

FACTS ABOUT ENVIRONMENTAL EXPOSURES

Air pollution and contaminants at child-care and preschool facilities in California

The Environmental Exposures in Early Childhood Education Environments Study examined air pollution and contaminant levels in dust in family-based child care and preschool facilities in California. This study, which was conducted by researchers from the University of California, Berkeley and completed in 2012, is the first comprehensive study in child care centers to measure a broad spectrum of pollutants including many volatile organic chemicals, particles, and pesticides, and emerging pollutants such as flame retardants, phthalates and perfluorinated compounds.

Understanding exposures in child care and preschool environments is important because infants and young children spend as much as 10 hours per day, 5 days per week in child care and preschool facilities. Children breathe more air per unit of body weight compared to adults and are also less developed immunologically, physiologically, and neurologically. Therefore, children may be more susceptible to the adverse effects of chemicals and toxins. Approximately 1 million children, five years or younger, attend child care or preschool in California, which has the largest number of licensed child care centers (49,000) in the United States; 80% of these are family-based centers located in homes. Additionally, 146,000 staff work in California's licensed child care facilities.

Major Findings of the Study

The study showed that most contaminant levels in child care and preschool facilities were similar to those measured in other studies of California schools and residences. For chemicals with health-based dose or exposure benchmarks, levels for most were usually below levels of concern. However, a few chemicals exceeded health guideline levels and mitigation strategies may be warranted to reduce exposures to those chemicals, especially formaldehyde.

Aldehydes – Formaldehyde levels in 87% of the facilities exceeded the California acute and chronic reference exposure guideline levels for non-cancer health effects such as respiratory and sensory irritation (e.g. eyes, nose, throat, and lungs). In 2007, ARB implemented an Air Toxics Control Measure that limits formaldehyde emissions from building materials, furnishings and other products made from pressed wood material such as plywood and particleboard. This should significantly reduce exposures in new homes in the future, but more actions are under consideration to further reduce formaldehyde exposures. Acetaldehyde levels did not exceed any California guidelines, but levels exceeded the U.S. guideline for respiratory and irritant effects in 30% of the facilities.

Flame Retardants – Brominated flame retardants (PBDEs) can disrupt normal hormonal function and development, especially in infants and children. They can persist in the environment for years, especially indoors. The estimated non-dietary ingestion of PBDEs (ingesting PBDEs that have been transferred from treated surfaces to the hands or objects that are mouthed) in children less than 1 year of age exceeded the U.S. EPA acceptable levels for PBDE-47 and PBDE-99 in 10% of the facilities. In June of 2012, Governor Jerry Brown directed the California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation to review the State's forty year-old flammability standards and recommend changes to reduce toxic flame retardants while continuing to ensure fire safety.

Particle Measurements – Indoor PM₁₀¹ concentrations exceeded the level of the 24-hr California Ambient Air Quality Standard in 46% of the child care and preschool facilities, and indoor PM_{2.5} levels exceeded the level of the 24-hr National Ambient Air Quality Standard in 11% of the facilities. While these measurements are not directly comparable to the standards because they were obtained over an 8 hr to 10 hr period, they indicate that potentially unhealthful exposures sometimes occur in day care facilities. Indoor ultrafine PM counts (the number of particles less than 0.1 microns in size) were highest in facilities where indoor cooking with gas occurred, and the counts were only weakly correlated with outdoor levels and traffic metrics.

¹ PM₁₀ is defined as particles that are 10 microns or less in diameter, and PM_{2.5} is defined as particles that are 2.5 microns or less in diameter. For more information see: www.arb.ca.gov/pm/pm.htm.

Metals in Floor Dust – Dust samples were analyzed for levels of metals such as lead and cadmium. Lead exposure estimates exceeded the age-adjusted California Proposition 65 no significant risk level (NSRL) benchmark based on carcinogenicity in 95% of facilities. However, the primary issue for childhood exposure to lead is developmental toxicity. Because U.S. EPA believes there is no safe level of exposure to lead, there is no defined reference dose. However, the levels of lead in dust measured in this study are comparable to the typical levels found in homes, and it is unlikely that these levels significantly contribute to cases of childhood lead poisoning. Levels of cadmium did not exceed child dose estimates for the U.S. EPA's oral reference dose, the only health benchmark available for cadmium.

What can child care and preschool facilities do to reduce potential exposures?

- **Buy wood products and furniture that comply with California's formaldehyde regulations:** Purchase pressed wood furnishings and building materials labeled as California 93120 Compliant for Formaldehyde-Phase 2, or products certified as California ULEF (ultra-low-emitting formaldehyde) or NAF (no added formaldehyde) products.
- **Request and purchase low formaldehyde products.** Also, wash permanent press clothing before wearing.
- **Turn on the range hood when using a gas stove.** Increasing ventilation with outdoor air will also help reduce indoor formaldehyde levels.
- **Clean frequently to minimize dust,** especially with a High Efficiency Particle Arrestance (HEPA) vacuum cleaner. This can reduce exposure to compounds such as PBDEs, lead and other metals, and some phthalates that are largely found in dust.
- **Use 'green' cleaning products.** Use household cleaning products that are low in levels of volatile organic compounds (VOCs) and are certified as "green" products to reduce exposures to potentially harmful VOCs.
- **Clean out old pesticides, solvents, cleaning products.** To help reduce indoor levels of pesticides and VOCs, remove older containers from cabinets and garages containing pesticides, solvents, and cleaning products that may leak.
- **Reduce use of pesticides.** Following Integrated Pest Management practices will avoid or reduce the need for pesticides.

For more information

- The full final report for the study can be viewed at www.arb.ca.gov/research/single-project.php?row_id=64830
- For more about formaldehyde emissions in composite wood products see www.arb.ca.gov/toxics/compwood/factsheet.pdf and www.arb.ca.gov/toxics/compwood/nafe_ulef/nafe_ulef.htm
- For additional ways to reduce formaldehyde exposure go to www.arb.ca.gov/research/indoor/formaldf08-04.pdf
- Information about ways to reduce your exposure to particulate matter can be found at www.arb.ca.gov/research/indoor/pmfactsheet.pdf
- For information about the Governor's directive on flammability standards go to gov.ca.gov/news.php?id=17598
- For information about Integrated Pest Management, see apps.cdpr.ca.gov/schoolipm/childcare/

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