July 20, 2017 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 July 20, 2017 in Richmond. This document briefly summarizes the Panel's input and recommendations on each agenda item. Visit the July 2017 SGP meeting page to access the presentations, other meeting materials, and the meeting transcript.

Program Update

Presentation: Nerissa Wu, Ph.D., California Department of Public Health

The Panel gave input primarily on aspects of the California Regional Exposure (CARE) Study (*launching in early 2018 in Los Angeles County*):

- Population sampling - Approach for achieving regional representation; the particular demographic characteristics (e.g., race, age, sex, geographic location) to be prioritized; adequacy of sample size to stratify on the targeted characteristics.
- Recruitment - Community engagement for reaching lower income and non-English speaking groups; careful messaging to prospective participants about the possibility of signing up and then not being selected; design and refinement of recruitment postcards.
- Participant website - Ensuring the website is viewable on a mobile device, as that is likely to be the method participants use to access it.
- Chemical selection - Factors underlying choice of metals and perfluoroalkyl and polyfluoroalkyl substances as the primary analytes statewide; how community concerns and priorities, such as diesel exhaust exposure, can be addressed; importance of having adequate comparison data for the regional sub-studies. (*Program staff noted the plan for a small sub-study of diesel exhaust in LA County, and the possibility for other region-specific sub-studies, pending adequate resources.*)
- Exposure questionnaire: How findings from other studies (such as elevated inorganic arsenic levels and exposure sources in the Asian/Pacific Islander Community Exposures (ACE) Project informed development of the CARE Study questionnaire.
- Future chemical analyses: Collection of adequate biospecimens for possible future chemical analyses; addressing potential ethical and data security issues related to future analyses of archived samples, such as the possibility of detecting drugs of abuse if a non-targeted screen were ever run.

The Panel also inquired about the flame retardants being measured in the Foam Replacement Environmental Exposure Study (FREES), and brainstormed on possible creative funding approaches for the Program.

Advancing and Integrating Non-Targeted Analysis Research at the US EPA
Background materials
Presentation: Jon Sobus, Ph.D., National Exposure Research Laboratory, US Environmental Protection Agency

The Panel, guest speaker, and the audience discussed a wide range of topics, some of which are highlighted below. For the complete discussion, refer to the full transcript.

- Only a small portion of the chemical universe to which we can be exposed has been characterized, with about 90% of it unknown ("exposure dark matter").
    - Tens of thousands of chemicals are registered for use, but the numbers to which we could be exposed could be in the millions. In non-targeted screening, only about 10% of sample contents can be matched to already known chemicals.
    - Previously uncharacterized chemicals can be present at unexpectedly high levels in the samples, and can pose toxicity concerns.
    - The uncharacterized chemicals are likely to be degradation products, transformation products, and biological metabolites formed from chemicals in use. These could be modeled or predicted using various approaches, and then added to screening libraries used for non-targeted measurements.
- Through non-targeted screening, a list is being generated of chemicals common in our environment that were previously undetected and are poorly studied from a toxicity perspective. This includes many chemicals that have been detected in consumer products and were previously not known to be associated with these products. This list could be used as a source of candidate chemicals for targeted biomonitoring analyses.
- ToxCast assay results, chemical read-across approaches and QSAR (quantitative structure-activity relationships) are being applied to examine potential bioactivity of chemicals found via non-targeted analyses and prioritize them for further study.
- Molecules detected in non-targeted analyses that are up-regulated in a diseased population can be compared to those detected in a non-diseased population. Similarly, molecules in a mutagenic fraction could be compared to those in a non-mutagenic fraction. By successively examining smaller and smaller fractions, molecules associated with bioactivity can be identified (an "effect-directed analysis").

- The challenges of non-targeted analysis in a biomonitoring context were discussed. The very large numbers of endogenous chemicals associated with natural biochemistry can complicate interpretation of non-targeted results in biological samples. Those endogenous chemicals are typically present at much higher levels than environmental chemicals, potentially interfering with the signal from xenobiotic chemicals. Partnerships across the fields of metabolomics and exposomics are underway to study endogenous and xenobiotic chemicals in the same sample.
- Using very large screening libraries for comparison to non-targeted results can pose logistical challenges. These libraries can be narrowed to screen for subsets of specific substances of interest.
- The analytical results from the non-targeted screening can also be narrowed by looking for chemicals already known to be of greater concern. For example, halogenated chemicals can be identified by looking for the highest intensity "negative mass defect" compounds.
- The broad usefulness and value of US EPA's Chemistry Dashboard, and planned future refinements were discussed.
- The impacts of approaches used for sample extraction and separation on the subsequent results of non-targeted screening analyses were also discussed.
- By building a network of non-targeted analytical practitioners adhering to the same performance standards, it will be possible to expand the numbers of real-world samples tested and create a more robust database of results.

Glyphosate Biomonitoring: Challenges and Opportunities
Presentation: Roy Gerona, Ph.D., and Axel Adams, M.S., UC San Francisco

The Panel, guest speakers, and the audience discussed a wide range of topics, some of which are highlighted below. For the complete discussion, refer to the full transcript.

- Analytical complexities with measuring glyphosate in various biological matrices, like urine and breast milk, and approaches for addressing those.
    - Choice of standard addition, instead of external calibration, to deal with matrix effects that vary between samples.
    - A disadvantage of the standard addition approach is it that requires more analyses per sample, limiting the capacity for analyzing large numbers of samples. Accuracy and reliability was prioritized over throughput in selecting standard addition.
- Wide detection of glyphosate across many regions, with a detection frequency of 86.1% in the DeTox Project national population.
    - Given this was a self-selected population likely to be making choices to reduce their exposures, this high detection frequency was surprising.

  - The US Food and Drug Administration has detected high levels of glyphosate in many common food products, such as cereal and snack products, which could explain the high detection frequency.
  - Pesticide drift and agricultural runoff, along with the stability of glyphosate in soil over long periods, can result in glyphosate being found in organic products as well.
  - No significant difference in urinary levels was found between those frequently eating organic foods versus those who typically ate conventional products.
  - Higher levels of glyphosate in US samples compared to Europe, for example. In general, higher levels are observed in countries with less stringent regulations on the use of genetically modified products containing glyphosate.
- Difficulty of comparing glyphosate analytical results across studies, due to differences in methods and limit of quantitation.

Potential Designated Chemicals: Organophosphorus Pesticides
Document
Presentation: Shoba Iyer, Ph.D., Office of Environmental Health Hazard Assessment

The Panel unanimously voted to recommend that the class of "organophosphorus pesticides" be added to the list of designated chemicals for Biomonitoring California.

Other Panel Business

Dr. Lauren Zeise, Director of OEHHA, and the Panel honored outgoing SGP member Dr. Asa Bradman for his 10 years of outstanding service. Dr. Bradman was appointed by Governor Schwarzenegger in 2007, and became SGP Chair in 2015. He resigned from the Panel in 2017 to devote time to his new role on the National Organic Standards Board.