

RESEARCH ARTICLE

Investigation of Relationships between Urinary Biomarkers of Phytoestrogens, Phthalates, and Phenols and Pubertal Stages in Girls

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Abstract

Background: Hormonally active environmental agents may alter the course of pubertal development in girls, which is controlled by steroids and gonadotropins.

Objectives: To investigate associations of concurrent exposures from three chemical classes (phenols, phthalates, and phytoestrogens) with pubertal stages in a multi-ethnic longitudinal study of 1151 girls from New York City, greater Cincinnati, and northern California who were 6-8 years old at enrollment (2004-2007).

Methods: We measured urinary exposure biomarkers at visit 1 and examined associations with breast and pubic hair development (present or absent, assessed one year later) using multivariate adjusted prevalence ratios (PR) and 95% confidence intervals (CIs). Modification of biomarker associations by BMI% (age-specific body mass index percentile) was investigated, because adipose tissue is a source of peripubertal hormones.

Results: Breast development was present in 30% of girls, and 22% had pubic hair. High-molecular-weight phthalate metabolites were weakly associated with pubic hair development (adjusted PR 0.94 (0.88-1.00), fifth vs first quintile). Small inverse associations were seen for daidzein with breast stage and for triclosan and high-molecular-weight phthalates with pubic hair stage; a positive trend was observed for low-molecular-weight phthalate biomarkers with breast and pubic hair development. Enterolactone attenuated BMI associations with breast development; in the first enterolactone quintile the association of high-BMI with any development was 1.34 (PR, CI 1.23-1.45 versus low-BMI); there was no BMI-association in the fifth, highest quintile of enterolactone.

Conclusions: Weak hormonally active xenobiotic agents investigated in this study had small associations with pubertal development, mainly among those agents detected at highest concentrations.

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