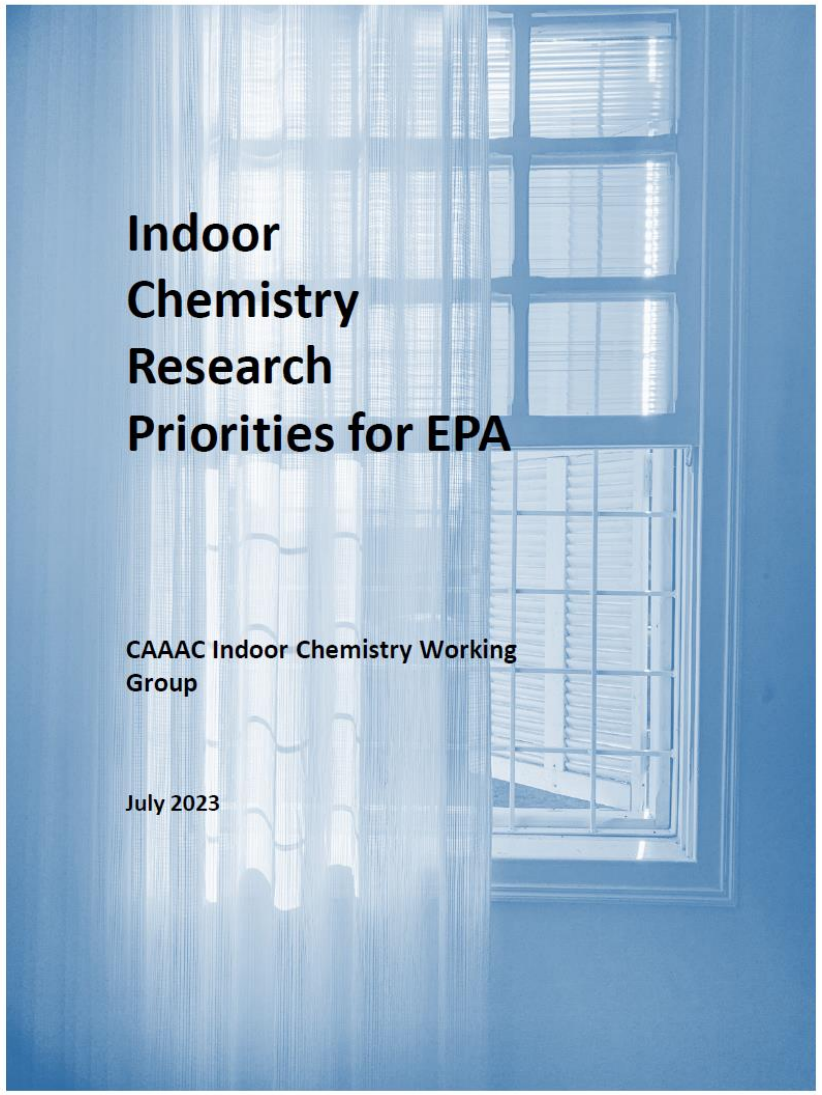
CAAAC Recommendations Based on the National Academies (NASEM) Report *Why Indoor Chemistry Matters*

Indoor Chemistry Work Group Report, 6/27/2023



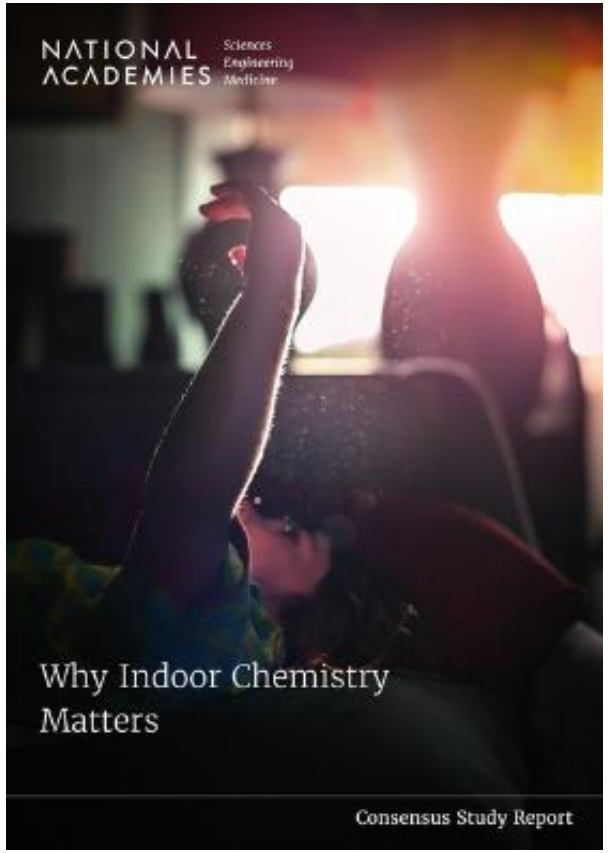
Dan Greenbaum

President Emeritus

Health Effects Institute

(On behalf of the CAAAC Indoor Chemistry Work Group)

NASEM Task – “summarize the state of the science regarding chemicals in indoor environments”



- Contents
  - Introduction
  - Primary Sources and Reservoirs of Chemicals Indoors
  - Partitioning of Chemicals in Indoor Environments
  - Chemical Transformations
  - Management of Chemicals in indoor Environments
  - Indoor Chemistry and Exposure
  - A Path Forward for Indoor Chemistry
- Sponsors
  - EPA, CDC, NIEHS, Sloan Foundation
- Report Published 2022

https://nap.nationalacademies.org/catalog/26228/why-indoor-chemistry-matters

Charge to CAAAC by EPA, June 15, 2022

Provide recommendations on prioritizing the research needs identified by the NASEM in their consensus report: *Why Indoor Chemistry Matters*.

Focus on priorities for short term research (1-3 years) that could inform public health guidance and building practices for improving Indoor Air Quality (IAQ) in homes, schools, and commercial office buildings.

- Full CAAAC or workgroup
- Short term written response
- Lead office: ORIA
  - Contact: Laura Kolb (now retired, new POCs are Vito Ilacqua and Alison Freeman)

CAAAC Indoor Chemistry Working Group

- William Bahnfleth (chair)
  Professor of Architectural Engineering, Penn State
- Daniel Greenbaum
  President Emeritus, Health Effects Institute
- Gary Jones
  Director of Environmental Health and Safety
  Specialty Graphic Imaging Association
- Max Sherman
  Senior Scientist (ret.), Lawrence Berkeley National Laboratory
- Support – Margaret Overton and Lesley Stobert, SC&A

Work Group Process

- Eleven meetings
- Reviewed and prioritized all NASEM report “recommendation” and “research priority” statements – more than 40
- Sent Draft Report to Full CASAC for Review
- Today’s report
  - Identified Highest Priority recommendations responsive to EPA charge
  - Also identified several priority areas above and beyond the NASEM Report
  - Combined into a compact, prioritized set of recommendations
  - Draft report now for full CAAAC review and approval

Prioritization of NASEM Recommendations

- Four Overall Categories
  - Overarching Recommendations
  - Human Behavior
  - Health Disparities and Environmental Justice
  - Air Cleaners

Overarching Recommendations

- Enhanced Exposure Assessment: EPA and partners should review current science of indoor chemistry to define gaps in current exposure assessment methods or data collection.
- Engagement of Key Health Effects Expertise: Researchers who study toxicology and epidemiology and their funders should prioritize resources toward understanding indoor exposures to contaminants, including those of outdoor origin
- Dissemination for Decisions: Researchers should proactively engage in links that connect research to application throughout the indoor chemistry research process

Human Behavior

- Exposure to and health effects resulting from indoor air chemistry are directly related to human behavior. Research to address exposures and health effects will need to:
  - Expand into the chemistry associated with human occupancy, behavior, and activities, especially identification of processes that alter exposure to chemicals.
  - Deepen understanding of human behavior and time-activity patterns as they relate to indoor chemistry.
  - Improve models through better integration of an understanding of human behavior.
  - Federal agencies should design and regularly implement an updated National Human Activity Patterns Survey.

Health Disparities and Environmental Justice

- There is growing awareness of the significant disparities in exposures and effects from air pollution experienced by environmental justice communities. These disparities occur both in outdoor and indoor environments. EPA and its partners should:
  - Include environmental justice communities in the wide range of indoor environments they study and engage these communities in formulating research priorities and recommendations for future indoor air quality standards.
  - Develop more harmonized measures to characterize indoor exposure disparities. A sparse number of studies demonstrate that demographic and socioeconomic factors can enhance susceptibility to chemical exposures, but the evidence is incomplete and data poor.
  - Develop methodological and technological tools to make direct measurement of exposures easier, more convenient, and lower cost, at scales that meaningfully improve the performance of exposure modeling and close gaps in understanding relationships between indoor environmental exposures and health outcomes, including persistent environmental health disparities.

Air Cleaners

- Given the recently heightened public interest in indoor air quality, device manufacturers, researchers, and public health professionals need to communicate clearly to consumers about the efficacy and chemical exposure consequences of different air-cleaning approaches.
  - Testing approaches need to be developed that consider both efficacy and byproduct formation in a representative range of real-world environments (e.g., ultrafine particles, PM2.5, oxygenated VOCs including formaldehyde).
  - Standardized consensus test methods could enable potential certification programs for air-cleaning products and services.
  - And controlled field experiments are necessary to better understand the fundamental chemistry of emerging air-cleaning technologies, as well as mold and smoke remediation schemes.

Additional Issues of Continuing Concern

- In addition to identifying and prioritizing recommendations from the NASEM report, the working group also reviewed and identified steps that could be taken to address several high priority indoor air "contaminants of concern," specifically,
  - reactive oxygen species (ROS) and
  - aldehydes.

Additional Issues of Continuing Concern (cont'd)

- Although peripheral to its charge, the CAAAC working group also considered aspects of indoor chemistry not addressed in the NASEM report that are of comparable importance as near-term research priorities.
  - ***Radon***, which is mentioned numerous times in the NASEM report but not addressed in its recommendations, continues to be a significant health hazard in many regions. EPA radon programs should continue.
  - ***Particulate matter***, also highlighted multiple times in the NASEM report, is an increasingly problematic concern in the indoor environment. EPA is moving forward on outdoor exposures; it should boost its efforts to quantify and lower indoor exposures.
  - EPA should encourage public-sector institutions to conduct surveys to determine which ***new chemicals*** are appearing in the indoor environment and to investigate the health impacts of contaminants known to be in the indoor environment but for which insufficient health data are known

Concluding Thoughts

- The NASEM Report has identified a wide range of activities to improve our understanding of air chemistry, indoor exposures, and health
  - The Working Group has endeavored to identified the highest priorities of these recommendations for the near term (1 – 3 years)
- We also identified Contaminants of Concern that deserve continuing attention…
- And highlighted the need to:
  - Link EPA's active work to control outdoor PM with its efforts to improve PM exposure indoors
  - Continue to survey for indoor exposures from new chemicals as knowledge of their effects emerges
- We are impressed by the skills of ORIA in trying to tackle these important issues
  - And look forward to working with them enhance action to protect public health

Thank You!