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Cash Register Receipts: The Newest Prop 65 Violator

The latest culprit of Proposition 65 violations includes everyday items like receipts

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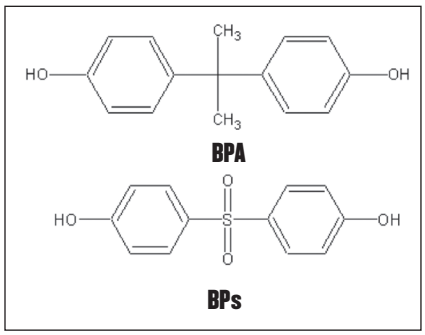
Businesses operating in California have long been aware the perils of utilizing any of the almost 1,000 chemicals identified by the state of California as potentially causing cancer or reproductive harm under California's Proposition 65. Consumer-facing businesses have learned to identify high-risk Prop 65 targets: soft, flexible plastics; faux and colored leathers; and any kind of brass or metal that may contain lead or other heavy metals. If they miss, scores of Prop 65 "bounty hunters" are waiting in the wings to seek penalties and attorney fees from businesses when they are caught including these chemicals in their products without a compliant warning label.

But since California typically leads the way on consumer regulations, even businesses that don't operate in California should be aware of a recent addition to the Prop 65 list: bisphenol A, or BPA. Consumer advocates have long voiced concerns about the use of BPA in baby bottles, as a liner for canned goods, and in other plastics and products. And as of May 11, 2016, BPA has been added to the Prop 65 list, so many businesses are scrambling to eradicate its use from these known sources. But one source may come as a surprise: BPA may be lurking in your cash register receipts and other thermal papers.

BPA Added to the Prop 65 List

Effective May 11, 2016, the California Office of Environmental Health Hazard Assessment added BPA to the list of Proposition 65 chemicals known to the state of California to cause reproductive harm. BPA commonly exists in certain plastics (particularly polycarbonates and epoxys) and UV-cured inks, as well as in the liner for canned foods. But many do not realize that thermal paper (commonly used in printing machines such as cash registers, credit card machines ATMs and automated ticket printers due to the fact that it does not require ink stock) is also likely to contain BPA – and businesses that fail to phase out the use of BPA-containing thermal paper before May 11 will eventually run the risk of receiving a Proposition 65 Notice of Violation from the plaintiffs' bar. Under Prop 65, businesses have a one-year grace period after the chemical has been listed to achieve compliance.

Figure 1: Chemical structure of bisphenol A (top) and the related bisphenol S (bottom).



BPA (figure 1) is a common chemical used in the adhesives and plastic industries. It is the common monomer in epoxy adhesives (the resin component) and is also used as a monomer high-impact polycarbonates used to make reusable bottles, safety glasses and CD/DVDs. Other advanced plastics such as polyether and polyether ether ketones as well as polysulfonates may contain BPA. BPA may also be found in PVC and vinyl (softened PVC), where it is sometimes included in the product as both a polymerization terminator and as an antioxidant.

BPA and Thermal Paper Technology

The technology of thermal-sensitive paper is straightforward. Normal paper is coated with an ink in a form that has little color at neutral or high pH, but becomes vivid at low pHs. Common inks include the leuco inks that demonstrate this pH-dependent color change. The paper is then sequentially coated with a thin layer of a temperature-sensitive polymer and a solid state acid, which acts as a developer. When the paper is heated by the printer head, the polymer melts and the dye and acid combine, the pH of the ink drops, and ink shifts to the colored form. When the paper cools back to room temperature, the thermal polymer condenses over the visible ink, thereby preserving the writing.

In order to function correctly, the acid component of the thermal dye must be solid with moderate water solubility, chemically

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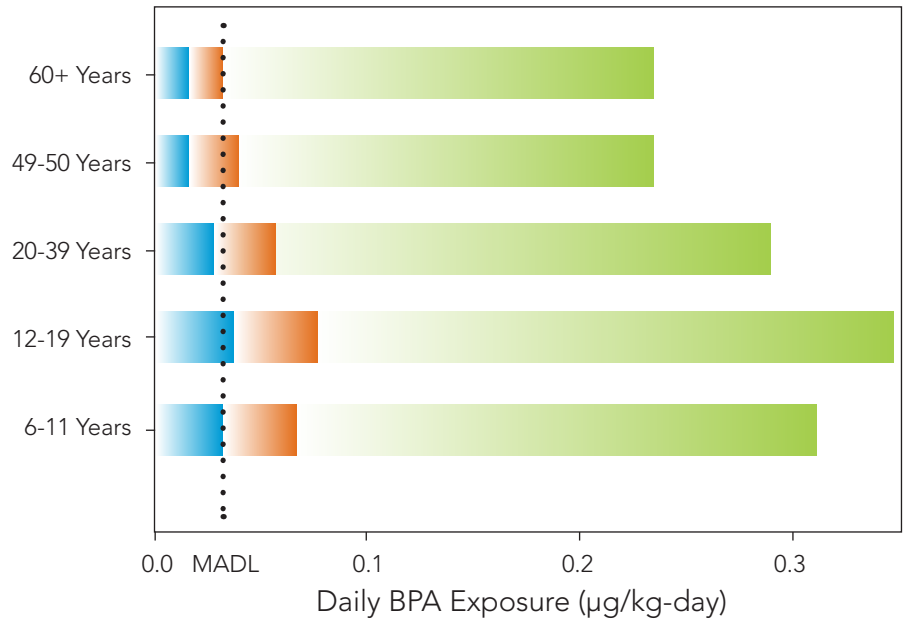
Figure 2: Daily BPA exposure based on urinary metabolite excretion by age.



The 2003 to 2004 National Health and Nutrition Examination Survey performed annually by the Centers for Disease Control and Prevention measured BPA metabolites in participants and back-calculated exposures by age group. The results are illustrated in figure 2. Almost all of this exposure is through inadvertent ingestion. Bars represent the 25th (blue), 50th (red) and 95th (green) percentile estimates from the 2003 to 2004 NHANES survey. The vertical dashed line represents OEHHA's proposed dermal MADL/kg-day.

stable within a large range of temperatures, and possess a low vapor pressure. BPA is one of the few chemicals that meet these criteria, and it provides the additional benefit of being low cost.

Why BPA Is on the Prop 65 List

The toxicology of BPA is complex, and its effects on humans are unknown. BPA has been classified as a weak estrogenic mimic, meaning that it produces effects similar to the female sex hormone estrogen. Binding studies with BPA and the classical estrogen receptors suggest its activity to be 1,000 to 10,000 times less than estrogen. However, some animal studies show impacts at lower concentrations, and some researchers have opined that BPA may act as a selective estrogen receptor modulator, while other researchers have advanced alternative theories.

The OEHHA has suggested (but has not yet confirmed) a maximum allowable daily limit, or MADL, for BPA of 3 µg/day through dermal exposure. This is extremely conservative and may not be supported by data. Current animal study data suggests that a more appropriate MADL would be on the order of 150-250 µg/day.[1]

Dermal Uptake Concerns

If OEHHA enacts 3 µg/day as the daily dermal limit as currently proposed, there will be an urgent need to remove all BPA-containing thermal paper from the market. The reasons are twofold. First, since exposure to the receipt is automatic for every customer who receives a receipt, traditional Proposition 65 warning systems may not be sufficient to avoid liability for alleged exposures. Second, because BPA in thermal paper is present in its monomer form, some studies have suggested that it is more available for transfer to people than BPA constituents of polymers, with one study suggesting that a single five-second contact by two fingers resulted in the average transfer of 1.2 µg of BPA (~0.22 µg/cm).[2] The study also indicated the transfer amount would increase about 15 times if the fingers were moistened. Interestingly, multiple exposures did not increase the BPA concentration on the skin, nor did longer holding periods (60 seconds compared with 5 seconds). This breaks down to an exposure of 3 µg/day (0.05 µg/kg-day) for the incidental user (i.e. consumer) and about 15.8 µg/day (0.24 µg/kg-day) for the occupational user (e.g. sales clerk).

Alternative Materials

BPA is not the only possible acid that can be used in thermal paper. Substitute materials include sulfonylureas or substituted salicylic acids, such as zinc di-tert-butylsalicylate. Another alternative commonly used in thermal paper is bisphenol S; however, because BPS itself has been implicated as a potential endocrine disruptor, it too may face limitations in the near future.

To review the footnotes to this article, visit http://www.metrocorpcounsel.com