**November 2024 Meeting of the Scientific Guidance Panel for Biomonitoring California**

**Summary of Input and Recommendations**

The Scientific Guidance Panel (SGP) for the California Environmental Contaminant Biomonitoring Program (also known as Biomonitoring California) met in Oakland on November 7, 2024. This document briefly summarizes input and recommendations received from the Panel, as well as the range of topics discussed with the audience. Visit the November 2024 SGP meeting page to access the presentations, transcript, and other meeting materials.

**SGP Panel Members in Attendance**

Thomas McKone, PhD, Acting Chair
Carl Cranor, PhD, MSL, *attended remotely*
Lara Cushing, PhD, MPH
Oliver Fiehn, PhD, *attended remotely*
Ulrike Luderer, MD, PhD
Amy Padula, PhD, MSc
Penelope (Jenny) Quintana, PhD, MPH, *attended remotely*
José Suárez, MD, PhD, MPH

**Program Updates**
Presentation: Kathleen Attfield, ScD, California Department of Public Health (CDPH)
Presentation: Rebecca Belloso, MPH, Office of Environmental Health Hazard Assessment (OEHHA)

The Panel members and audience discussed the following topics with staff presenters:

- Follow-up protocol for elevated arsenic results.
    - The Program follows an arsenic speciation protocol if arsenic levels are above the established level of concern. A Biomonitoring California paper was recently published that describes our protocol for following up with participants with elevated arsenic levels. (Iyer S, Kauffman D, Steinmaus C, Hoover S. Biomonitoring California Protocol for Following up on Elevated Levels of Urinary Arsenic. Int J Environ Res Public Health. 2023 Mar 27;20(7):5269. doi: 10.3390/ijerph20075269. PMID: 37047885; PMCID: PMC10094481.)

- Development of the quaternary ammonium compounds (QACs) and expanded perfluoroalkyl and polyfluoroalkyl substances (PFASs) laboratory panels.

    - The expanded PFAS panel is currently in use for the Studying Trends in Exposure in Prenatal Samples (STEPS) project in banked maternal samples.
    - A QAC panel was developed by an external lab at the University of Washington. An initial exploratory use of this panel to analyze urine samples collected from individuals not occupationally exposed to QACs found few detections, while a follow-up analysis of samples collected from health care workers found a greater frequency of detection. This panel may be more appropriate for use in studies with targeted populations (e.g., health care workers).

- BiomSPHERE (Biomonitoring component of the San Joaquin Valley Pollution and Health Environmental Research Study) results return packets and evaluation project.
    - The BiomSPHERE results will be returned in tabular form to all participants. As part of the project to evaluate this study's results return packets, the Program may consider introducing additional materials in other formats, such as graphs or an online platform, to share with the focus groups and gather feedback.
        - A graphical depiction of the results may be particularly useful in helping participants understand how their levels compare with others.
    - Participant selection for the evaluation project will be a staged process. For the initial survey, all participants that requested their results materials will be contacted. Afterwards, a randomized sample will be recruited for the focus groups based on who responds to the survey. The survey will guide us in choosing a focus group.

- Opportunities for participants to consult a physician about their biomonitoring results.
    - For participants with results above the levels of concern, they will receive a notification letter that tells them to contact their primary care doctor/physician if they have concerns. We also have medical doctors on our team to speak with them about their concerns.
        - Occupational and Environmental Medicine clinics within the University of California (UC) system would also be a good resource to point participants to for clinical information.

- Communicating biomarkers of response results to participants.
    - The Program has returned biomarkers of response results for the Stockton Air Pollution Exposure Project (SAPEP) and BiomSPHERE studies. These packets included fact sheets about the biomarkers of response and

informed the participants that there are many factors that can contribute to their levels (e.g., time of day) besides exposure to air pollution.

- The Program's previous experiences with participant reactions to receiving their results, including how often the Program receives questions from participants about their results.
    - The Program generally receives few inquiries from study participants regarding their results. The Program communicates overall study findings by holding community meetings and webinars where study participants and others interested in the study can learn about and discuss the study's findings. For example, in April 2024, the Program held a community meeting to discuss findings of the SAPEP study, and a public webinar to discuss the findings of the CARE study.

- Alternative distribution methods for returning results to study participants.
    - The Program is considering the use of Digital Exposure Report-Back Interface (DERBI), which would first be tested using one of our intra-program pilot (IPP) projects.
    - Study population should be considered when deciding on a distribution method.
        - Younger age groups would likely prefer digital methods.
    - Some digital methods include:
        - WhatsApp, a popular encrypted texting app.
        - REDCap, a secure web application for building and managing online surveys and databases.
        - DERBI, which has a smartphone version and will notify study staff whether participants have opened or viewed their results.

- Dr. Ahimsa Porter Sumchai commended the Program for including nickel in its biomonitoring studies and noted that the Program should consider diesel exhaust as a source of nickel exposure.
    - Panel member McKone added his support for the use of metal biomarkers as potential indicators of diesel exposure.

**Updates on Air Pollution Community Biomonitoring Studies**
Presentation: Jeff Wagner, PhD, Environmental Health Laboratory, CDPH
Presentation: Kimberly Valle, MS, University of California, Merced

Panel members, staff and guest speakers discussed the following topics:

- Evaporative (swamp) cooler filters and indoor air cleaners used in the FRESSCA-Mujeres (Farmworker women & Respiratory Exposure to Smoke from Swamp Cooler Air ) Project.

- The indoor air monitoring data collected at times when the swamp cooler was used without a filter are still being analyzed to determine whether there is a negative impact on indoor air quality.
- Survey data were collected to get a sense of participants' willingness to pay (~$200) for the swamp cooler filters. Responses were mixed, suggesting that these filters may not be affordable for all. Electrical costs of using the swamp coolers with the filters is also being considered.
- Differences in home and room square footage and the potential need for additional indoor air cleaners.
    - Data is currently being analyzed for the effectiveness of the indoor air cleaners based on the square footage of the homes.
- The survey did not collect information on opening of windows during the study period. The temporal variability shows that there was a moment in one home where air PM2.5 concentrations rose suddenly to equal the outdoor air concentrations for a short period of time. An open window or door could have caused it.
- All the participants that attended the community meetings received a replacement filter for the air purifiers as an incentive. Swamp cooler replacement filters for participants were left with the study's community partner. We have also shared information with participants on where to purchase replacement filters.

- Environmental results from the FRESSCA-Mujeres Project.
    - Indoor levels of polycyclic aromatic hydrocarbons (PAHs) such as naphthalene were likely influenced by cooking. Local petroleum industries are a potential source of outdoor PAHs.
    - Differences between indoor and outdoor levels of volatile organic compounds (VOCs).
        - Except for styrene, the VOC concentrations were highest outdoors and lowest indoors with the evaporative cooler (EC) filters.
        - There is a concern that the filters themselves could potentially release chemicals such as styrene. Mold could also form on the filters when they get wet, which emphasizes the importance of analyzing the filters themselves in the laboratory.

- PurpleAir monitors in the FRESSCA-Mujeres Project.
    - PurpleAir monitors were deployed both indoors and outdoors, though not with the same coverage. While indoor monitors were deployed in each home, there was about one outdoor monitor per city.
    - PurpleAir monitors were calibrated. The study focused on indoor/outdoor ratios, so the goal of calibration was agreement between PurpleAir monitors rather than with a federal reference monitor.

- The indoor PurpleAir monitors captured spikes in indoor $PM_{2.5}$ levels likely associated with cooking. Study partners at IIT are working on algorithms to identify short term PM spikes that suggest indoor vs outdoor sources.
- PurpleAir data from a minor wildfire smoke episode during the study were compared to federal 24-hour and annual standards, and the outdoor PM data at that location did not exceed the 24-hour standard during that time. Future analyses will include comparisons of data from all locations to both the State and federal standards.

- Biomarkers of response data from BiomSPHERE.
  - The BiomSPHERE study is the first of its kind looking at consecutive daily samples with these biomarkers of response (8-isprostane, 8-OHdG, PGE2, and CC16) to better understand short-term variability. This data can also be used to conduct power and sample size calculations for potential future larger studies.
  - Challenges in interpreting the CC16 biomarker in light of chronic vs acute responses to a variety of stressors and possible exposure durations.
    - In individuals with chronic respiratory conditions, their CC16 tends to be lower.
    - Future studies could consider restricting participation or inclusion of data from participants that had chronic health conditions or acute inflammatory conditions.
  - Higher levels of inflammation markers were seen in children versus adults in BiomSPHERE. A few children reported that they had flu-like symptoms or physical ailments such as a sprained arm. This could explain why children had higher levels of inflammation.
    - Panel member Jose Suarez discussed results from an external study, which also found that adolescents had higher levels of inflammation than adults. Inflammation may also be associated with general growth and development in children.
    - Obesity, more rapid breathing, and behavioral differences (e.g., more active playing) could also contribute to higher levels of inflammation in some children.
  - The BiomSPHERE participant questionnaire includes diet and access to health insurance which are variables that other studies have linked to associations with these biomarkers. Future analyses will take into account these variables and other information identified in the questionnaires.
    - The literature also indicates that BMI can influence levels of these biomarkers. The BiomSPHERE study collected information on the BMI of children involved in the study, but not adults.

- Difficulty in recruitment of men in recent Biomonitoring California studies.
    - More mothers were involved in BiomSPHERE than fathers, as the mothers were more interested in participation. Greater efforts to recruit male participants in future studies should be considered.

**Planning for 2025 SGP Meetings**
Presentation: Martha Sandy, PhD, MPH, OEHHA

Panel members expressed support for the Program to consider the following topics for future SGP meetings:

- Oil and gas exposures near residential areas in the San Joaquin Valley and Los Angeles, including assessing in-home exposures to benzene from natural gas stoves and heating sources.
- Climate change and associated exposures, such as from wildfires and drought, and identification of relevant biomarkers of exposure.
- Creatinine versus specific gravity adjustment for urinary measurements.
- Health guidance values, including guidance for the community.
- Identification of appropriate populations from the National Health and Nutrition Examination Survey (NHANES) for comparison to Biomonitoring CA studies, and acknowledgement of populations not captured by NHANES, such as immigrant populations and special worker populations.
- New and emerging chemicals, such as microplastics.
- Best practices for returning study results to participants, including graphic design, communication messaging, and different perspectives of report back platforms.

**Open Public Comment**

Dr. Ahimsa Porter Sumchai provided an update on the Hunters Point Community Biomonitoring Program, a human biomonitoring program for residents and workers within the one-mile perimeter of a federal Superfund site in heavily industrialized southeast San Francisco. They have screened 15 workers who are sited near the federal Superfund site which is within about 300 feet of a radiation contaminated methane-producing landfill. They are detecting manganese at high levels, and biomarkers of radionuclides in the workers. Along with Dr. James Dahlgren, the founder of Pacific Toxicology Laboratories, they have detected products of nuclear fission and decay in 11 current and childhood residents, the majority of whom are living within half a mile of the perimeter of the landfill and the entry to the Naval Radiological Defense Laboratories.