Dramatic Devices?

Medical Procedures May Expose Infants to BPA

The industrial chemical bisphenol A (BPA) is widely used to make polycarbonate plastic and epoxy resins. Low-level exposure to BPA has been shown to cause endocrine disruption in animal experiments, resulting in abnormal development of the prostate and mammary glands, among other adverse outcomes. Interpreting these studies with regard to human health has generated substantial debate, one heightened by growing awareness of the widespread nature of BPA exposure. In this report, researchers describe substantial exposure to BPA and other potential endocrine disruptors through medical treatment of premature infants [*EHP* 117:639–644; **Calafat et al.**].

In an earlier study by the same group [*EHP* 113:1222–1225 (2005)], urine samples were collected from 54 premature infants in neonatal intensive care units at two institutions. The infants required medical interventions such as ventilation, enteral feeding, parenteral feeding, and indwelling catheterization. Some of the medical devices used in these procedures contained the plasticizer di(2-ethylhexyl) phthalate (DEHP), and urine sample analysis revealed that concentrations of DEHP metabolites correlated with the relative intensity (low, medium, or high) of medical device use—that is, the variety, invasiveness, and duration of the procedure(s) that each infant underwent.

In the current study, the team used some of those same urine samples to assess exposure to several other potential endocrine disruptors, including BPA, the antimicrobial triclosan, the preservatives methyl paraben and propyl paraben (found in personal care products), and benzophenone-3, a sunscreen agent. For each chemical, urinary concentrations of the free (unmetabolized) and total (both free and conjugated, or metabolized) compounds were measured.

The detection of BPA and both parabens in the urine of all the samples analyzed suggested that all the infants had been exposed to those chemicals. Benzophenone-3 was detected in the urine of all but 2 infants, whereas triclosan was detected in only 8 infants. Urinary concentrations of BPA correlated with those of DEHP, suggesting a common pathway of exposure. Of the chemicals assessed in the current study, only BPA correlated significantly with the intensity of medical device use, although the authors have no information about whether or how BPA is used in these devices.

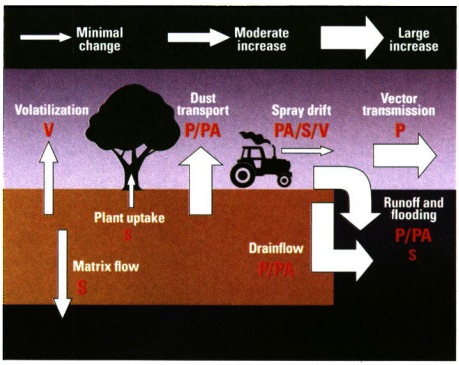
The median urinary BPA concentration in these infants was almost 10 times higher than levels reported elsewhere for 6- to 11-year-old children in the general population. The fact that more than 90% of the BPA was conjugated suggests that premature infants are able to metabolize the compound even though metabolic pathways typically do not function at an adult level for some months after birth. The authors suggest that, given concerns over BPA toxicity and the demonstrated exposure, use of BPA-free products may be justified in this developmentally vulnerable population. –Julia R. Barrett

Climate Change and Agricultural Agents

Planning for Future Interactions

Global climate change is expected to causeas increasingly extreme oscillations in atmospheric temperatures as well as increased frequencies and intensities of storms and natural disasters. Other effects may be felt in more indirect ways, such as through altered exposures to chemicals and pathogens whose use and spread, respectively, may shift in response to climate change. Researchers now present various scenarios for potential climate change–related shifts in human exposure to agricultural chemicals and pathogens in the United Kingdom [*EHP* 117:508–514; **Boxall et al.**].

A number of potentially hazardous agents are associated with agricultural activities, among them pesticides, fertilizers, pharmaceuticals, plant toxins, and pathogenic bacteria and fungi. Evidence suggests these and other agents travel well beyond farming operations through various channels, resulting in potential human exposure. According to the authors, the main routes of human exposure typically are consumption of food and drinking water, with vector, aerial, and direct contact pathways of less importance for the U.K. population.



P = particulate (e.g., microbes, nanoparticles); PA = particle-associated (e.g., hydrophobic organics, ammonium, heavy metals); S = soluble contaminant (e.g., nitrates, hydrophilic pesticides); V = volatile contaminant (e.g., methane). The size of the letter reflects the importance of the pathway to the agent in question.
Source: Boxall ABA et al. *EHP* 117:508–514 (2009).

Changes in chemical use to accommodate altered crop growing cycles, increased production of naturally occurring mycotoxins, and changes in temperature and precipitation all may contribute to more widespread human exposure to agricultural agents. For instance, more or new pesticides and biocides may be required to offset altered pest activity. This, along with localized increases of dissolved phosphorus and nitrate in drain flow and floodwaters, could lead to more overall exposure via waterways.

Dust released into the atmosphere during tilling and harvesting is a key transport pathway for particulate and particle-bound contaminants, and soil dust has already been linked to a range of human health impacts. The authors predict that hotter, drier summers will lead to increased transfer of surface dust into the environment, and air- and waterborne exposures associated with dust release are likely to be of major public health significance in the future.

Although the authors anticipate a rise in human health hazards associated with climate change–driven exposures to agricultural agents, they believe this rise can likely be managed in large part through research and policy changes such as the development of targeted surveillance schemes for monitoring farm-related pathogens and chemicals, and their health effects, as well as the creation of experimental data sets and models for airborne dust transport and other exposure pathways. –Tanya Tillett