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Dietary Patterns and Ultra-processed Food Consumption Exposure to Phthalates and Bisphenols in the Women's Health

Ariel Pablo Lopez*

Department of Genetics, Molecular Biology Laboratory, Universidad de Buenos Aires, Argentina

***Correspondence to:** Ariel Pablo Lopez, Department of Genetics, Molecular Biology Laboratory, Universidad de Buenos Aires, Argentina, E-mail: aplopez@prensamedica.com.ar

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Introduction

Multiple consumer and commercial items include synthetic chemicals phthalates and bisphenols, which have multiple uses. Bisphenols are employed in epoxy resins and polycarbonate plastics, while high molecular weight phthalates are used to manufacture flexible, long-lasting polymers. Children's exposure to phthalates has been related to a range of harmful health outcomes, such as cognitive decline, behavioral issues, and deteriorated lung function. It is increasingly linked to an increased risk of various long-term health issues, such as diabetes and obesity. The Women's Health Initiative (WHI) is the greatest study project on nutrition and health to be established in the United States. Inflammation can be influenced by several dietary variables. Inflammatory indicators including C-reactive protein (CRP) and interleukin-6 (IL-6) are increased by a European diet high in high-sugar anti-inflammatory foods, refined carbohydrates, red and processed meats, and fried meals (IL-6) [1]. Due to their extensive usage in consumer products including cosmetics, fragrances, toys, shampoos, prostheses, and packaging materials, these synthetic chemicals are known endocrine disruptors, and human exposure to them is common. The high molecular weight phthalate diesters and those who are allergic to low molecular phthalates are mostly exposed through diet, and the majority of these substances have numerous phthalate intermediates and bisphenols in their urine. Since exposure to phthalates and BPA (Bisphenol A), there is growing worried about the prevalence of exposure sources to a variety of adverse health consequences because of their capacity to interfere with endocrine function.

Adults are primarily exposed to phthalates through food because phthalates are a prevalent ingredient in food packaging products and because phthalates can leak from packaging and contaminate food. Moreover, certain phthalates' lipophilic characteristics make them more likely to "stick" to fatty meals, exposing consumers to greater quantities of phthalates through these foods. Phthalates can leak into food when they interact with it since they are not covalently bonded to polymers, especially at higher temperatures. Consumption is the primary method of exposure to high molecular weight phthalates and bisphenols. Higher urinary concentrations of several phthalate metabolites have been linked to the intake of particular food types, such as dairy products, meat, spices, flour, wheat, or cereals. Phthalates are also found in a variety of packaging materials for food, such as plastic films. The use of cans and beverages was connected to increased levels of BPA in urine intake to phthalates has also been associated with dietary sources, including school canteen meals, eateries that serve fast food, food frequency questionnaire (FFQ), main dietary assessment tool used in the WHI (Women's Health Initiative), is crucial to the clinical trials low-fat diet alteration arm. According to the WHI FFQ test, one of the qualifying requirements for women is that their body fat percentage must be at least 32%. According to the WHI FFQ test, one of the qualifying requirements for women is that their body fat percentage must be at least 32%. High correlations between nutrients, interactions with a single food group or nutrient that may be too small to be identified, and statistically significant associations that may be the result of chance or excessive reliance on analytical tests are all difficulties in evaluating specific foods or food groups.

Materials and Methods

Study participants

All contestants were between the ages of 50 and 79 at enrollment and got involved in one of at least four clinical trials (CT; N = 68,132) or observational studies (OS; N = 93,676) that made up the WHI, a sizable and complex study of techniques to avoid and manage popular morbidity and mortality in postmenopausal women respondents filled out surveys, gave a 24-hour meal recall, and provided urine samples. while being evaluated at the NHANES Mobile Study Center. The study procedure was accepted by both the participants and the National Institute for Health Statistics (NCHS). We restricted our analysis to those, with chemical and food exposure data that were comprehensive. Thereafter, 194 persons with unreported covariates - of whom 193 did not disclose, one did not complete the physical activity evaluation, and one did not earn a living were eliminated. There were no statistically significant differences in the traits of those in the analysis sample who were included and those who were removed when compared to the

2,212 participants in the final analysis sample.

Classification of Food Processing

There are four levels of food processing in the Food Processing Classification System's categorization of foods and drinks provided in the following categories for each product and beverage subject to a 24-hour food recall [2]. Unprocessed or lightly processed foods, processed food components, processed foods, and highly processed foods are among the options. Foods from plants and animals that are fresh or cooked without additions like sugar, salt, or oil, such as fruit, flour, and meat, are considered unprocessed or minimally processed. Unprocessed or slightly processed foods manufactured from prepared materials or foods preserved in various ways are referred to as processed foods. Foods like honey, butter, and salty ultra-processed foods, including mass-produced, industrially packaged meals, are examples of natural goods that are prepared for use in cooking rather than being eaten on their own [3-6]. Unrefined or minimally processed foods are infrequently found in the components of ultra-processed meals, and they frequently contain additions that are uncommon in traditional culinary preparations. According to the concept of ultra-processed meals, the majority of the food you buy at fast food joints or from vending machines is considered to be ultra-processed. 18 categories were created by classifying all ultra-processed food and drink according to previously suggested categories.

Biomarkers of Exposure to Phthalates and Bisphenol

Humans are likely to be exposed to phthalates, which are pervasive industrial pollutants. To evaluate exposure to phthalates, validated analytical techniques for detecting minute concentrations of phthalate metabolites in humans are required. The Centers for Disease Control and Prevention (CDC) measured seven additional analytes, which include oxidative metabolites of diisononyl and diisodecyl phthalate, two commonly used chemical compounds, to ascertain phthalate metabolites and total bisphenols using solid-phase extraction and high-performance liquid chromatography (HPLC) [7,8]. We employed a novel, unorthodox HPLC solvent gradient procedure for a number of consumables. These 22 phthalate metabolites can be precisely and accurately detected in parts per billion. To illustrate the value of phthalate metabolites in exposure assessment, further information is required, including chronic toxicity data.

Phthalates and Bisphenols in Pregnancy: Dietary Predictors

Throughout pregnancy, there are considerable changes in both diet and physiology. Even though it's critical to conduct numerous food monitoring allow students to learn dietary sources of phthalates and BPA, particularly during pregnancy, to make dietary recommendations for this at-risk population, foods and dietary practices like eating organic food, adopting a vegetarian diet, and taking folic acid are linked to leading healthier lives. For instance, decreased urine phthalate

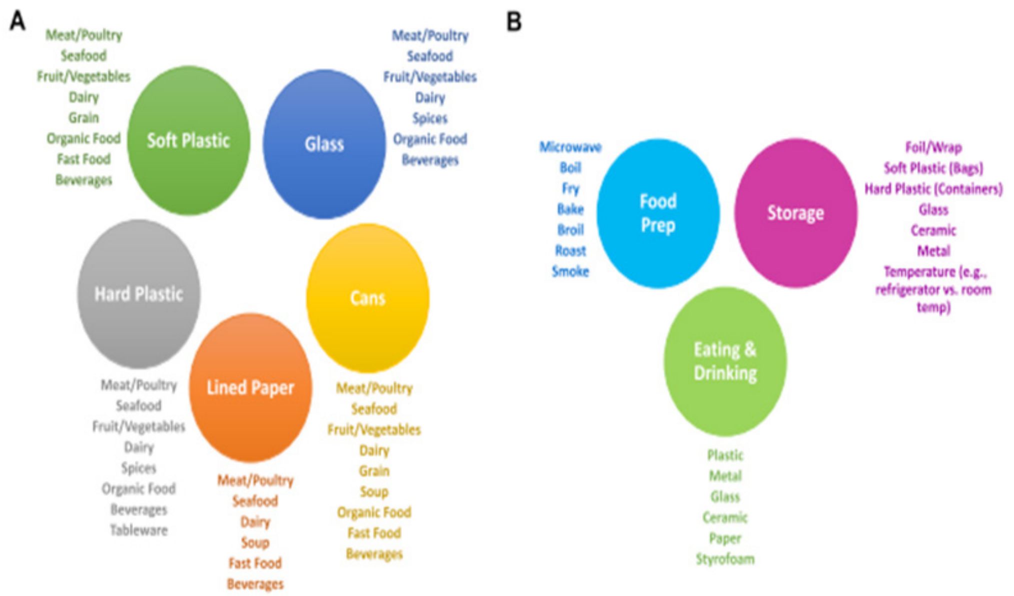

Figure 1: A list of possible food packaging materials and customer eating habits. **(A)** Possible causes of phthalate and BPA exposure from food packing materials, such as glass, lined paper, cans, and flexible and hard plastics. **(B)** Consumer food habits that affect exposure to phthalates and BPA, such as food preparation, storing, and consumption methods.

Table 1: Urinary phthalate metabolite and bisphenol concentrations (ug/g-creatinine) according to quartiles of percent of total energy intake from ultra-processed food.

Phthalate metabolite or bisphenol	Quartile 1: 0 - <46.7% (n = 553)	Quartile 2: 46.7 - <63.1% (n = 553)	Quartile 3: 63.1 - <79.2% (n = 553)	Quartile 4: 79.2% - 100% (n = 553)	*p*-value
Summed di(2-ethylhexyl) (∑DEHP)	22.7 (1.8)	23.2 (1.1)	24.3 (1.4)	26.3 (1.4)	0.08
Mono-benzyl (MBzP)	4.1 (0.3)	3.9 (0.2)	4.5 (0.3)	5.6 (0.5)	0.001
Mono-(3-carboxypropyl) (MCPP)	1.8 (0.1)	2.1 (1.5)	2.3 (0.2)	2.8 (0.2)	0.001
Mono-(carboxyisononyl) (MCNP)	2.3 (0.1)	2.9 (0.2)	3.0 (0.1)	3.3 (0.2)	0.001
Mono-(carboxyisoctyl) (MCOP)	16.7 (1.2)	21.1 (1.5)	21.8 (1.7)	31.9 (1.7)	<0.001
Bisphenol A	1.2 (0.6)	1.2 (0.7)	1.4 (0.9)	1.4 (0.6)	0.004
Bisphenol F	0.5 (0.04)	0.4 (0.03)	0.4 (0.03)	0.4 (0.03)	0.43
Bisphenol S	0.5 (0.05)	0.5 (0.03)	0.5 (0.05)	0.6 (0.05)	0.06

metabolite and bisphenol concentrations in pregnant women are related to supplements, broth, spices, and cereals. The use of plastic boxes increased urinary concentration levels of phthalate metabolites, despite the fact that numerous food surveillance studies found high levels of phthalates and BPA in meat and dairy products [9]. Most study designs in pregnant women also failed to reliably identify associations between food groups and phthalates and BPA. and increased BPA levels in urine.

Results and Discussion

Dietary methods to reduce blood pressure and aMed diet ratings were negatively correlated with diphthalate levels. Inverse relationships between DII-, DASH, and aMed scores and monobenzyl and mono-3-carboxypropyl phthalates were also found [10-13]. An association between DII scores and the total of monobenzyl phthalate and di-n-butyl phthalate was found to be positive, except for MEHP (57.8%), BPA (67.3%), and BPA (88.9%). Young, non-Hispanic blacks or people of other races were more likely to be found in the higher percentile of ultra-processed food consumers.

Conclusion

Higher urine concentrations of MCPP, MCNP, and MCOP were associated with increasing intake of ultra-processed foods, still not MBzP, other compounds, or bisphenols. Urinary concentrations of MCPP and MCNP were 25 - 50% higher in individuals in the top quartile of ultra-processed food consumption in comparison to total energy intake in the bottom quartile [14]. Examples of ultra-processed foods include flavored milk, enriched yogurt, and dessert. But whole or condensed milk and unflavored yogurt were classified as lightly processed. Concentrations of DEHP and MBzP, two metabolites not linked to ultra-processed meals, drop while levels of the phthalate precursor MCPP, which is connected with increased intake of ultra-processed foods. Shellfish and vegetables in cans are categorized as processed under the NEW categorization system, not as fresh [15]. Microwave soups and canned goods are regarded as ultra-processed if they include no industrial additives. Our emphasis on highly processed foods, the different outcomes might have been caused by the inclusion of products packaged in jars or boxes rather than containers, or by changes in the amount of BPA used over time to package beverages and foods [16]. Only one ultra-processed food category and not the overall intake of ultra- or less processed foods were linked to bisphenol S. Food samples with higher levels of bisphenol A and F than the amount of bisphenol used in food production can lessen exposure to phthalates and bisphenol as well as the health effects that go along with it, particularly especially youngsters, who are more prone to pollutants and consume more food that has undergone extensive processing than adults.

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