

Preterm birth linked with maternal phthalate exposure during pregnancy

By Nancy Lamontagne

Researchers led by NIEHS Superfund Research Program grantee John Meeker, Sc.D., from the University of Michigan (UM), report that women with the highest levels of phthalate exposure during pregnancy had up to five times the odds of preterm birth, compared to women with the lowest exposure. Phthalates can be found in food stored or processed in plastic; plastic products, such as shower curtains and vinyl flooring; and personal care products, such as deodorants and lotions.

"Preterm birth is a serious public health challenge, and rates are significantly higher than they were 20 to 30 years ago," Meeker explained. "Explanations for this increase remain elusive. If environmental factors, such as exposure to phthalates, are indeed a cause of preterm birth it may represent a modifiable risk factor that could lead to effective interventions."

Adding evidence

Meeker

(<http://www.sph.umich.edu/iscr/faculty/profile.cfm?unique=meekerj>)

previously published results from a small pilot [study](#)

(<http://www.ncbi.nlm.nih.gov/pubmed/20019910>)

that showed a link between phthalate exposure and preterm birth. The new [study](#),

(<http://www.ncbi.nlm.nih.gov/pubmed/24247736>)

published in *JAMA Pediatrics* and co-authored by UM doctoral student Kelly Ferguson and Thomas McElrath, M.D., Ph.D., of Brigham and Women's Hospital, builds on the pilot study, by using a nested case control design to study a much larger group of women. They also analyzed urine samples from up to three time points during pregnancy, to better determine overall phthalate exposure.

The study included 130 mothers who had delivered prior to 37 weeks of completed gestation, and 352 control mothers who delivered at or after 37 weeks. The researchers examined the nine phthalate metabolites of four phthalates and found that, depending on the individual phthalate, women with the highest levels of exposure to four of the phthalates during pregnancy had two- to five-times the odds of preterm birth compared to those with the lowest exposure.

The researchers found the strongest dose-dependent associations with maternal levels of the two di-2-ethylhexyl phthalate (DEHP) metabolites, mono-(2-ethyl)-hexyl phthalate (MEHP) and mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP), and the summed levels of all the DEHP metabolites.

Subset of preterm births shows stronger association

The researchers also analyzed a subset of 57 mothers with preterm deliveries preceded by spontaneous preterm labor or preterm premature rupture of the membranes. When this group was examined alone, the odds ratios increased for all the phthalate metabolites. This finding indicates a stronger association between phthalate exposure and spontaneous preterm birth, than the association with all preterm births.

"One of the limitations to studying factors associated with preterm birth has been that it is a heterogeneous outcome with a number of different underlying conditions or biological mechanisms that are possible," Meeker said. "Restricting cases to those with spontaneous preterm birth was important to try and narrow down a potentially more homogeneous group. Our hypothesis was that phthalates may cause biological responses, such as altered endocrine function, inflammation, or oxidative stress, which may lead to a spontaneous preterm birth."

The researchers caution that, before implementing interventions aimed at decreasing phthalate exposure, more studies are needed to confirm these findings, to examine the sources of the phthalates, and to better understand the mechanisms involved. Phthalate exposure might be reduced by eating fresh foods that have undergone less processing and packaging, and by purchasing phthalate-free plastics and personal care products, but Meeker noted that research on the effectiveness of these activities in reducing exposure remains limited.



Meeker is an associate professor of environmental health sciences and associate dean for research at the UM School of Public Health. (Photo courtesy of UM School of Public Health)



Ferguson, a doctoral student in environmental health sciences at UM, is first author of the new paper. (Photo courtesy of Kelly Ferguson)

The researchers are continuing to explore biological mechanisms that may be involved in the associations they observed, and whether certain populations may be particularly susceptible to environmental influences on preterm birth. They are also examining sources, pathways, and routes of exposure for pregnant women, to help inform interventions.

Citation: [Ferguson KK, McElrath TF, Meeker JD.](#)

(<http://www.ncbi.nlm.nih.gov/pubmed/24247736>)

2013. Environmental phthalate exposure and preterm birth. *JAMA Pediatr*; doi:10.1001/jamapediatrics.2013.3699 [Online 18 November 2013]. [Summary](#)

(Nancy Lamontagne is a science writer with MDB Inc., a contractor for the NIEHS Division of Extramural Research and Training.)

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