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# BISPHENOL-A AND ITS HARMFUL EFFECTS ON HUMAN DEVELOPMENT

by Letty Guerra\*

**B**isphenol-A (“BPA”), the endocrine-disrupting chemical used to create polycarbonate plastics, such as baby bottles, microwavable plastics, and children’s toys, may interfere with human brain development.<sup>1</sup> BPA is consumed when it leaches from plastic containers into foods or drinks as they are heated or when they become broken or cracked.<sup>2</sup> BPA has been linked to a numerous adverse effects, including an increase in breast and prostate cancer cell growth,<sup>3</sup> obesity when exposed early in life, gestational diabetes in women,<sup>4</sup> damage to human brain development, diminished sperm production,<sup>5</sup> early puberty,<sup>6</sup> and insulin-resistance, which leads to diabetes.<sup>7</sup>

An ongoing concern in the scientific community is the effect of prenatal and childhood exposure to BPA and other endocrine-disrupting chemicals (“EDCs”). The relation of these chemicals to “abnormalities in human sexuality, gender development and behaviors, reproductive capabilities, and sex ratios” is a major distress among scientists.<sup>8</sup> Although high-level exposure to EDCs clearly has gender-related effects on human development, today’s debate centers around low-dose exposures, “generally defined as doses that approximate environmentally relevant levels.”<sup>9</sup> BPA studies have demonstrated that exposure at quantities lower than the EPA’s reference dose has detrimental effects on fetal development.<sup>10</sup> Additionally, the possibility that harmful effects from exposure to EDCs can be passed down through generations is extremely alarming.<sup>11</sup>

The current U.S. Environmental Protection Agency (“EPA”) standard for tolerable levels of BPA exposure was set in 1982 and is known as the “reference dose.”<sup>12</sup> This dose, 50 mg/kg/day, reflects the level of BPA that the EPA has determined is safe for human exposure. However, studies indicate that lower exposure doses of BPA have profound impacts on human development that can last throughout adulthood.<sup>13</sup> Despite the fact that BPA’s presence is highly widespread – it was detected in the blood and urine of 95 percent of people tested in the United States – the EPA’s standard remains unchanged.<sup>14</sup> The restriction of this chemical should be the EPA’s top priority.

As part of the agency’s Endocrine Disruptors Research program, the EPA Office of Research and Development will examine the effects of EDC exposure.<sup>15</sup> In response to a 2000 peer reviewed report, which found that “low-dose effects had been sufficiently documented at that point in time for the EPA to consider revisiting its current testing paradigm on the issue of low-dose adverse affects,” the EPA “is currently funding three research grants in the area of low-dose EDC exposures.”<sup>16</sup>

On a grassroots level, there are various ways to limit our exposure to BPA. For instance, some stores have decided to stop selling the popular water bottle, Nalgene.<sup>17</sup> Nalgene bot-

tles are composed of lexan polycarbonate resin.<sup>18</sup> In 1998, Dr. Patricia Hunt of Case Western Reserve University stumbled upon an unexplainable result of aneuploidy<sup>19</sup> in one of her experiments.<sup>20</sup> It was traced to a harsh detergent that was used to clean the polycarbonate mice cages and water bottles.<sup>21</sup> The detergent caused the plastic to leach BPA, and this accident was duplicated in another study.<sup>22</sup> Even though another study conducted in 2003 confirmed Dr. Hunt’s results, the polycarbonate industry has harshly criticized Dr. Hunt’s findings.<sup>23</sup>

Additionally, California’s Assembly recently proposed Bill 319, which would have banned some products that contained BPA and phthalates<sup>24</sup> intended for use by children.<sup>25</sup> Assembly Bill 319 “sought to limit some transitional phthalates that have been shown to be especially deleterious to normal development, especially sexual development,”<sup>26</sup> but was unfortunately defeated on January 19, 2006.<sup>27</sup> However, it provides a useful model for other states looking to take action on BPA exposure.

Becoming informed consumers allows individuals to limit the exposure to themselves and their families, and to inform others in their communities of the risks of using plastics containing BPA. Additionally, the EPA should re-evaluate its risk assessment process, and more state legislatures should try to ban BPA. In short, the public must take the responsibility for making wise decisions when purchasing merchandise composed of plastic.



## ENDNOTES:

<sup>1</sup> See News-Medical.Net, Medical Research News, *Bisphenol A (BPA) Has Been Linked to Damage in Developing Brain Tissue* (Dec. 2, 2005), available at <http://www.news-medical.net/?id=14790> (last visited Feb. 3, 2006); see generally THEO COLBORN, DIANNE DUMANOSKI, JOHN PETERSON MYERS, *OUR STOLEN FUTURE, 50-76* Plume/Penguin Books 1997), available at <http://www.ourstolenfuture.org> (last visited Feb. 3, 2006).

<sup>2</sup> See Cynthia Washam, *Exploring the Roots of Diabetes: Bisphenol A May Promote Insulin Resistance*, 114 ENVTL. HEALTH PERSP, 106-112 (2006), available at <http://ehp.niehs.nih.gov/docs/2006/114-1/ss.html#expl> (last visited Feb. 3, 2006); see also THEO COLBORN, *supra* note 1, at 50-76 (finding that “the older the plastic is, the faster the leaching rate.”).

<sup>3</sup> See News-Medical.Net, *supra* note 1; See generally Breast Cancer Fund, *Report Finds Half of Breast Cancer Causes May Be Environmental* (Jan. 24, 2006), available at <http://www.breastcancerfund.org/site/pp.asp?c=kwKXLDPaE&b=1370305> (last visited Feb. 3, 2006).

<sup>4</sup> See Science News Online, *Diabetes from a Plastic? Estrogen Mimic Provokes Insulin Resistance*, Jan. 21, 2006, available at <http://www.sciencenews.org/articles/20060121/fob4.asp>. (last visited Feb. 3, 2006).

<sup>5</sup> See News-Medical.Net, *supra* note 1.

<sup>6</sup> *Id.*; see also Roger Highfield, *Are These Sperm Doomed?*, THE TELEGRAPH, TELEGRAPH.CO.UK, available at <http://www.telegraph.co.uk/connected/main.jhtml?xml=/connected/2005/06/15/ecfsperm15.xml> (last visited Mar. 24, 2006) (discussing how even very low doses of BPA can alter the develop-

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ment of mammary glands during puberty, leading to an increased risk of developing breast and prostate cancer).

<sup>7</sup> See Washam, *supra* note 2.

<sup>8</sup> See Ernie Hood, *Are EDCs Blurring Issues of Gender?*, 113 ENVTL. HEALTH PERSP. Oct. 2005, at A 670, available at <http://ehp.niehs.nih.gov/members/2005/113-10/focus.html> (last visited Feb. 10, 2006).

<sup>9</sup> Hood, *id.*

<sup>10</sup> See TELEGRAPH, *supra* note 6. In one particular study, the dose that caused insulin resistance in mice is in the same range as the EPA's reference dose; see also THEO COLBORN, *supra* note 1, at 50-76.

<sup>11</sup> See Highfield, *supra* note 6 (highlighting one study that suggests that the decline in men today could be as a result of the exposure by their great-grandmothers to an environmental agent).

<sup>12</sup> See THEO COLBORN, *supra* note 1, at 50-76.

<sup>13</sup> See Hood, *supra* note 8; see also News-Medical.Net, *supra* note 1.

<sup>14</sup> See Washam, *supra* note 2.

<sup>15</sup> Hood, *supra* note 8 ("The integrated program was launched at about the same time that a congressional mandate, under the 1996 Food Quality Protection Act, directed the EPA to develop a screening and testing program for EDCs.").

<sup>16</sup> See U.S. Environmental Protection Agency, Office of Research and Development, [http://www.epa.gov/ord/articles/endocrine\\_grants.htm](http://www.epa.gov/ord/articles/endocrine_grants.htm) (last visited Mar. 30, 2006) (As of the date of publication the EPA has not submitted the results of its research).

<sup>17</sup> See Sanin Adnan, *Nalgene May Emit Toxins*, THE CAVALIER DAILY, Feb. 1, 2006, available at <http://www.cavalierdaily.com/CVArticle.asp>

?ID=25594&pid=1384 (last visited Feb. 28, 2006).

<sup>18</sup> See, e.g., Brenna Doheny, *Nalgene Plastic May Be Harmful*, THE DAILY BAROMETER, Mar. 28, 2006, available at <http://barometer.orst.edu/vnews/display.v/ART/40324e5d40a14> (last visited Mar. 28, 2006).

<sup>19</sup> A chromosomal state in which abnormal numbers of specific chromosomes or chromosome sets exists within the nucleus.

<sup>20</sup> See Hunt, PA, KE Koehler, M Susiarjo, CA Hodges, A Ilagan, RC Voigt, S Thomas, BF Thomas and TJ Hassold. 2003. *Bisphenol A exposure causes meiotic aneuploidy in the female mouse*, CURRENT BIOLOGY 13: 546-553.

<sup>21</sup> Hunt, *id.*

<sup>22</sup> Doheny, *supra* note 18.

<sup>23</sup> Doheny, *supra* note 18.

<sup>24</sup> A group of chemical compounds that are mainly added to plastics to increase their flexibility.

<sup>25</sup> See AcronymRequired.com, *Bisphenol-A and Phthalates Bill in California*, [http://www.acronymrequired.com/2006/01/bisphenol-a\\_and.html](http://www.acronymrequired.com/2006/01/bisphenol-a_and.html) (last visited Feb. 3, 2006); see also Shanna H. Swan, *Parents Needn't Wait For Legislation To Shield Kids From Toxins In Products*, SAN FRANCISCO CHRONICLE, Jan. 9, 2006, available at <http://www.sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/2006/01/09/EDGMKGJL61.DTL> (last visited Feb. 28, 2006) (mentioning how the European Union is also re-evaluating the use of BPA in children's products).

<sup>26</sup> AcronymRequired.com, *id.*

<sup>27</sup> See AcronymRequired.com, *id.*