

Prenatal phthalate exposures and anogenital distance in Swedish boys

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The first study to examine prenatal exposure to the phthalate DiNP finds it is associated with a shorter anogenital distance (AGD) in Swedish boys at the age of 21 months. These findings raise concern since animal research has linked DiNP exposure to a shorter AGD, and studies on humans have related shorter AGD to male genital birth defects as well as impaired reproductive function in adult males, and the levels of DiNP metabolites in humans are increasing globally.

Phthalates are used as plasticizers in soft polyvinyl chloride (PVC) and found in a large number of commonly used consumer products. Due to reported health risk, di-isononyl phthalate (DiNP) has been introduced as a replacement for diethyl hexyl phthalate (DEHP) as a plasticizer in soft PVC. This raises concerns since animal data suggest that DiNP may have anti-androgenic properties similar to DEHP. In addition, biomonitoring data show that human DiNP metabolite levels are rapidly increasing globally. The anogenital distance (AGD) - the distance from the anus to the genitals - is a marker that has been used in animal studies to assess reproductive toxicity. While several studies have examined phthalates such as DBP, DEHP and AGD in humans, none has included DiNP.

The purpose of the current study have been to examine the relationship between 1st trimester urinary metabolite concentrations (week 9-11) of DEP, DBP, DEHP, BBzP as well as DiNP in relation to AGD in 196 Swedish boys at 21 months of age. Analyzes of the mothers urine, identified all phthalate metabolites in all samples. Anogenital distance

was measured by two pediatric nurses at County Council of Värmland, Sweden. The measured phthalate levels and AGD were comparable with data from two pregnancy cohort studies in USA.

Most of the phthalate metabolites were associated with a shorter AGD, however, not all associations reached significance. The strongest and significant associations were found between a shorter AGD and DiNP metabolites.

These findings call into question the safety of the recent substitution of DiNP for DEHP in soft PVC, particularly since a shorter male AGD has been shown to be related to male genital birth defects in children (such as hypospadias and undescended testis) and impaired reproductive function in [adult males](#) (such as decreased fertility, impaired semen quality and lower serum testosterone levels) and the fact that human levels of DiNP are rapidly increasing globally, says Carl-Gustaf Bornehag, professor in Public Health Sciences at Karlstad University and responsible for the current study.

More information: Bornehag, C.G., Carlstedt, F., Jönsson, B.A.G., Bodin, A., Jonsson, C., Janson, S., Swan, S. . "Prenatal Phthalate Exposures and Anogenital Distance in Swedish Boys," *Environmental Health Perspectives*; [DOI: 10.1289/ehp.1408163](https://doi.org/10.1289/ehp.1408163)

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