July 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) was in Sacramento on July 19, 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 July 2024 SGP meeting page to access the presentations, complete transcript, and other meeting materials.

SGP Panel Members in Attendance

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

Program Updates

Presentation: Nerissa Wu, PhD, MPH, California Department of Public Health (CDPH)
Presentation: Aalekhya Reddam, PhD, OEHHA
Presentation: Paramjit Behniwal, PhD, MSc, Environmental Health Laboratory (EHL), CDPH

Panel members discussed the following topics with staff presenters:

- Exploring future collaborations with established statewide surveillance programs, such as the California Health Information Survey, and California's Maternal and Infant Health Assessment.

- The important role the Program's studies can play in providing information on exposures to Californians that goes beyond the information provided by the National Health and Nutrition Examination Survey (NHANES), to provide a more detailed understanding of California-specific exposure issues (e.g., examining exposures not covered by NHANES and including key data NHANES lacks, such as geographic information, proximity to exposure sources, and behavioral factors in analyses).

- Expanding laboratory methods to measure polycyclic aromatic hydrocarbons (PAHs) in blood.
    - The current laboratory method used by CDPH's EHL detects urinary metabolites of PAHs. The Department of Toxic Substances Control (DTSC)'s Environmental Chemistry Laboratory (ECL) is making good progress on developing a method to detect PAH parent compounds in serum.

- Possible utilization by the Program of blood samples collected for other purposes.
    - Limitations of using newborn blood spots were discussed, including technical difficulties associated with the nature of the samples (e.g., small volume, dried), and concerns regarding potential contamination after sample collection.
    - The Program's successful use of California Biobank second-trimester blood samples collected by the Prenatal Screening Program was also discussed. Biobank prenatal screening samples were used in the MAMAS study. Biobank prenatal screening samples are also being used in the current surveillance study, STEPS. STEPS uses the Prenatal Screening Program as a sampling frame, to obtain a population-based sample (for specific counties). Limitations associated with the Biobank samples include small sample volume, only serum is available, and only samples from seven counties are banked.

- Sample size and population considerations, specifically the sample size and greater proportion of female adults in the East Bay Diesel Exposure Project (EBDEP)
    - The study team actively recruited both male and female adults, however the study population was parent-child pairs, and mothers were more likely to participate with their children.
    - Children in the study were evenly balanced by sex.

- Use of CalEnviroScreen as a preliminary screening tool to identify populations that have higher chemical burdens for EBDEP and future community biomonitoring studies.
    - CalEnviroScreen data were used to inform the design and planning of EBDEP and are considered in the planning of community air pollution biomonitoring studies. In addition, CalEnviroScreen data have been used to help identify potential AB 617 communities.

- Examining factors that may have contributed to volatile organic compound (VOC) exposures in EBDEP.
    - Gas water heaters are sometimes located within houses and may be a potential source of VOC exposure.
    - The study questionnaire asked about the presence of gas stoves but did not ask about gas oven use.
    - Information from time activity diaries may be used to examine the impact of time spent indoors vs. outdoors on urinary VOC metabolite levels, and possible relationships with the observed seasonal differences in urinary VOC metabolite levels.

- Using the newly developed expanded laboratory VOC metabolite method in future studies to investigate potential VOC exposures.

- Additional analytical considerations in developing the new VOC method.
    - Selection of VOC metabolites to measure, given interindividual genotypic and phenotypic variability within the population.
    - Consider measuring creatinine or specific gravity in the urine samples to inform and optimize sample preparation (e.g., dilution) prior to analysis.
    - Previous stability tests with BTEX (benzene, toluene, ethylbenzene, xylene) metabolites have shown that:
        - Storage at -80 degrees: samples are stable with prolonged storage.
        - Storage at -20 degrees: samples are unstable with prolonged storage, and multiple freeze (-20 degrees) thaw cycles led to lower efficacy of standards.
    - There are plans to run long-term, short-term, and post-preparation stability tests on the additional VOC analytes.

- Monitoring climate change effects on exposures of concern.
    - Although the Program does not specifically target climate change impacts, an established surveillance system can help track changes in exposures to chemicals like air pollutants over time, which may increase as ambient temperatures increase, and the occurrence and severity of events such as wildfires and droughts increase.
    - Some of the Program's AB 617 activities, including studies assessing the effect of air filtration interventions on the indoor environment and study participants' exposures, can help inform future biomonitoring studies on exposures affected by climate change.
    - Consider exploring how biomonitoring studies can be designed to characterize changes in chemical exposures due to the impacts of climate change (e.g., wildfires, drought, heat stress, spending more time indoors) at a future Panel meeting.

Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs) and Seafood in California: Monitoring of Human Populations and Fish Species
Presentation: Kelly Chen, MS, CDPH
Presentation: Wes Smith, PhD, Office of Environmental Health Hazard Assessment (OEHHA)

Panel members discussed the following topics with presenters:

- Other studies reporting seafood as a source of PFASs.
    - In populations with high seafood consumption and without contaminated drinking water, such as the Faroe Islands, high blood levels of PFASs are detected.

- Contributions of diet and drinking water to PFAS exposures.
    - The Asian/Pacific Islander Community Exposures (ACE) Project did not collect data on consumption or sources of drinking water, which might have contributed to PFAS exposure.
    - Previous Program analyses have found associations between levels of some PFAS measured in the California Reginal Exposures (CARE) studies and PFAS levels in drinking water (e.g., March 2023 SGP)
    - Preliminary analyses of the CARE data suggest that drinking water may contribute more than diet.
    - Preliminary analyses of the CARE data suggest that dietary sources of PFASs may differ, depending on the specific PFAS type and size.

- The detection and concentration of PFASs in fish can be attributed to different factors.
    - The half-lives of PFASs are variable, with PFOS and PFAS having longer half-lives.
    - PFASs have different partitioning factors and affinities for proteins such as albumin. This may explain the differences in accumulation between PFOS and PFOA.
    - Current research has not demonstrated a relationship between PFAS levels and fish size/age.
    - There appears to be some degree of correlation between trophic level and PFAS accumulation in fish, but the correlation is not completely consistent with trophic level.
    - The degree of bioaccumulation of PFASs can differ, depending on the water body and the bioaccumulation chains for different fish species.
    - Tidal flushing and PFAS sediment levels may affect the levels of PFAS detected in fish, based on data from the San Francisco Bay.

- Fish advisories are developed only for recreationally caught fish, and they are specific to individual water bodies. Fish advisories are disseminated to the public by placing posters near specific water bodies and working with relevant community groups.

- PFAS health guidance values developed by OEHHA, and listings under Proposition 65
    - OEHHA's Water Toxicology Section has set public health goals for PFOA and PFOS and recommended notification levels for other PFASs.
    - Under Proposition 65, PFOA and PFOS are listed for cancer and PFOA, PFOS, and PFNA are listed for reproductive toxicity.
    - OEHHA continues to monitor ongoing research on PFASs and actions by other groups, states, and federal agencies.

Trends of PFASs and Persistent Organic Pollutants (POPs) in Pregnant Californians
Presentation: Dina Dobraca, MPH, CDPH

Panel members and members of the public discussed the following topics with the presenter, regarding the findings presented from the MAMAS studies:

- The apparent increase in levels of PFBA (perfluorobutanoic acid), a four-carbon fluorocarbon chain PFAS, in the MAMAS studies.
    - This may be something to investigate further. A preliminary look at the literature did not identify other biomonitoring studies reporting increases in blood PFBA levels, or associations with contaminated drinking water.
    - PFBA was detected in two out of 150 pregnant women in samples collected from 2011 to 2018 in the ECHO (Environmental influences on Child Health Outcomes) study.

- The higher levels of PFHxS (perfluorohexane sulfonic acid), a six-carbon fluorocarbon chain PFAS, in White populations compared to other races/ethnicities.
    - This finding is consistent with national data in NHANES.
    - Past analyses in the California Regional Exposure study have shown a a significant relationship between PFHxS water levels and serum concentrations.
    - Water contamination with PFHxS is thought to be due to industrial sources, such as airports or other industrial use sites.

- When stratifying by race/ethnicity, it is useful to compare findings to other ethnicities, as well as the population as a whole.

- Future possible analyses of the MAMAS study data, including examining associations between levels of PFASs and persistent organic pollutants (POPs) and regional and socio-economic factors, and associated challenges.