Study links prenatal phthalate exposure to reduced childhood lung function

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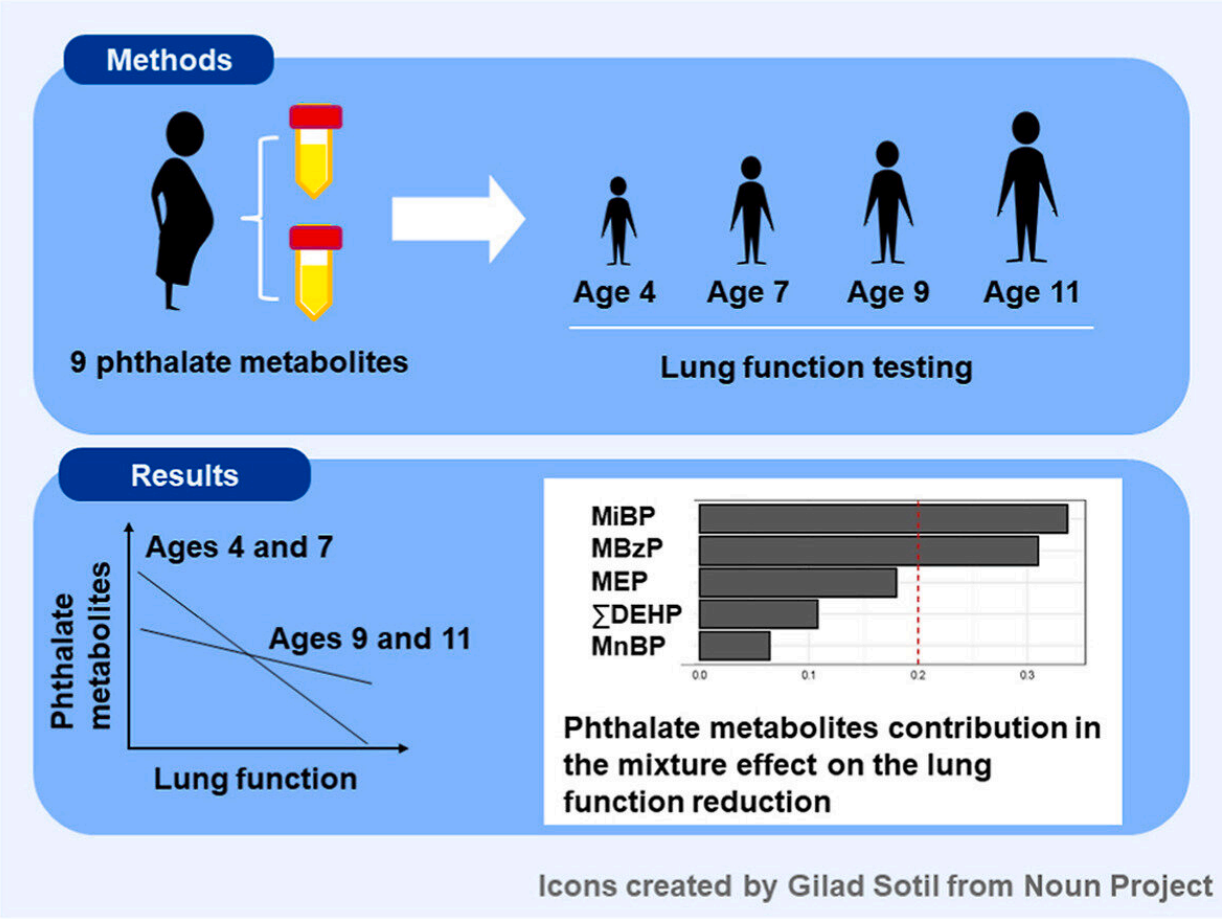

Graphical abstract. Credit: *Environmental Pollution* (2022). DOI: 10.1016/j.envpol.2022.119833

A study led by the Barcelona Institute for Global Health (ISGlobal) has found that exposure to phthalates in the womb is associated with reduced lung function during childhood. The findings of the study, published in *Environmental Pollution*, support the European Union's current restrictions on the use of these substances.

Phthalates are chemical compounds that are widely used as plasticizers, as well as in lacquers and varnishes. They are found in a wide variety of consumer products, ranging from toys to food packaging, clothing, detergents, cosmetics, solvents, etc. Over time, phthalates in these products leach into the surrounding environment—for example, into the air, dust and food—making them virtually ubiquitous. Moreover, human exposure to phthalates starts as early as in utero, given that these compounds are able to cross the placental barrier. Phthalates act as endocrine disruptors and have been associated with numerous developmental and reproductive health problems.

"Research has consistently found that gestational phthalate exposure is associated with increased risk of childhood asthma, but the evidence on its possible association with lung function is scarce and unclear," explained ISGlobal researcher Magda Bosch de Basea, lead author of the study.

The study included 641 mother-child pairs from the INMA Project birth cohorts in Sabadell and Gipuzkoa. Gestational phthalate exposure was analyzed using urine samples collected from the mothers during pregnancy. The children's lung function was assessed by spirometry at various stages of development between the ages of four and eleven years.

As an indication of the ubiquity of these compounds, laboratory analyses detected all nine of the studied phthalate metabolites—i.e., substances into which phthalates are transformed once metabolized by the human body—in nearly 100% of the urine samples examined. At all stages of

development, the studied metabolites were associated with decreases in two lung function parameters: forced vital capacity (FVC), which measures the maximum volume of air a person is able to exhale, and forced expiratory volume in 1 second (FEV_1), which measures the maximum exhaled volume in the first second of exhalation.

However, the researchers found that the associations between certain metabolites (e.g. MiBP and MBzP) and decreased lung function were generally statistically significant only at younger ages, but not in spirometries performed in later years. This pattern is consistent with the findings of studies in animal models suggesting that the possible effects of these compounds on lung function revert over time.

Moreover, using statistical methods that account for exposure to mixtures of compounds, the study identified MBzP as an important contributor to the observed effect on lung function. "This leads us to believe that this metabolite—MBzP—could be one of the main drivers of the observed association with reduced lung function during childhood," commented Judith Garcia-Aymerich, head of the Non-Communicable Diseases and Environment Program at ISGlobal and senior co-author of the study.

"The use of some phthalates is already banned in certain consumer products in the European Union. Although the associations observed in our study are relatively small in magnitude, the ubiquity of these substances and their known effects as endocrine disruptors in children lead us to suggest that these regulations should be extended to additional phthalates and to those countries that do not yet apply these restrictions," concluded ISGlobal researcher Maribel Casas, senior co-author of the study.

The nine phthalate metabolites studied are as follows: MEP, MiBP, MnBP, MCMHP, MBzP, MEHHP, MEOHP, MECPP and MEHP.

Prenatal exposure to BP3 linked to body mass index and blood pressure

A second study recently published in *Environment International*, found an association between prenatal exposure tobenzophenone-3 (BP3) and higher body mass index and diastolic blood pressure at 11 years of age.

BP3 is a common ingredient in cosmetics and sunscreens due to its qualities as a UV light filter. However, it is also an endocrine disruptor belonging to the phenol group.

The study set out to assess whether prenatal exposure to phthalates and phenols was associated with higher body mass index and blood pressure in adolescence. To do this, the researchers used data on 1,015 mother-child pairs from INMA Project birth cohorts. Exposure to eight phthalate metabolites and six phenols was analyzed by studying urine samples collected in the first and third months of pregnancy; body mass index and blood pressure were recorded when the children reached 11 years of age.

No other associations were found for any of the other compounds tested, nor for the overall mixture of compounds. In the case of BP3, the associations were observed most consistently in preadolescents who had reached the onset of puberty.

"Along with the fetal and neonatal stages, puberty is considered to be one of the developmental windows in which the effects of endocrine disruptors are most likely to occur," said ISGlobal researcher Nuria Güil, lead author of the study. "Our findings shed light on the potential metabolism-disrupting effects of BP3 during puberty and underscore the need to impose stricter regulations on the use of this compound in certain products."

More information: Magda Bosch de Basea et al, Gestational phthalate exposure and lung function during childhood: A prospective population-based study, *Environmental Pollution* (2022). DOI: 10.1016/j.envpol.2022.119833

Nuria Güil-Oumrait et al, Prenatal exposure to mixtures of phthalates and phenols and body mass index and blood pressure in Spanish preadolescents, *Environment International* (2022). DOI: 10.1016/j.envint.2022.107527

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