Identification of phthalate esters in the serum of young Puerto Rican girls with premature breast development (thelarche)

Ivelisse Colón[1], Doris Caro[1], Osvaldo Rosario[1], Carlos J. Bourdony

[1]Department of Chemistry, University of Puerto Rico, San Juan, Puerto and [2] Premature Sexual Development Registry of Puerto Rico, Department of Health Pediatric Endocrinology Division, San Juan City Hospital, Puerto Rico Department of Pediatrics, University of Puerto Rico, School of Medicine

Premature thelarche is defined as the premature growth of mammarian tissue in girls without other manifestations of puberty. Puerto Rico has the highest known incidence of premature thelarche ever reported. In the last two decades since this serious anomalous public health observation is known, no explanation for this phenomenon has been found.

It is well established that some organic pollutants, including pesticides and some plasticizers, can disrupt normal sexual development in wildlife. Many of these have been widely used in Puerto Rico. This investigation was designed to identify pollutants with a possible association with the occurrence of premature thelarche in Puerto Rico.

A method for blood serum analysis was optimized and validated using pesticides and phthalate esters as model compounds of endocrine disrupting chemicals. Percents of recovery were higher than 80% for all compounds. Final detection was performed by GC/MS. Forty-one serum samples analyzed were from thelarche patients. Although no pesticide or their metabolite residues were detected in the serum of the study subjects, significantly high levels of phthalate esters were identified. Thirty-five control samples were also analyzed and only one showed significant levels of di-isooctyl phthalate. Many analytical blanks were also performed to assure the quality of the data obtained.

Dimethyl, diethyl, dibutyl, di-(2-ethylhexyl) and its major metabolite mono-(2-ethylhexyl) phthalate were identified in 28 (out of 41) serum samples from Puerto Rican girls with premature thelarche. These phthalates have been classified as endocrine disruptors. This study represents a possible human model for the assessment on how these substances may threaten human health.