Fast Food: A Source of Exposure to Phthalates and Bisphenol A in a Nationally Representative Sample

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Introduction

Certain phthalates and bisphenol A (BPA) are industrial chemicals widely used in consumer products that can adversely impact human health. Diet is hypothesized to be a major source of exposure but little is known about the impact of specific food sources.

- **BPA**: Bisphenol A is found in polycarbonate, plastic products, and epoxy resin (food can lining)
- **DEHP & DINP**: Di (2-ethylhexyl) Phthalate & Di-iso-nonyl Phthalate are plasticizers that impart flexibility to polyvinyl chloride (PVC), tubing, plastic gloves, food containers, building material, etc.

Exposures are associated with:
- Metabolic disorders and diabetes
- Reduction in couple fecundity
- Allergic diseases, behavioral and neurodevelopment impairment in children
- Increased asthma risk in children

Is Fast Food an Exposure Source?

✓ Processed ✓ Packaged ✓ Handled

**OBJECTIVE:** To test the association between fast food consumption and urinary levels of high molecular weight phthalates (DEHP & DINP) and BPA

Methods

- National Health and Nutrition Examination Survey (NHANES), 2003-2010 data
- NHANES Mobile Exam Center
  - 24-hour food recall
  - Urine sample
- Nationally representative of persons aged 6 to 85 years old
- Exposures: Fast Food (kilo calories) modeled dichotomously (Yes/No); categorically (0%, 1-49% 50%+) total dietary intake
- **Outcome**: Urinary measures of BPA, DEHP, (MEHP, MEHHP, MEOHP, MCPP) & DINP (MCOP metb)
- **Sample Size BPA**: 8792
- **DEHP**: 8876
- **DINP**: 6628
- **Confounders**: age, sex, household poverty-income ratio (PIR), race/ethnicity, body mass index (BMI), NHANES cycle year, urinary creatinine and survey weights
- **Regression Model Analysis** in SAS Version 9.3 (SAS Institute, Inc., Cary, NC)

Conclusions

- Fast food is not a potential source of exposure for BPA
- Fast food is a significant route of exposure for high molecular weight phthalates (DEHP and DINP)
- Positive dose-response effect exists between fast food and DEHP and DINP (p<0.0001)
- Meat and grains are the drivers of this association between fast food and DEHP and DINP

**Implications**:
- Further research to investigate which components of the fast food industry (production and storage, cooking process, packaging, etc.) contribute to this association
- Greater policy awareness of phthalate substitution given evidence of the stronger DINP associations, a DEHP replacement phthalate

Results

- Majority of participants had detectable levels of chemicals:
  - Phthalates >87% and BPA >90%
- 35% had consumed fast food in the last 24 hours

**Main Analysis**

**Percent Change in Chemical Concentration by Fast Food Exposure Level, NHANES 2003-2010**

<table>
<thead>
<tr>
<th>Exposures as % of Total Consumption</th>
<th>Reference</th>
<th>Adjusted</th>
<th>DEHP (95%CI)</th>
<th>DINP (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% Fast Food</td>
<td>ref-</td>
<td>ref-</td>
<td>ref-</td>
<td>ref-</td>
</tr>
<tr>
<td>1-49% Fast Food</td>
<td>10.6 (8.2,23.4)</td>
<td>20.4** (20.0,45.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100% Fast Food</td>
<td>28.0% (16.1,41.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Adjusted Geometric Mean Phthalate Concentration by Fast Food Exposure Level**

**Adjusted Geometric Mean Phthalate Concentration by Fast Food Grain Exposure Level**

**Adjusted Geometric Means Phthalate Concentration by Fast Food Meat Exposure Level**

Sub-Analysis: In adjusted regression analysis of food groups - meat and grains were associated with elevated phthalate levels

References


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