WHAT’S ALL THIS FUSS ABOUT BISPHENOL A?

Mr. McGuire: I want to say one word to you. Just one word.
Benjamin: Yes, sir.
Mr. McGuire: Are you listening? Benjamin: Yes, I am.
Mr. McGuire: Plastics.
   * The Graduate, 1967

A QUIZ*
1. True or false? In Oregon, the Willamette River is the most significant source of bisphenol A exposure as a result of industrial practices during the latter 20th century?
2. True or false? Multnomah County adopted a policy in 2011 restricting the sale of reusable beverage containers (including baby bottles) made with bisphenol A?
3. Choose the correct answer. One important way to limit one’s exposure to bisphenol A is:
   a. Minimizing the amount of large, resident species of fish from the Willamette River consumed.
b. Wearing a respirator when preparing a house for painting.
c. Washing one’s hands after handling receipts from cash registers.
4. True or false? The median U.S. urinary bisphenol A concentration increases with age.

THE SETUP
This is Oregon after all. We know you’ve had questions from your patients. So this week, CD Summary ventures into toxicology to explicate the mystery of bisphenol A. What is it? Where does it come from? Should we worry? Let’s get this out of the way first: exercise, don’t smoke, wear your seatbelt, lose weight, get tested for HIV, get immunized. Now...

...Bisphenol A, BPA for short, is an endocrine disruptor which is “any chemical (including dietary) or physical agent that modulates one or several of the endocrine organs or the function of these organs.”

More specifically, BPA can activate estrogen receptors, though, thankfully not as efficiently as estrogen itself. Some offspring of rodents given BPA during pregnancy manifest abnormal prostate and mammary growths and disruption of puberty.1 BPA hasn’t been conclusively linked to disease in people yet, but data from NHANES2 show an association between high urinary levels of BPA and some chronic diseases.2 So far as reasonably possible, we believe that limiting exposure to BPA is prudent. Especially if one is an infant or a fetus.6

A BIT OF CHEMISTRY
Patently apparent from its name, bisphenol A has two phenol rings in a pleasingly symmetric arrangement with two hydroxyl and two methyl groups (Figure 1). It has been widely used for at least 50 years to make polycarbonate polymers and epoxy resins in products such as hard plastic water bottles, compact disks, baby bottles, automobile parts, plastic dinnerware, dental composites, and thermal receipt paper.3 The most common source of exposure for the general population is believed to be canned foods into which BPA from the epoxy can linings leaches in measureable quantities (<0.2–1,140 parts per billion) during processing.4,5

Ubiquitous as these products are, you won’t be surprised to learn that 93% percent of us have detectable levels of bisphenol A in our urine.6 Unlike other more biologically persistent toxins, BPA is rapidly cleared from the body—within 24 hours—so, the high prevalence of detectable levels substantiates constant exposure (see Table 1).7 Children and adolescents have higher urinary BPA levels than adults and men have higher levels than women (not shown).6,8

So how much is too much? No one knows for sure but National Toxicology Program (in the Department of Health and Human Services) and others have estimated overall oral doses from all sources in various age groups (See Table 2, verso).

Table 1. Creatinine-adjusted urinary bisphenol A in the general U.S. population, 2007–2008

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>Median urinary bisphenol A concentration (µg/L)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>6–11</td>
<td>2.4</td>
</tr>
<tr>
<td>12–19</td>
<td>2.3</td>
</tr>
<tr>
<td>≥20</td>
<td>2.0</td>
</tr>
</tbody>
</table>

* µg/L = micrograms per liter

REGULATIONS
In Oregon, Senate Bill 695 restricting BPA in infant formula and baby bottles was introduced but failed to pass the state legislature during the 2011 session. However, in October 2011, the Multnomah County Board of Health voted (5–0) to restrict the sale of any reusable beverage container for adults or children (including baby bottles) that is made with BPA in Multnomah County. Even in the absence of regulation, some large retailers, such as Wal-Mart and Babies R Us and others have voluntarily phased out BPA from their baby bottles, pacifiers and other baby feeding products. Nalgene and Campbells7, among other manufacturers, have voluntarily removed BPA from their products.9

WAYS TO REDUCE EXPOSURE
Individual citizens can reduce bisphenol A exposure by ingesting fewer canned foods and beverages (Figure 2, verso). If you are a retail worker who handles a lot of receipts printed on carbonless (or thermal) copy paper which contains BPA, you can also reduce your exposure by washing your hands between handling receipts and putting on soap and water between).10

http://e360.yale.edu/digest/campbells_to_stop_using_chemical_bpa_in_lining_of_soup_cans/3362/
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The best way to reduce infants’ exposure to bisphenol A is to breastfeed. If that isn’t possible, parents can look for BPA-free or “no BPA-added” infant formula cans. Also, reconstituted canned powdered infant formula has consistently lower bisphenol A concentrations than canned liquid (ready to use) formulas. Parents can also look for bottles, pacifiers, and teething rings that are BPA-free.

**QUIZ ANSWERS:**
1. Blatantly false. Use of the Willamette as an industrial toilet was, sadly, common at one time. However the chemical legacy of these activities consists of more environmentally persistent chemicals than BPA, such as polychlorinated biphenyls (PCBs), dioxins, and dichlorodiphenyltrichloroethane (DDT).
2. True.
3. While a) isn’t a bad idea for women of child-bearing age, and b) is a great idea for reducing the potential for environmental lead exposure, the correct answer is c).
4. False. See Table 1.

**ADDITIONAL RESOURCES**
- EPA’s Action Plan for Bisphenol A: [www.epa.gov/oppt/existingchemicals/pubs/actionplans/bpa.html](http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/bpa.html)
- Multnomah County BPA Ban: [http://oeb.multco.us/bpa](http://oeb.multco.us/bpa)

**REFERENCES**
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