Epidemiology, and an expert in phthalates.

"Our results need to be confirmed, but are intriguing on several fronts," Swan said. "Not only are they consistent with our prior findings that link phthalates to altered male genital development, but they also are compatible with current knowledge about how hormones mold sex differences in the brain, and thus behavior. We have more work to do, but the implications are potentially profound."

Phthalates are chemicals used to soften plastics. Recent studies have shown that the major source of human exposure to the two phthalates of most concern (DEHP and DBP) is through food. These phthalates are used primarily in polyvinyl chloride (PVC), so any steps in the

processing, packaging, storage, or heating of food that use PVC-containing products can introduce them into the food chain.

Phthalates are also found in vinyl and plastic tubing, household products, and many personal care products such as soaps and lotions. Phthalates are becoming more controversial as scientific research increasingly associates them with genital defects, metabolic abnormalities, and reduced testosterone in babies and adults. A federal law passed in 2008 banned six phthalates from use in toys such as teethers, play bath items, soft books, dolls and plastic figures.

In Swan's study, higher concentrations of metabolites of two phthalates, di(2-ethylhexyl) phthalate (DEHP), and dibutyl phthalate (DBP), were associated with less male-typical behavior in boys on a standard play questionnaire. No other phthalate metabolites measured in-utero was linked to the less-masculine behavior. Girls' play behavior was not associated with phthalate levels in their mothers, the study concluded.

Swan's interest in phthalates stems from an investigation into the environmental causes of reproductive health problems. Since 1998 she has led the federally funded, multi-center Study for Future Families (SFF), which established a large database from which to explore various scientific questions about toxins.

The current study focused on a small sample of SFF mothers who delivered children between 2000 and 2003. The mothers provided urine samples around the 28th week of pregnancy. The urine was analyzed for phthalate metabolites by the Centers for Disease Control and Prevention (CDC).

Swan hypothesized that phthalates may lower fetal testosterone production during a critical window of development - somewhere within eight to 24 weeks gestation, when the testes begin to function - thereby

altering brain sexual differentiation.

To explore the question, researchers reconnected with mothers from the SFF sample and asked them to complete a standard research questionnaire, called the Preschool Activities Inventory (PSAI), for their children ages 3 1/2 to 6 1/2 years.

The PSAI is designed to discriminate play behavior within and between the sexes, and in the past has been shown to reflect the endocrine-disrupting properties of other toxins, such as PCBs and dioxins. The PSAI addressed three aspects of play: types of toys children choose (trucks versus dolls), activities (rough-and-tumble play, for example), and child characteristics.

However, researchers were concerned about how the choice of toys available in any given household might skew results, so in addition they asked about parental views toward atypical play. For example, the survey asked, "What would you do if you had a boy who preferred toys that girls usually play with?" The possible answers included "strongly encourage" (him to play this way) to "strongly discourage."

The final survey scores are designed to reflect sex-typical play. Higher scores meant more male-typical play and lower scores meant more female-typical play.

Researchers then examined boys play-behavior scores in relation to the concentration of phthalate metabolites in their mothers' prenatal urine samples, finding that higher concentrations of DEHP and DBP metabolites were associated with less masculine play behavior scores.

Earlier studies by Swan and others have shown that phthalate exposure during pregnancy might affect the development of genitals of both male rodents and baby boys. Scientists refer to this cluster of genital

alterations as the "phthalate syndrome," and research suggests that in rodent pups, the syndrome can have adverse consequences for later sexual development.

If endocrine disrupters such as phthalates can impair genital development and hormone levels in the body, the play-behavior study noted, then a deeper examination of how these chemicals impact the brain is warranted.

Source: University of Rochester Medical Center (news : web)

Citation: Pilot study relates phthalate exposure to less-masculine play by boys (2009, November 16) retrieved 23 April 2024 from https://medicalxpress.com/news/2009-11-phthalate-exposure-less-masculine-boys.html

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