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PCBs in schools—where communities and science come together

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Abstract

A novel aspect of the 8th International PCB Workshop at Woods Hole, MA, was the interaction between scientists and activists. While earlier workshops in this series had mentioned policy making, this Workshop focused on the problem of PCBs in schools. Focus on a problem brought an activist to give a plenary talk and facilitated a 1-day registration for other non-scientists to attend. The workshop was cohosted by the Superfund Research Programs at University of Iowa and Boston University and included active participation of each Program's Research Translation and Community Engagement Cores. A mandate of each National Institute of Environmental Health Science (NIEHS)-funded Superfund Research Program is bidirectional communication between scientists and community groups. The authors describe the events leading up to community involvement in the Workshop and the substance of the community engagement aspects of the workshop, in particular the participation by a parent-teacher group, Malibu Unites. The authors also discuss the value of such communication in terms of making important research accessible to those who are most affected by the results and poised to use it and the value of making scientists aware of the important role they play in society in addressing difficult questions that originate in community settings.

Keywords

PCBs; Community engagement; Research translation; Schools; Mitigation; Construction materials; Indoor air

Background/introduction

Polychlorinated biphenyls (PCBs) are mixtures of individual chemicals that have not been intentionally manufactured in the USA since the 1970s but due to their persistent nature are ubiquitous nonetheless. While many electric utilities began to remove PCBs from equipment such as transformers starting in the 1980s, some electrical equipment and commercial

products still contain PCBs. At least 500 of the 1598 National Priorities List (Superfund) sites contain PCBs (Hornbuckle and Robertson 2010), and present manufacturing can produce byproducts containing congeners of PCBs (Grossman 2013). All these sources contribute to a profusion of these chemicals that can be found in indoor and outdoor air, soil, water, food, and house dust. There are 209 individual PCBs known as congeners. Most were part of Aroclor mixtures used for a variety of products (Aroclor is the trade name of commercial PCB formulations by the Monsanto Company). Lower molecular weight PCB congeners generally are not part of Aroclor formulations and much still remains unknown about the volatilization, transport, and exposure of lower halogenated PCBs via air.

PCBs have been found in US schools since the 1970s. Reports of PCB emissions from fluorescent light ballasts, caulking, and sealants date back to 1974 (Herrick et al. 2004). Dr. Robert Herrick attended the Woods Hole Workshop and presented a research on the long history of PCBs in buildings and specifically in school buildings going back to 1996 when samples of heavily contaminated caulking were found in an elementary school on the Massachusetts Military Reservation. PCBs in building materials are still found in New England and New York. Dr. Herrick informed the Workshop audience that PCBs in schools continues to get headlines in the press: “The recent findings and reactions from a school in Malibu, California (PCB caulk levels of 340,000–370,000 ppm) suggest that things have not changed and the issue of PCBs in schools is still not effectively addressed” (Herrick 2014).

The US EPA has responded to these concerns and research with a renewed interest in airborne PCBs likely to result from exposures in building materials in schools. This interest and subsequent work is summarized in a 150-page monograph on PCBs in school buildings. The report by Thomas et al. demonstrated that the sources of PCBs in schools are primarily plasticizers in caulk and fluorescent light ballasts although other products might also be sources. Secondary sources that were contaminated by the primary sources include paints, dust, masonry, floor, and ceiling tile (Thomas et al. 2012). Since newly manufactured paints continue to contain PCBs, paints can also be a primary source (Hu and Hornbuckle 2009). Both volatilization into air and contamination of dust are considered the route of exposure to those regularly inside the school requiring research on inhalation to supplement the years of research on ingestion of PCBs.

While new aspects of PCB exposure have garnered headlines, science has continued to investigate exposure sources and health risks posed by this old contaminant. Additionally, the University of Iowa Superfund Research Program (SRP) has found widespread urban and rural exposure to non-legacy PCBs from present-day pigment manufacturing and use; monitored their presence in schools and in outdoor air; and identified metabolic, chemical, and toxicological processes specific to volatile PCBs from Aroclor and non-Aroclor sources (Hu and Hornbuckle 2009). The year following the EPA publication noted above, the International Agency on Research on Cancer (IARC) produced a new monograph boosting the class of PCBs to group 1, known human carcinogen from group 2A, probable human carcinogen (Lauby-Secretan et al. 2013).

Community Engagement Cores of Superfund Research Programs

A mandate of each National Institute of Environmental Health Science (NIEHS) SRP like those at the University of Iowa and Boston University is bidirectional communication of scientists and community groups. There are historic reasons for this requirement. The law establishing the Superfund cleanup program passed in 1980 had an inauspicious beginning; the early 1980s were a tumultuous time for the US EPA. The EPA Administrator appointed by President Reagan, Anne Gorsuch, was held in contempt of Congress for not sharing information related to the Superfund program and forced to resign 22 months into her position. In 1984, the chief of solid waste and emergency response programs was convicted and fined for perjury related to Superfund. Between those events, in 1982, the arrests of nearly 500 people in North Carolina garnered national attention for protesting EPA's decision to site a PCB landfill in Warren County. The non-violent civil disobedience of mostly Black residents was described in a *Washington Post* editorial as representing "the marriage of civil rights activism with environmental concerns" (Dumping on the poor 1982). Following this event, a study conducted by the US General Accounting Office at the request of a North Carolina Congressman and the Congressional Black Caucus, examined three of four designated hazardous waste sites among eight southern states in EPA's Region IV. Based on 1980 census data, the study concluded that the majority of the population where landfills were located was Black, and at all four hazardous waste sites in the region, the Black population represented the majority of those below poverty level (GAO 1983). Public trust in the EPA and in the Superfund program was greatly diminished. Congress reaffirmed its commitment to the Superfund program in 1986 with the passage of the Superfund Amendment and Reauthorization Act (SARA). In addition to bolstering the cleanup program, the Act established the program for scientific research on the human health risks of contaminants found at Superfund sites known as the Superfund Research Program. The passage of SARA acknowledged the uncertain science regarding the human health risk, as well as the politically charged community contexts of hazardous waste location.

Since the Superfund Research Program was established, NIEHS has almost consistently required that the funded Centers include a Core devoted to the engagement of those most affected by hazardous waste. Previously named the Community Outreach Core, and now the Community Engagement Core, the mandate includes that scientific investigators not only listen to and hear the concerns of communities but also that their research be responsive to such concerns (NIEHS 2014). This is recognition of the fact that people on the front lines of hazardous exposures are often the ones to highlight concerns and questions before any physician or scientist is aware of a potential problem. This was certainly true of Lois Gibbs, known as mother of the Superfund Act, and it is also true of the mothers and school teachers in Malibu, Southern California, a suburb of Los Angeles.

Malibu Unites

The Santa Monica-Malibu Unified School District is comprised of 16 schools just north of Los Angeles, CA. Two of the schools, the Malibu High School and the Juan Cabrillo Elementary School, were built on the same plot of land at the same time and share a K-12 campus. In 2011, the teachers and community members learned that more than 1000 cubic

yards of soil on campus had been removed due to high concentrations of PCBs, lead, DDT, chlordane, and other pesticides. The teachers became worried for themselves and their students and asked to have their classrooms tested. Five of ten buildings tested on campus have PCBs in caulk, and PCB concentrations in air are significant. Malibu Unites (later renamed America Unites for Kids), the parent-teacher advocacy group, formed with this mission: “Uniting our community to ensure high standards of health and safety in our schools, for all children and those who educate them.” Their goals include further campus-wide testing of soil and classrooms at the schools; independent oversight of testing; community input in assessment, planning, testing, and remediation; increased transparency and full disclosure; and successful representation for Malibu within the school district Malibu Unites: for healthy schools (<http://malibuunites.com/>).

Since their formation, Malibu Unites has teamed with city government and many parents in the community to ask for more testing and removal of PCBs in the schools. The group has done its own independent testing of caulk inside rooms not included in school-sponsored testing. One room contains PCB levels as high as 370,000 ppm (37 %) of Aroclor-1254 and 121 ppm of congener 126. Malibu Unites President, Jennifer deNicola, and others have been active in seeking knowledge about PCBs. One place they looked was the EPA’s Contaminated Site Clean-Up Information (CLU-IN) portal where all waste remediation stakeholders are encouraged to find and engage in materials related to site characterization and cleanup. In April 2014, the NIEHS SRP hosted two CLU-IN webinars focused on the topic of PCBs in Schools. Both webinars featured researchers at University of Iowa SRP and the US EPA (<http://www.clu-in.org/conf/tio/pbcsinschools1/>, <http://www.clu-in.org/conf/tio/pbcsinschools2/>). Several Malibu Unites members followed up with Iowa researchers after hearing Iowa’s Drs. Peter Thorne and Gabriel Ludwig discuss their research. In July 2014, Ms. deNicola and another member of her organization, Ms. Hope Edelman, traveled to the University of Iowa to meet PCB researchers, Drs. Keri Hornbuckle and Scott Spak and Iowa SRP Research Translation and Community Engagement Core Staffer Prof. David Osterberg. Impressed with the knowledge of these activists, and realizing they had something to teach researchers about the view from the ground level of a contaminated school, the two were invited to speak at the 8th International PCB Workshop in Woods Hole in October 2014. In preparation for the workshop, the Boston University SRP along with the Collaborative on Health and the Environment hosted a second teleconference on the topic of PCBs in schools in September 2014, also featuring PCB researchers at the University of Iowa, Boston University, and Harvard University and active participation by Ms. deNicola(http://www.healthandenvironment.org/wg_calls/15229).

PCBs in Schools: the 8th International PCB Workshop, October 2014

Seven highly successful biennial international PCB Workshops, organized by University of Iowa SRP director, Dr. Larry Robertson, had taken place before the Woods Hole PCB workshop.¹ A primary goal of these workshops has been to provide an opportunity for researchers of varied backgrounds and expertise to apply their combined knowledge and

¹Lexington, Kentucky (2000); Brno, Czech Republic (2002); Urbana-Champaign, Illinois (2004); Zakapane, Poland (2006); Iowa City, Iowa (2008); Visby, Sweden (2010) and Arcachon, France (2012).

experience to questions of the detection, movement, metabolism, toxicity, remediation, and risk assessment of PCBs. Only in the 6th Workshop, in Sweden in 2010, was PCB contamination in buildings a major focus. The Workshop at Woods Hole, in contrast, was subtitled PCBs in Schools. It was also the first time this scientific conference brought a community representative to speak.

The 8th PCB Workshop was cohosted by Boston University SRP, which has several investigators at Woods Hole studying PCBs and similar compounds, particularly as they affect fish species in the New Bedford Harbor Superfund site. Boston University SRP Community Engagement Core leader, Dr. Madeleine Scammell, worked with organizers to plan a day specifically for non-scientist stakeholders to participate. In addition to inviting Ms. deNicola to speak, the Workshop included a reduced price for local stakeholders to learn about the science and about the problem from the perspective of Malibu Unites. The reduced 1-day registration fee and substantial outreach to organizations such as the Healthy Schools Network, Massachusetts Teachers Association, Massachusetts Coalition for Occupational Health and Safety, and the Massachusetts Department of Public Health led to 30 additional attendees on that day, boosting the workshop audience by 25 %. The talks included presentations by EPA risk assessors from Region I, Region II, and headquarters as well as from a state health department. Researchers from academic institutions and research firms presented investigations from particular US schools. Scandinavian researchers presented data on various methods of remediation required by agencies in both Denmark and Sweden.

Jennifer deNicola in her plenary talk and Hope Edelman in a lunch breakout session made an impression with the primarily academic audience. The previous two workshops had included a policy panel but the California women were actual activists. Both Ms deNicola's presentation and a breakout discussion were well attended by students, researchers, the director of NIEHS, and an activist from New Bedford, MA.

A community-driven research agenda for PCBs in schools

Ms. deNicola began her talk, "PCBs in schools - how regulations and science are affecting students teachers and parents," by asserting that the PCB laden classrooms in the Malibu Schools have not been remediated and many have never been tested, "Yet," she claimed, "the district has spent over 1 million dollars on lawyers, PR firms and consultants to protect themselves rather than investigate, remediate and protect our students and staff." Parents and teachers are concerned and confused by the knowledge of PCBs in some classrooms and the lack of action by the district (Denicola 2014). Ms. deNicola's PowerPoint slides referenced the Code of Federal Regulations and US EPA's Current Best Practices for PCBs in Caulk Fact Sheet—*Removal and Clean-Up of PCBs in Caulk and PCB-Contaminated Soil and Building Material*. While parents and teachers are told that concentrations of greater than 50 ppm should be mitigated, "the district and their paid consultant, Environ, claim that PCBs are safe to leave in place and will not harm our children." She proceeded to articulate the questions raised by parents and teachers given this context.

A slide with the bold heading “We rely on your research,” included the following questions: What is the health-based threshold for PCB impacted caulk? Is 50 ppm protective of a child’s health? What is the inhalation threshold for a pregnant teacher? If we only do air and dust testing for PCBs, will it produce results we can rely on that are protective of children and teacher’s health? Will these results protect our children’s future health? The questions posed by Ms. deNicola provided an opportunity during the discussion for experts and regulators in the area of PCB research to jointly consider both the knowledge and the vast uncertainties associated with responses to such questions and to grapple with the challenges of communication. However, she continued with her formal presentation by declaring to the audience multiple times: “Your research will influence our government agencies and politicians to be more precautionary with our children’s future health and will have a direct impact on the health and safety of children in schools across America. ...None of us want to wake up 10 years from now with a sick child and say, ‘I wish I had been more protective of my child’s exposure’.”

Ms. deNicola then described some of her concerns related to the Malibu Schools situation in greater detail. In November 2013, the district conducted an initial testing of 10 random classrooms indicating that 40 % of the rooms had levels of PCBs in the caulking in excess of 50 ppm. Several rooms had PCBs in the dust over EPA thresholds. The experience of having tested caulking and trying to ascertain human health risk to school children and teachers is what clued Malibu Unites into the unknowns regarding PCBs. “Testing is a huge issue,” explained Ms. deNicola, “While testing caulking seems quite straight forward, we have found that [indoor] air and dust sampling is much more uncertain. We had this experience in Malibu by windows being left open during air testing when the EPA clearly stated to the district that windows must be closed.” Malibu Unites is concerned that introducing out-side air brought very low results compared with what might have resulted if the windows had been closed. She acknowledged, the school is in southern California, not Massachusetts. Still, there did not seem to be clear standards for the district to meet. This led to a slide with the heading: “The Need for Air Testing Protocol.” In her experience, school districts get to choose how they test, where they test, and how often. Each decision can dramatically alter results which do not consider outdoor temperature, humidity, and wind direction and speed.

The remainder of Ms. deNicola’s presentation highlighted the testing done by the school district and by her organization in the schools and the political challenges identified by Malibu Unites. Malibu is a small part of the Santa Monica-Malibu District and has no representation on the school board. According to Ms. deNicola, the district has adopted the “don’t test, don’t know policy,” which is allowable by law. “Even the best science about the effects of PCBs on students and teachers is not effective when we leave it up to school districts to decide whether they test or not, how they test, and what standards they set for health and safety. Without proper oversight and good regulation, there is no guarantee that schools will enact any measures to protect the health of their students and staff,” she lamented. She then posed another question for the audience: Have there been peer-reviewed studies of best management practices, cleaning and its effectiveness on risk? Her question was genuine. Malibu Unites appreciates that there are very few clear answers to the problems they identified, and that remediation is costly. However, when it comes to

protecting their children, the members of Malibu Unites are not willing to look the other way.

Conclusion

Malibu Unites may be unique in their organizing, initiative, and tenacity, but they are not unique as a group of parents with concerns about hazards in their schools. Many parents and teachers across the country are dealing with school-based hazards (mold, asbestos, poor ventilation, vapor intrusion, noise, particulate matter, VOCs) (Scammell and Levenstein 2014). Further, there are many places in the world where populations are vulnerable to exposures in schools, old buildings, and in their homes: where they live, work, and play. Being responsive to community concerns is only half the challenge. On the other hand, PCB scientists have done research that local groups desire to take to local decision-makers and get action. Representatives from Malibu Unites came to the Woods Hole PCB meeting not only to learn but also to inform the mostly scientific audience that their research is critical to prevent present and future exposures to PCBs. This is the meaning of bidirectionality: people who will translate our science for policy makers, and scientists who are willing to have their questions influenced by community concerns.

Acknowledgments

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