July 2021 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 virtually on July 16, 2021. This document briefly summarizes the Panel's input and recommendations, as well as the range of topics discussed with the guest speakers and audience. Visit the July 2021 SGP meeting page to access the presentations, complete transcript, written public comments, and other meeting materials.

Program Update and Panel Input on Recommendations for the Seventh Report to the Legislature

Presentation: Nerissa Wu, PhD, MPH, California Department of Public Health (CDPH)

Panel members discussed the following topics:

- Details of the $2 million budget augmentation that the Program received as ongoing funding in Fiscal Year 2021-2022, and the extent of statewide surveillance it would support.
    - *Program staff noted that the augmentation is not sufficient to support the original vision of the 2006 legislation for statewide surveillance, which was estimated at that time to require more than $10 million per year.*
- Possible recommendations to include in the Seventh Report to the Legislature.[1]
    - Design studies to identify and mitigate environmental injustices and health inequities faced by some communities, which can be defined by geography, occupation, race/ethnicity or other identifiers.
        - This could include conducting biomonitoring intervention studies to assess the effectiveness of policies designed to reduce exposures in disproportionately impacted communities.
    - Consider ways to address breast cancer concerns, which were foundational to passing the Program's enabling legislation.
        - This could include applying new capabilities, such as non-targeted analysis, to inform biomonitoring for chemicals relevant to breast cancer (e.g., endocrine disruptors).
    - Evaluate exposures related to climate change, particularly in vulnerable populations, which may arise from:
        - Increases in wildfires.
        - Changes in the environmental transport and distribution of volatile

[1] A letter summarizing the Panel's recommendations is posted on the meeting page at this link: https://biomonitoring.ca.gov/sites/default/files/downloads/SGPRec7thLegReport.pdf.

and persistent chemicals.
        - Removing fossil fuel combustion from buildings and improving energy efficiency.
    - Continue to develop non-targeted analysis to help identify previously unknown industrial/commercial chemicals.
        - Ensure that certain types of chemicals are excluded (e.g., drugs of abuse).
        - Consider using samples that would not require individual results return.
    - Continue to work toward statewide representative sampling to fulfill the original mandate of the legislation, which will require additional resources.
    - Consider approaches beyond intervention studies to evaluate regulatory effectiveness and promote effective policies to reduce exposures.
    - Prioritize:
        - Funding laboratory analyses over sample collection if possible.
        - Studying children as one of the most vulnerable groups.
        - California-specific issues.

Public comment:

- Dr. Ahimsa Sumchai of the Hunters Point Biomonitoring Program encouraged the Program to use geospatial mapping to identify patterns and distribution of exposure, as well as tools like the US Environmental Protection Agency Environmental Justice Screening and Mapping Tool (EJSCREEN) (*Program staff noted that CalEnviroScreen is a California-specific tool developed by the Office of Environmental Health Hazard Assessment [OEHHA] that Biomonitoring California uses in selecting targeted biomonitoring locations, for example*).
- Nancy Buermeyer of Breast Cancer Prevention Partners provided a list of groups that supported the recent budget augmentation for the Program. She also recommended that a section be included in the Report to the Legislature to explain what the budget augmentation was used for, and what it allowed the Program to do that would not have been possible without the additional funding.

AB 617 Biomonitoring Update

Background document: Selected references related to AB 617 biomonitoring

Presentation: Susan Hurley, MPH, OEHHA

The Panel provided the following input on the AB 617 targeted biomonitoring study:

- Rather than timing the study to avoid a wildfire, consider that as an opportunity to look at the effect of filtration on those exposures.

- Consider choosing a school that uses MERV 13, rather than MERV 16, for air filtration. The lower rated filter places less burden on the HVAC system, allowing better energy efficiency.
- The standalone filtration will provide an important augmentation to the MERV filter by reducing volatile organic compounds (VOCs) in addition to particles. It's important to choose a high quality unit, which scientists at the Lawrence Berkeley Laboratory could provide input on.
- Take into account time spent outdoors during the school day (e.g., recess) in deciding when to collect urine samples.
- Collect information on how the child gets to and from school.
- Document as much information as possible about the building characteristics, such as air infiltration rate and energy efficiency upgrades that might affect that.
- Collect information on indoor sources of VOCs, and cleaning and disinfection protocols.
- Consider engaging the students in the study for science education.
- Ask about barbecued or grilled food consumption the day before the study, which is important when studying polycyclic aromatic hydrocarbons (PAHs).
- Consider not advising people to avoid certain foods, to test how well the biomarkers assess exposure reduction under real-world conditions.

Public comment:

- Matt Holmes of Little Manila Rising underscored the importance of engaging with the community early and often in the study design process, and praised OEHHA for doing so. He noted that the planned study is aligned with the community's priorities to protect schools, particularly in areas with a cluster of emission sources. He raised concerns about allowing energy costs to dictate the choice of air filter, emphasizing that we should "set the highest benchmark possible for our most valuable resource…young human brain tissue." He indicated that most of the schools have built up significant solar capacity, which should mitigate energy cost issues.
- John Balmes of UC Berkeley and UC San Francisco shared that his group put in a proposal to work with Matt Holmes and Little Manila Rising on installing a network of black carbon monitors at homes of children and adults with asthma, which could be helpful for the biomonitoring study. Matt added that Little Manila Rising is also working with Asa Bradman at UC Merced on a proposal to better characterize ambient air quality across the region and understand where the pollution is coming from.
- LeVonne Stone, Director of the Fort Ord Environmental Justice Network, commented on air pollution issues in her area, such as prescribed burns, and exposures associated with the military base and agriculture (e.g., pesticides). She raised concerns that the State of California and the air district have not

given adequate attention to her community with regard to biomonitoring, air monitoring, and grants to support their research.

Traffic-Related Air Pollution and Biomarkers of Effect in Children in Fresno

Presentation: John Balmes, MD, UC Berkeley and UC San Francisco

Topics discussed in the question period after this presentation included:

- Circadian rhythms and half-lives of biomarkers of oxidative stress.
- Pathway of air pollutant exposures leading to a local airway inflammatory response to oxidative stress, which can result in local airway injury and then systemic effects, including extrapulmonary impacts, if the inflammatory response is chronic/severe.
    - Systemic effects have been shown in terms of blood vessel response, with endothelial function being inhibited by air pollution exposure, and inflammation of adipose tissue.
    - Ultrafine particles have been shown to be deposited in the brain of animals exposed to traffic-related air pollution.
- Evidence that wildfire smoke PM2.5 may be more toxic than non-wildfire PM2.5 with regard to respiratory outcomes.

Challenges and Opportunities in Air Filtration Intervention Studies

Presentation: Ryan Allen, PhD, Simon Fraser University, Canada

Topics discussed in the question period after this presentation included:

- Compliance of participants in terms of consistently using the air filters in the intervention studies.
    - In the British Columbia studies, participants were told to use the air filter at the highest fan setting they were comfortable with, and this introduced variability (with some participants using it on high and others on low).
    - In the later Mongolian study, the air filters were locked on one setting, which ended up causing some participants to turn it off entirely (e.g., due to noise or electricity cost).
    - It was uncertain how these compliance issues affected their results.
- The substantial impact of opening doors and windows on the effectiveness of air filtration.
- The difficulty of interpreting biomarkers of inflammation and oxidative stress in terms of air pollution exposures, because these biomarkers are non-specific.

Biomarkers of Effect in Air Pollution Intervention Studies: Study Design Issues

Presentation: Maggie Clark, PhD, Colorado State University

Topics discussed in the question period after this presentation included:

- Challenges in using dried blood spots for biomonitoring.
    - Stability at room temperature and viability for mailing depends on the analyte of interest (there is extensive literature on this topic). Their study approach was to freeze after collection and mail them in coolers with ice packs (not dry ice) to the lab.
    - Another issue with dried blood is blood volume standardization using hemoglobin, given that air pollution exposures can be associated with hemoglobin. Other options could be C-reactive protein or potassium.
    - The volume available for analyses means analytes have to be prioritized (e.g., measuring some biomarkers would require two blood spots).
- Approach used to determine appropriate compensation for participants.
    - Community groups were consulted at the four study locations to decide how best to compensate the control group, because that would play a role in understanding the impact of the intervention on the measured outcomes (i.e., avoiding the introduction of a socioeconomic status advantage for participants receiving a cleaner stove).
    - Control compensation was provided, and that varied by research site based on community feedback (e.g., smaller incentives throughout the study, or waiting until the end of the study to provide compensation).
- Returning results to participants.
    - The study team is working with anthropologists to determine what approach(es) would be most appreciated by participants.
    - A likely aspect will be putting individual exposure results in the context of the overall study.

Using Biomarkers of Effect in Air Pollution Biomonitoring Studies – Issues in Study Design, Measurement, and Results Interpretation

Introduction: Susan Hurley, MPH, OEHHA

The Panel, guest speakers, and audience discussed a range of topics, including:

- Returning results to parents of child participants.
    - A survey was proposed to seek input from parents on what information would be most helpful to them in terms of understanding the results.
    - Communicating biomarker results in the context of familiar exposures (like smoking) was suggested as a way to improve understanding.
- Suggestions for exposure questionnaire content.
    - Diet (e.g., consumption of fried food) and cooking practices (e.g., use of a stove fan/vent), in particular during the evening before sample collection.

        - Consulting validated questionnaires on these topics was advised.
    - How they commuted to school, including the type of vehicle.
    - When they came to school (e.g., were they dropped off for daycare before school).
    - Smoking (including cannabis) and vaping.
    - Time spent outside the day/evening before sample collection, and the particular activities (e.g., sports).
    - Mask wearing, including type of mask.
    - Self-reported stress or perceived stress.
- Reminders about study activities.
    - Develop reminders for parents to hang on the refrigerator with visual depictions and written instructions about study activities.
    - Use text reminders as a proven effective approach.
- Timing of urine sample collection.
    - Take into account short half-lives of biomarkers of effect.
    - Aim to collect samples during a period when children are not being exposed to outside air (i.e., account for recess and the possibility of children staying after school to play outside).
    - Consider potential diurnal patterns in the air pollutants.
- Other study challenges and opportunities.
    - Consider options for control groups (e.g., enrolling children in the same household who do not attend the school with air filtration).
    - Rain would pose larger issues than wildfires, because air quality is much better during rainy periods.
    - Wildfires could present an important opportunity to collect data on those increased exposures.
    - Measuring exhaled nitric oxide was suggested.
    - Having children wear silicone wristbands, which could help with understanding exposures at school versus at home, was suggested.
    - The recommendation to not provide any dietary advice was reiterated and emphasized.
- Proposal for Matt Holmes of Little Manila Rising to give a presentation at a future SGP meeting about the community perspectives on the study results and lessons learned.

Open Public Comment

Submission from Dr. Ahimsa Porter Sumchai

Nancy Buermeyer noted that state legislation banning perfluoroalkyl and polyfluoroalkyl substances (PFASs) in firefighting foam last year, and a new bill related to PFASs in

food packaging this year, may provide an opportunity for the Program to track the effectiveness of these policies in reducing PFAS exposures.