

November 2019 Meeting of the Scientific Guidance Panel for Biomonitoring California

Summary of Panel Input and Recommendations

The Scientific Guidance Panel (SGP) for the California Environmental Contaminant Biomonitoring Program (also known as Biomonitoring California) met on November 6, 2019, in Oakland. This document briefly summarizes the Panel's input and recommendations on each agenda item and the range of topics discussed with the guest speakers and audience. Visit the [November 2019 SGP meeting page](#) to access the presentations, transcript, and other meeting materials.

Program Update and Initial Results from the California Regional Exposure (CARE) Study, Los Angeles ([CARE-LA](#))

Presentation: Robin Christensen, ScM, Chief, Biomonitoring Investigation and Outreach Unit, Exposure Assessment Section (EAS), Environmental Health Investigations Branch (EHIB), California Department of Public Health (CDPH)

Presentation: Jennifer Mann, PhD, Research Scientist IV, EAS, EHIB, CDPH

Topics raised in the question period after these talks included:

- CARE-LA exposure questionnaire
 - Information was collected on active tobacco users and exposure to secondhand smoke (SHS), but there was too much overlap between these two groups to conduct separate analyses. Only four participants were exposed to SHS who did not use tobacco themselves.
 - The tobacco use question captured current cigarette smoking, as well as use of hookahs, bidis, and smokeless tobacco.
 - Food frequency data include rice and rice products, relevant to the analysis of arsenic and cadmium results.
- Association between levels of 1-nitropyrene (1-NP) metabolites measured in CARE-LA and tobacco use
 - Excluding smokers was suggested as a way to reduce “noise” in the analysis of other exposure factors, such as diesel exhaust exposures, potentially associated with 1-NP metabolite levels.
- Treatment of mixed race as a demographic category in CARE-LA
 - Race and ethnicity were categorized in several ways, including approaches for identifying multiracial participants.

- To comply with changes in state law that go into effect in 2022¹, future presentations will display results by multiple categorizations of race/ethnicity.
- Higher detection frequency for one perfluoroalkyl substance (Me-PFOSA-AcOH) in CARE-LA compared to NHANES (National Health and Nutrition Examination Survey)
 - This was likely attributable to Biomonitoring California's lower detection limit, but could reflect a temporal trend for this PFAS.

Initial Results from the [East Bay Diesel Exposure Project](#)

Presentation: Asa Bradman, PhD, Associate Director, Center for Environmental Research and Children's Health, UC Berkeley

Topics covered during the question period after this talk included:

- Examining factors affecting within- and between-subject variability in 1-NP metabolite results, such as:
 - Seasonal variability
 - Specific meteorological events (e.g., a large rainstorm; an inversion)
 - Weekday versus weekend exposures
 - Relatively short half-life of 1-NP metabolites (12-15 hours)
- Identifying major determinants of within-subject variability based on analyzing repeat measures in EBDEP, and using this information to help inform comparisons of between-subject results across other studies that collected single samples from participants (e.g., CARE-LA and CARE-2).
 - The small number of subjects in EBDEP relative to the number of variables was noted as a limitation in conducting this analysis. Pursuing funding to expand the number of subjects was encouraged.
- Other limitations in the EBDEP dataset posing challenges for the analysis
 - Relatively few less-exposed participants were included; participants tended to live in areas of high diesel exhaust exposures. Sampling in an area like Bolinas, known to have much lower exposures, would be helpful to get a better sense of geographic variability.
 - The education level of participants was higher and rate of SHS exposure was lower than expected. Expanding the study to capture a population more representative of these East Bay communities was suggested.
- Choice of buffer size around participant homes or other locations (e.g., work, school) for analysis of traffic data and other potential exposure sources
 - The analysis presented at this meeting used buffer sizes of 500-2000 meters. Examining smaller buffers, such as 300-400 meters, was suggested for greater sensitivity in the analysis.

¹ Assembly Bill 532 (McCarty, Chapter 433, Statutes of 2015):

https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB532

- Air pollutant levels reportedly drop rapidly at approximately 180 to 300 meters from roadways; however, this estimate is based on daytime studies. Information from nighttime studies, when inversions are more likely and people tend to be home, would be valuable to assess whether air pollutant levels stay higher for longer distances under these conditions.

Morning Session Discussion

The Panel, guest speakers, and audience discussed a range of topics based on the morning presentations, including:

- Association between tobacco smoke and 1-NP metabolite levels
 - A review by the International Agency for Research on Cancer (IARC) indicated that cigarette smoke is not a source of 1-NP. IARC suggested this would be an improbable source, because the chemistry of cigarette smoke is reducing and 1-nitropyrene is a product of oxidation.
 - There are conflicting reports in the literature about tobacco smoke as a potential source of 1-NP:
 - A study of 1-NP indoor air levels reported the levels were higher in smoking homes compared to non-smoking homes; this finding was not affected by the type of stove or heat being used in the homes.
 - A study by the US Environmental Protection Agency (reported as a meeting abstract) detected 1-NP in cigarette smoke condensate.
 - There is evidence that 1-NP can form in the air in the presence of tobacco smoking under certain atmospheric conditions, suggesting SHS as a potential exposure source.
 - In animal studies, endogenous formation of nitro-PAHs has been observed via the reaction of ingested or inhaled PAHs with nitrogen dioxide, such as from cigarette smoke.
 - Cigarette smoking and possibly SHS exposure could affect the activity of enzymes involved in the metabolism of PAHs, which could influence 1-NP metabolite levels. Smokers might also have a reduced ability to clear particles.
 - To examine potential associations with SHS, consider measuring cotinine.
 - Consider excluding smokers from studies that measure 1-NP.
- Identifying important occupational exposures to diesel exhaust
 - EBDEP and CARE-LA collected some questionnaire data on occupational sources, but the sample sizes are likely too small to draw conclusions about more significant sources.
 - Additional studies would be needed to examine potential differences in occupational exposures from stationary versus mobile sources, or trucks versus ports. A targeted study of a highly exposed population like toll collectors would also be valuable.
- Evaluating the temporal decline in PFAS levels

- The challenges of comparing studies conducted at different times in California and the US were discussed. Additional analyses of regional and US trends will be conducted as more NHANES results are released.
- The half-lives of some phased out PFASs are very long; examining the likelihood of seeing a true reduction in body burden over the short time of these studies would be important to examine.
- Intervention studies, such as substituting drinking water sources, are providing better data on half-lives.
- Additional information is needed to identify communities in California that may be more highly exposed.
 - Insights could be gained by looking at participants with levels in the high end of the range.
 - Analysis of CARE-LA exposure questionnaire data on important PFAS sources is ongoing.
- Better understanding of the temporal component in US and California data could help with evaluating specific state policies that may be reducing exposures to PFASs.
- Considerations for the next phase of the CARE study in San Diego and Orange Counties (CARE-3)
 - The importance of accounting for seasonal variability in determining timing of sampling for certain analytes (e.g., 1-NP) was noted.
 - The issue of collecting samples in view of the expanding wildfire season in California was also discussed. To address this, participants will be asked about recent exposures to fires.
 - The recruitment strategy for CARE-2 was adjusted to address the disparity in racial groups enrolled across the CARE-LA Study period; this will also be taken into account for CARE-3.
 - Suggestion to request data from NHANES to compare exceedances above the levels of concern (LOCs) for metals
- Temporal trends in phenols measured in a subset of 60 female participants in CARE-LA
 - Lower levels of triclosan were observed in comparison to NHANES, which may be related to the 2017 US Food and Drug Administration (FDA) ban on triclosan in liquid hand soap and body washes. The detection frequency for triclosan was still relatively high at 82%, possibly due to its many other applications beyond the use banned by the FDA.
 - The detection frequency for triclocarban was only 17%, possibly due to the FDA ban on its major use in antimicrobial soap.
 - The detection frequency for bisphenol S (BPS) in CARE-LA was much higher than that for bisphenol A. This observation could be related to the use of BPS as a replacement for BPA in some applications, such as cash register receipts.

- Suggested request to the Centers for Disease Control and Prevention (CDC) for information on percentages of selected NHANES populations that exceed LOCs for metals to compare with exceedances observed in Biomonitoring California studies.

Update on [Community Air Protection Program](#)(established under [AB 617](#))

Presentation: Brief Overview of AB 617 Implementation, Heather Arias, Chief, Community Planning Branch (CPB), Office of Community Air Protection (OCAP), California Air Resources Board (CARB)

Presentation: Example Community - Wilmington, West Long Beach, Carson, Terry Allen, Air Pollution Specialist, CPB, OCAP, CARB

Presentation: Example Community - South Central Fresno, Brian Moore, Air Pollution Specialist, CPB, OCAP, CARB

In the question period after these talks, topics discussed included:

- Recommendations to CARB for the second year of the Community Air Protection Program
 - Three new communities were recommended:
 - The South Coast Air Quality Management District recommended Southeast Los Angeles and East Coachella.
 - The San Joaquin Air District recommended Southwest Stockton.
 - The San Diego Air District recommended moving Portside, an existing AB 617 community, to an emissions reduction program
- Funding mechanisms for air monitoring, mobile and stationary source emissions reductions measures, and targeted exposure reduction (e.g., installation of air filtration in schools) in AB 617 communities.
- Air pollutants and exposure sources of concern in AB 617 communities, which include:
 - Truck idling, of concern in all the communities
 - Traffic emissions from local streets and highways
 - Diesel emissions due to port- and warehouse-associated truck traffic
 - Backyard burning
 - Pesticides
 - Rendering facility
 - Natural gas bus terminal
- Tailoring emissions reductions measures to the particular community. For example, pesticides are a high priority in Shafter and the Department of Pesticide Regulation has engaged with the community about:
 - Results from existing air monitoring
 - Potential future monitoring
 - Possible regulatory action

- Identifying best practices with community input

Exploring Next Steps for Biomonitoring in AB 617 Communities

Introduction: Duyen Kauffman, Health Program Specialist, Office of Environmental Health Hazard Assessment (OEHHA)

The Panel, speakers, and the audience discussed aspects of designing targeted biomonitoring studies in AB 617 communities, including:

- Recruiting children and pregnant women as high-priority sensitive subpopulations
 - Understanding the impact of chemical exposures on children's health is very meaningful to communities. All AB 617 communities have expressed strong concerns about children and schools.
- Establishing baseline exposures and conducting longitudinal studies to track changes
 - The importance of getting in the field quickly to collect baseline samples and store them for later analysis was noted.
 - Conducting a concurrent study in a control community could be important for understanding both the baseline and changes in exposures.
- Designing intervention studies, such as:
 - A nested occupational intervention study on diesel exposures based around a facility in an AB 617 community.
 - However, it was noted that these communities are more concerned about residents living there and not workers commuting into their community.
 - Studies to measure exposures before and after a specific exposure reduction intervention. This type of study could help inform regulatory policy.
- Options for intervention studies that would be relevant across multiple AB 617 communities
 - Conducting the same type of study or suite of studies in multiple locations would be useful for evaluating and comparing the effectiveness of the intervention.
 - The difficulty in attributing a change in exposure to a particular reduction strategy, versus the entire suite of strategies being carried out in a community was noted.
 - Possible strategies proposed for evaluation in an intervention study included:
 - Statewide strategies that will go into effect at the same time, which will facilitate before and after exposure measurements.
 - Truck re-routing in a city.
 - Installation of school air filtration, though it will be hard to know in advance when that will be implemented.
 - Focusing on an issue of common concern across communities could lead to a focus on mobile sources, which CARB is comprehensively addressing.

- Identifying community-scale issues instead like gas stations, refineries, or rendering plants might be better suited for an intervention study, though the results may be applicable in unique locations.
- Facilities that may pose concerns for metals emission, which could include:
 - Chrome-plating shops
 - Crematoriums
- Identifying currently unknown exposures of concern
 - Non-targeted measurements in air or dust would be one approach for identifying uncharacterized pollutants.
 - This would be of great interest both to the communities and to CARB in advancing new policies.
- Challenges with conducting intervention biomonitoring studies on chemicals with short half-lives that will have significant within-person variability.
 - Collecting spot measurements of such chemicals would be unlikely to provide the desired information.
 - Taking multiple samples from individuals and/or expanding the study size would be required to overcome this issue.
 - However, some chemicals with short half-lives may have ongoing exposures (e.g., cotinine), making it possible to observe the impacts of specific interventions.
- Considering a hybrid of longitudinal and cross-sectional studies; for example, biomonitoring fourth-graders every year during the same month
- Examining ways to link biomonitoring results with health outcomes.
 - The potential for measuring biomarkers of effect in addition to biomarkers of exposure was discussed.
 - Seeking academic partners already conducting a longitudinal study of clinical outcomes (e.g., asthma) in an AB 617 community and proposing to add biomonitoring to the study was suggested.
 - The challenges of conducting these studies in small communities in which some health outcomes may be rare events (e.g., visit to the emergency room due to asthma) was noted. The importance of Biomonitoring California to focus on evaluating exposure reductions and not health outcomes was emphasized.
- Potential for biomonitoring pesticides
 - Fungicides were noted as being of particular concern in terms of significant increases in use and lack of exposure data.
 - Glyphosate was highlighted as a widely used herbicide.
 - Neonicotinoid insecticides are increasing in use as replacements for organophosphates.
 - Careful timing of a biomonitoring study to ensure sampling at the time pesticides are being applied would be important.
 - In recruiting populations highly exposed to pesticides, the Program would need to be sensitive to community concerns about immigration status.
- Engaging with communities
 - Ask the communities what they would want out of a biomonitoring study, and be ready to make adjustments to accommodate their requests.

- Presenting the capabilities of Biomonitoring California at monthly AB 617 community meetings and requesting proposals from the community for biomonitoring studies was suggested. This could include seeking proposals from researchers in those communities with existing biorepositories.
- It is essential to address community concerns about the purpose of the biomonitoring studies, including showing that the findings will be practical and will help identify which actions can reduce exposures. Communities do not want to “be studied to be studied.”
- All AB 617 communities are environmental justice communities that experience many simultaneous factors that impact their health. Including health education and/or support (e.g., linkage to care) as part of the biomonitoring studies could help address community requests for actions that will lead to improved health outcomes.
- Allocating funds to provide stipends to study volunteers is also essential.
- Partnering with community organizations and AB 617 Community Steering Committees could aid in recruitment of biomonitoring study participants.

Possible Topics for 2020 SGP Meetings

Presentation: Sara Hoover, MS, Chief, Safer Alternatives Assessment and Biomonitoring Section, OEHHA

The presentation outlined planned topics for 2020 SGP meetings. The Panel and audience raised the following additional suggestions:

- Chemicals linked with breast cancer risk as candidates for biomonitoring
- Microplastics – an update on the state of the science with regard to chemical exposures and potential health effects
- Community and occupational and exposures from wildfires, including exposures to day laborers and domestic workers who perform clean-up of ash and debris during and after wildfire events
- Chemical exposures associated with marijuana cultivation

Open Public Comment Period

Nancy Buermeyer of Breast Cancer Prevention Partners expressed the strong commitment of a number of organizations to obtaining stable funding for Biomonitoring California, and their efforts to approach the Legislature and Governor’s Office to achieve that goal.

