November 6, 2014 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, 2014 in Sacramento. This document briefly summarizes the Panel's input and recommendations on each agenda item and related public comments. Visit the November 2014 SGP meeting page to view or download the presentations, other meeting materials, and the full transcript.

Program Update and Evaluation

Program Update
Presentation by Michael DiBartolomeis, Ph.D., D.A.B.T., Chief, Exposure Assessment Section, Environmental Health Investigations Branch, California Department of Public Health (CDPH); Lead of Biomonitoring California

Biomonitoring California: Evaluation of Activities under the Centers for Disease Control and Prevention (CDC) Cooperative Agreement, 2009 - 2014
Presentation by Christine Arnesen, R.N., M.P.H., Arnesen Consulting

Panel members:

- Encouraged the Program to compile resources for researchers, such as an index of the chemical analyses that Biomonitoring California laboratories are able to carry out.
- Commended the Program on receiving a second round of funding from CDC.
- Supported further discussion about the possible future establishment of a stakeholder advisory group.
- Encouraged future efforts to raise awareness of the Program through targeted outreach to specific audiences, such as via a news article to publicize and explain the work of Biomonitoring California.
- Noted that some California university researchers are collaborating on biomonitoring projects with out-of-state laboratories and suggested that the Program connect with these researchers for possible future collaborations.

Public comment:

Sharyle Patton, of the Commonweal Biomonitoring Resources Center, requested that the Panel prioritize volatile organic compounds (VOCs) for measurement in Californians, particularly in communities near current or future sites of oil and gas extraction. She also supported the establishment of a stakeholder advisory group.

Laboratory Update

Environmental Health Laboratory Update
Presentation by Jianwen She, Ph.D., Chief, Biochemistry Section, Environmental Health Laboratory Branch, CDPH

Environmental Chemistry Laboratory Update
Presentation by Myrto Petreas, Ph.D., M.P.H., Chief, Environmental Chemistry Branch, Environmental Chemistry Laboratory, Department of Toxic Substances Control (DTSC)

Panel members:

- Supported continued development of analytical methods to biomonitor for organophosphate flame retardants (OPFRs).
- Suggested that future biomonitoring studies focus on gathering data across the age spectrum, especially younger children. The Panel expressed particular interest in studying OPFR exposures in children.
- Provided input on issues related to the Program's development of non-targeted screening methods:
    - For submissions to Institutional Review Boards (IRBs), suggested the Program emphasize plans to use anonymous samples during early method development.
    - Discussed concerns and challenges regarding potential detection of illegal substances, drugs of abuse, or pharmaceutical drugs in specimens during non-targeted screening.
        - Some Panel members suggested that the Program explicitly address this issue by indicating in consent forms that the Program will exclude measurement of illegal substances and focus only on environmental chemicals, to reassure potential study participants.
        - In the case of studies with completely anonymous samples, the Program was encouraged to retain the full scope of analytes; having a complete picture of all chemical exposures would be important for evaluating potential links to health outcomes.

Public comment:

Nancy Buermeyer, of the Breast Cancer Fund (BCF), noted the potential for identification of illegal substances in biomonitoring studies as very concerning for communities, particularly occupational groups such as firefighters.

Afternoon Session

Challenges in Measuring Exposure to Diesel Exhaust
Presentation by Melanie Marty, Ph.D., Assistant Deputy Director, Scientific Affairs Division, OEHHA

Nitropyrene Metabolites as Biomarkers for Diesel Exhaust Exposure
Presentation by Chris Simpson, Ph.D., Associate Professor, University of Washington (UW)

Presentations by public commenters:
Joe Suchecki, Truck and Engine Manufacturers Association
Chris Ruehl, Ph.D., California Air Resources Board (CARB)

The afternoon session began with the guest presentations listed above, followed by a discussion with the Panel, guest speakers, and audience on strategies to study communities highly exposed to diesel exhaust.

The Panel reiterated its previous support for the Program to identify one or more biomarkers for diesel exhaust. The Panel noted that measuring a diesel exhaust biomarker could help demonstrate the public health success of diesel-reduction efforts in California. Potential approaches to studying diesel exhaust exposure in California were proposed and discussed.

The Panel, guest speakers, and/or audience:

- Encouraged the Program to pursue method development for 1-nitropyrene (1-NP) and its metabolites as non-specific biomarkers in urine.
- Proposed measuring 1-NP and metabolites in archived samples to explore:
    - Relationships between 1-NP and its metabolites and traffic density information.
    - Regional differences in diesel exhaust exposure, such as by comparing levels of 1-NP and metabolites in samples collected near I-580 (no truck traffic) and I-80 (heavy truck traffic).
    - Temporal changes in 1-NP and its metabolites to examine effects resulting from changes in diesel regulations, which may help inform engine emissions policies in the State.
    - Relationships between levels of hydroxy-PAHs (polycyclic aromatic hydrocarbons), which the Program can already measure, and 1-NP and its metabolites.
- Suggested investigating within and between subject variability in levels of 1-NP and its metabolites by conducting a study with repeated measurements.
- Noted the Program should investigate other sources of 1-NP exposure and examine how much those other sources might contribute to urinary levels of 1-NP compared to exposure from diesel exhaust.

- Suggested possibly broadening to a larger panel of nitro-PAHs, beyond only 1-NP and metabolites, or another panel of multiple chemicals if a clear link to diesel exhaust exposure could be made.
- Noted that there is a tradeoff between the analytical requirements of measuring chemicals that occur at very low concentrations, including 1-NP and metabolites, versus attempting a screening analysis to measure a broader panel of chemicals.
- Proposed investigating potential diesel biomarkers in blood instead of urine, which might be more persistent and provide a more consistent picture of exposure (for example, protein adducts in blood as a longer term measure); however, much more is known about diesel urinary biomarkers.
- Noted that secondary atmospheric reactions should be taken into account when investigating other biomarkers.
- Suggested the Program explore finding a diesel biomarker that could potentially link the operation of diesel engines (measured by number of miles driven, for example) to disease burden.
- Proposed strategic sample collection to store for future analysis if a more optimal biomarker becomes available.
- Suggested using a combination of different tools, such as exposure modeling, ambient air measurements, and measurement of biomarkers, including 1-NP as well as non-specific markers of genotoxicity and/or inflammation, to better understand exposure to diesel exhaust.
    - Noted that to make a link between nitro-PAHs as potential biomarkers and diesel particulate matter, which is linked to health effects, nitro-PAHs should be measured in diesel emissions at the same time as in biological samples.
- Discussed available studies of changes in diesel emissions related to the new diesel technology, including:
    - One study that showed reductions in emissions of 1-NP to below detection levels when comparing a new diesel engine, equipped with filters as well as selective catalytic reduction, to engines from 2007 or earlier.
    - A study of human exposures from new diesel technology that showed a significant reduction in particle emissions but only a two-fold reduction in levels of 1-NP per gram particle. The same study found variability in 1-NP levels depending on the operating load of the engine (low load had higher 1-NP; high load had lower 1-NP).
    - Studies by CARB and others showing that emissions of nitro-PAHs from heavy-duty diesel vehicles can vary by more thansix orders of magnitude, and have been found in both the gas phase and particle phase of exhaust from diesel engines, even those with advanced after treatment.
    - Studies showing changes in particle- versus gas-phase nitro-PAH levels. For diesel engines equipped with filters but no selective catalytic reduction, *particle-phase* nitro-PAHs were reduced. However, *gas-phase* nitro-PAH emissions were either lower, higher, or similar for these engines, depending on the study.

- Discussed factors that influence the phase-in of new diesel technology, such as the durability and reliability of older diesel engines, relative financial burden of upgrades for small versus large businesses, and exemptions to retrofit requirements, and how these issues may impact diesel exhaust pollution.
    - Encouraged biomonitoring studies in border regions that may have greater diesel pollution due to lags in upgrading the fleet.
    - Noted that out-of-state businesses operating in California are required to meet California regulations for diesel trucks if a significant percentage of their operations occurs in the state. However, there are exemptions to the retrofit rule and compliance issues, which CARB is working to address.
    - Questioned the extent to which sophisticated exhaust treatment technologies continue to operate over the life of the vehicle, and suggested ongoing retesting to certify that emissions requirements continue to be met.

SGP Agenda Planning for 2015
Presentation by Laurel Plummer, Ph.D., Associate Toxicologist, OEHHA

The Panel highlighted potential topics for 2015 SGP meetings:

- Consideration of the following chemicals/chemical classes as potential designated chemicals:
    - Phthalates as a class
    - Perfluoroalkyl and polyfluoroalkyl substances (PFASs) as a class
    - Pesticides, such as imidacloprid and glyphosate
- Discussion of VOCs as potential priority chemicals, including technical challenges in measuring these.
- Discussion of musks, such as alicyclic and macrocyclic musks, for further screening.
- Review of efforts to approximate a statewide sample, possibly though broader collaboration with Kaiser to include both Northern and Southern California.
- Discussion of cotinine and other tobacco smoke exposure biomarkers and ways these measures could inform interpretation of biomonitoring results for other compounds.
- Discussion of possible future collaborations with the Safe Cosmetics Program and other state programs.
- Presentations on results return efforts in two Program studies: the Maternal and Infant Environmental Exposure Project (MIEEP) and the Biomonitoring Exposure Study (BEST).

The Panel also requested that the Program provide an overview of the analytes that Biomonitoring California laboratories are currently measuring, to help provide context for future discussions of potential designated or priority chemicals.

Public comment:

Ruth Breech of Global Community Monitor submitted a letter via email requesting that the Panel prioritize the measurement of VOCs, particularly in populations living near current or future sites of gas and oil extraction.

Dr. Veena Singla of the Natural Resources Defense Council supported phthalates and polyfluorinated substances as classes for consideration as designated chemicals. Dr. Singla recommended carbamate insecticides and pyrethroid pesticides (as a class) for consideration as potential priority chemicals. She also requested discussion of pesticide biomonitoring to follow up on the April 2014 report "Agricultural Pesticide Use Near Public Schools in California" by the California Environmental Health Tracking Program.

Nancy Buermeyer of BCF supported consideration of phthalates (as a class), aromatic amines, UV filters, and nitrosamines as potential designated chemicals. She recommended consideration of the acrylamide set of chemicals and VOCs as potential priority chemicals.