Environmental nutrition and women’s health – should we worry about BPA and phthalates?
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Environmental Nutrition
• Intersection between environmental health and nutrition
• Food and water provide needed nutrients, but are also vehicles of toxicant exposure
• Nutrients and toxicants may interact

Mechanisms by which nutrients may alter toxicity of environmental exposures

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Example</th>
<th>Reference (PubMed ID*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhance absorption of the environmental chemical in the intestinal tract</td>
<td>Dietary fat increases phthalate absorption from foods stored in plastic food storage materials</td>
<td>12142236</td>
</tr>
<tr>
<td>Decrease absorption of the environmental chemical in the intestinal tract</td>
<td>Dietary fiber decreases absorption of polychlorinated biphenyls (PCBs)</td>
<td>17977574</td>
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<tr>
<td></td>
<td>Coffee and tea decreased absorption of dietary mercury</td>
<td>22014585</td>
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<tr>
<td>Increase the toxicity of the environmental exposure</td>
<td>Iron creates free radicals which can increase the toxicity of polychlorinated biphenyls (PCBs)</td>
<td>8597166</td>
</tr>
<tr>
<td>Decrease the toxicity of the environmental exposure</td>
<td>Antioxidants (vitamins A, C, E, and zinc) prevent the conversion of nitrites to adduct forming N-nitroso compounds</td>
<td>12948815</td>
</tr>
<tr>
<td>Aid in the elimination of the environmental exposure</td>
<td>Folate provides methyl-groups needed for excretion of inorganic arsenic</td>
<td>18522624</td>
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* To find the referenced article, visit PubMed.gov, and enter the ID number into the search box.
Bisphenol A (BPA) is used in the production of epoxy resins and polycarbonate plastics. Phthalates are added to plastics, especially polyvinyl chloride (PVC), to increase flexibility and resiliency. The primary route of human exposure to both bisphenols and phthalates is through food and beverages that have been in contact with plastics containing those chemicals. BPA have been demonstrated to leach from plastics as the plastic degrades, especially after exposure to high temperatures or acidic/basic foods. Di-2-ethylhexyl phthalate (DEHP) enters food items during processing, and is more likely to leach into liquids and non-polar solvents such as fats and oils. The medical setting can also be a source of EDC exposure through IV tubing and catheters, time release coatings on medications and dietary supplements, and exposure to other disposable medical supplies.

Demonstrating the ubiquity of BPA and DEHP exposure among the US population, BPA was detected in the urine of 93% of the 2003-2004 NHANES cohort, and DEHP metabolites were detected in the urine of >75% of the 1999-2000 NHANES cohort.

The reference dose (RfD) set by the US Environmental Protection Agency as an acceptable human intake is 50 μg BPA/kg/day and 20 μg DEHP/kg/day. Many researchers feel these RfDs are too high, and chronic, low-dose exposures may also pose significant health effects.

**Glossary**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Bioaccumulation</td>
<td>A process by which chemicals are taken up by an organism either directly from exposure to a contaminated medium or by consumption of food containing the chemical. (EPA)</td>
</tr>
<tr>
<td>Endocrine disrupting chemical</td>
<td>Chemicals that may interfere with the body’s endocrine system and produce adverse developmental, reproductive, neurological, and immune effects in both humans and wildlife (National Institute for Environmental Health Sciences, NIEHS)</td>
</tr>
<tr>
<td>Lowest observable adverse effect level (LOAEL)</td>
<td>The lowest exposure level at which there are biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control group. (IRIS glossary, EPA)</td>
</tr>
<tr>
<td>Lowest observed effect level (LOEL)</td>
<td>In a study, the lowest dose or exposure level at which a statistically or biologically significant effect is observed in the exposed population compared with an appropriate unexposed control group. (IRIS glossary, EPA)</td>
</tr>
<tr>
<td>No observed adverse effect level (NOAEL)</td>
<td>The highest exposure level at which there are no biologically significant increases in the frequency or severity of adverse effect between the exposed population and its appropriate control; some effects may be produced at this level, but they are not considered adverse or precursors of adverse effects. (IRIS glossary, EPA)</td>
</tr>
<tr>
<td>Reference dose (RfD)</td>
<td>An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. (IRIS glossary, EPA)</td>
</tr>
</tbody>
</table>
**Recommended Resources:**


State of the Science of Endocrine Disrupting Chemicals – 2012
World Health Organization

National Report on Human Exposure to Environmental Chemicals
Centers for Disease Control and Prevention
http://www.cdc.gov/exposurerreport/

Integrated Risk Information System (IRIS)
Environmental Protection Agency
http://www.epa.gov/IRIS/

Endocrine Primer
Endocrine Disruptor Screening Program (ESDP), Environmental Protection Agency
http://www.epa.gov/endo/pubs/edspoverview/primer.htm

Bisphenol A (BPA): Expanding Research to Impact Human Health
National Institute of Environmental Health Sciences (NIH)
http://www.niehs.nih.gov/research/supported/recovery/critical/bpa/index.cfm

Bisphenol A Fact Sheet
National Toxicology Program
http://www.niehs.nih.gov/health/assets/docs_a_e/bisphenol-a-factsheet.pdf

Food > Chemical Contaminants > BPA
Food and Drug Administration
http://www.fda.gov/Food/FoodborneIllnessContaminants/ChemicalContaminants/ucm166145.htm

Phthalates Fact Sheet
National Biomonitoring Program
http://www.cdc.gov/biomonitoring/Phthalates_FactSheet.html

Phthalates and DEHP
Healthcare Without Harm

Breast Cancer and the Environment: Prioritizing Prevention
Interagency Breast Cancer & Environmental Research Coordinating Committee (NIEHS, NCI)
http://www.niehs.nih.gov/about/boards/ibcercc

Check the Kinds of Plastic You Use   (patient education material, appropriate for all ages)
Pediatric Environmental Health Specialty Units
References