

**FINAL REPORT:**  
**Semi-Volatile Organic Compounds (SVOCs) in the Residential Environment Workshop 1**  
**August 18-19, 2009, EPA, Research Triangle Park, NC**  
Organizational Sponsor: Indoor Air Institute

For submittal to EPA for Reporting on Funding for Workshop 1  
14 September 2009

**Outcomes**

The objectives of Workshop 1, to be discussed in further detail in this report, were successfully met, and the output generated during the workshop matched the expected output. This was accomplished within the anticipated budget.

**Background**

The Indoor Air Institute is organized to advance awareness of critical issues in indoor air science, to promote collaboration among various related disciplines, and to disseminate knowledge and encourage action based on indoor air science. The Indoor Air Institute operates by organizing expert workshops resulting in the production of one or more publications intended to broaden awareness and encourage further action on the workshop topics.

REACH and the current emphasis on chemical screening and prioritizing in the US highlight the critical need for improved tools to characterize and predict potential exposures associated with the indoor use of building materials and consumer products. Semi-volatile organic compounds (SVOCs) (such as plasticizers, flame retardants, biocides, and pesticides) are released from a vast number of building materials and consumer products including toys, lotions, nail polish, perfume, cling film, shampoo, computers, televisions, foams, shower curtains, vinyl flooring, and PVC products. Many SVOCs have been associated with adverse health outcomes in laboratory animals and in limited environmental epidemiology studies.

Focused on this topic, a series of two workshops and a resulting series of collaborative peer-reviewed manuscripts were proposed to address the potential health impacts in a holistic manner by considering the source-to-health continuum for SVOCs. The workshops and papers will focus on SVOCs that are relevant and important from a health standpoint. The first workshop, Workshop 1, was held on August 18 and 19, 2009 at the EPA Research Triangle Park campus and included scientists and engineers working on specific sources, transport pathways, exposure mechanisms, physiologically-based pharmacokinetic (PBPK) models, metabolic reactions, and organ-specific toxic effects including asthma. This report summarizes the results and outcomes of Workshop 1.

**Objectives of Workshop 1**

- Characterize the source-to-effect continuum for one class of SVOCs (phthalates) by linking source types, emissions, transport, exposure, PBPK models, and organ-specific toxic effect, showing that emissions, transport, and resulting dose to target site are largely controlled by the physical/chemical properties of the SVOCs (or their metabolites)
- Consider whether the overall mechanistic risk assessment approach can be generalized to other SVOCs

- Identify general research required to develop screening-level, rapid exposure assessment approaches based on simplified forms of mechanistic exposure models
- Agree on outline and writing tasks for Paper 1
- Develop draft plan for Workshop 2

### **Expected Output for Workshop 1**

1. A brief workshop report will be prepared for submittal to sponsoring organizations.
2. A scientific paper will be prepared for submittal to a high-end journal. The paper will be focused on identifying research required to rapidly screen and prioritize potential exposures associated with SVOCs in residential sources, with a focus on phthalates (DEHP) as an example. Draft copies of the paper will be sent to the committee that prepared the recent National Academy of Sciences report entitled “*Phthalates and Cumulative Risk Assessment: The Tasks Ahead.*”
3. Workshop 1 will serve as a “pilot” workshop and will focus on drafting the paper and on identifying the scope and objectives for the subsequent Workshop 2 with significantly expanded participation and scope.

### **Workshop 1 Summary**

Workshop 1 was conducted on August 18 and 19, 2009 at the EPA Research Triangle Park Campus. There were 25 participants at the workshop, representing an array of organizations, including: US EPA, Indoor Air Institute, Lawrence Berkeley National Laboratory, University of California Berkeley, University of Washington, University of Toronto, Virginia Tech, University of Medicine and Dentistry of New Jersey, and Hamner Institute. These participants contributed a variety of areas of expertise essential for an improved understanding of the exposures and risks associated with SVOCs, including sources and emissions, transport pathways, exposure mechanisms, PBPK models, metabolic reactions, and organ-specific toxic effects.

The first day of the workshop featured a series of presentations, each followed by a group discussion. The presentations were designed to give all participants a background and understanding of the various aspects of SVOC transport, from the sources and exposures within residences to organ-specific toxic effects. These presentations set the stage for group discussions during the latter portion of the first day and the second day, which focused on three main topics: understanding of the source to toxic effect continuum, generalizing the approach outlined for phthalates to all other SVOCs, and proposing methods for rapid exposure assessment. The second day of the workshop involved group discussion aimed at developing an outline for a manuscript and determining the scope and goals for Workshop 2.

### **Presentations**

A series of six presentations given at the workshop summarized the transport processes from source to toxic effects. These included: “ToxCast<sup>TM</sup> and ExpoCast<sup>TM</sup> for prioritization and chemical evaluation” by Elaine Cohen Hubal of EPA; “Sources, emissions, transport, exposure and rapid screening for exposure” by John Little of Virginia Tech; “Dermal sorption” by John Kissel of University of Washington; “PBPK measurement, modeling, and metabolic reactions” by Harvey Clewell of the Hamner Institute; “Organ-specific toxic effects” by Vickie Wilson of EPA; and “Models in environmental regulatory decision making” by Tom McKone of UC Berkeley and Lawrence Berkeley National Laboratory. Each presentation was followed by a

group discussion, with the overall goal of identifying the key inputs for each part of a contaminant's source to effect continuum and important gaps in knowledge to direct future research.

## **Participants**

### **Workshop 1 Co-Chairs**

- John Little, Virginia Tech
- Elaine Cohen Hubal, US Environmental Protection Agency

### **Steering Group Members/Participants**

- William Fisk, Department Head, Indoor Environment Department, Lawrence Berkeley National Laboratory (Vice-President, Indoor Air Institute)
- Hal Levin, Building Ecology Research Group (President, Indoor Air Institute)
- Thomas McKone, School of Public Health, University of California, Berkeley
- William Nazaroff, College of Engineering, University of California, Berkeley (Vice-President, Indoor Air Institute)
- Charles J. Weschler, University of Medicine and Dentistry of New Jersey and Danish Technical University

### **Invited participants**

- Harvey Clewell, The Hamner Institute
- John Kissel, University of Washington
- Vickie Wilson, EPA, Reproductive Toxicology Division (Phthalate Toxicity)
- Miriam Diamond, University of Toronto

### **External participants**

- Michael Breen, US EPA
- Jennifer Benning, Virginia Tech
- Michael Breen, US EPA
- Sally Darney, US EPA
- Peter Egeghy, US EPA
- Roy Fortmann, US EPA
- Alice Gilliland, US EPA
- Ross Highsmith, US EPA
- Heidi Hubbard, US EPA
- Bob Kavlock, US EPA
- David Marr, US EPA
- Mark Mason, US EPA
- Linda Sheldon, US EPA
- Jamie Strong, US EPA
- Cecilia Tan, US EPA