

March 2020 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 March 4, 2020, in Sacramento. This document briefly summarizes the Panel's input and recommendations, as well as the range of topics covered in the afternoon discussion session. Visit the [March 2020 SGP meeting page](#) to access the presentations, transcript, and other meeting materials.

Program Update

Presentation: Nerissa Wu, Chief, Exposure Assessment Section (EAS), Environmental Health Investigations Branch (EHIB), California Department of Public Health (CDPH)

Panel members:

- Discussed the Program's recruitment efforts for the California Regional Exposure Study, Region 3 (CARE-3), particularly with regard to the large immigrant and refugee population in San Diego. [Note: CARE-3 had to be suspended due to the COVID-19 emergency.]
- Recommended further highlighting the CARE Study, including adding the link to the pre-screening portal for potential participants, to the [Biomonitoring California website](#). [Note: This is on hold until the CARE Study is re-launched.]
- Suggested tailoring the CARE Study exposure questionnaire to region-specific sources, such as local industries. This could be applicable if new lab panels were added to certain regions (e.g., pesticides in the Central Valley).
- Impact on the Program of reduced resources, funding that would be required to achieve key goals (e.g., robust surveillance), and possible options to help fill the gap (e.g., collecting fees for laboratory analyses; working with interns; seeking opportunities to promote the value of the Program).
- Recommended preparing an article for the [Biomonitoring Matters newsletter](#) to more broadly disseminate CARE Study findings.

Overview: Quaternary Ammonium Compounds (QACs) as Potential Designated Chemicals

Presentation: Shoba Iyer, PhD, Staff Toxicologist, Safer Alternatives Assessment and Biomonitoring Section, Reproductive and Cancer Hazard Assessment Branch, Office of Environmental Health Hazard Assessment (OEHHA)

Document: [Potential Designated Chemicals: Quaternary Ammonium Compounds](#)

The Panel and audience commented on:

- The unique physicochemical properties of QACs due to their charge distribution and how that could impact properties like absorption, excretion, solubility, and environmental fate.
- Probable routes of human exposure, which could include oral, dermal, and/or inhalation.
- Preferred sample type for biomonitoring.
- The potential for differential QAC use patterns in the United States versus other parts of the world.
- The broad nature of the class and whether it would be appropriate to focus on subclasses for biomonitoring, and consider availability of analytical methods.

Reproductive and Developmental Toxicity of Selected QACs: A Chemical Detective Story

Presentation: Terry Hrubec, DVM, PhD, Professor of Anatomy and Embryology, Edward Via College of Osteopathic Medicine, Virginia

The Panel, guest speaker, and audience discussed:

- Methodological aspects of Dr. Hrubec's research, such as the procedure for identifying neural tube defects.
- The potential for examining other neural tube patterning or cognitive effects.
- Findings that QAC exposure to male rodents only also produced reproductive and developmental effects in the offspring, and that some effects persisted for multiple generations.
- QAC-induced birth defects and altered reproductive and immune functions in animal studies as important evidence for potential toxicity in humans.
- Widespread use and ubiquitous nature of QACs in the environment, evidenced in part from the trace QAC tissue levels detected in unexposed rodents.

Reviewing QACs for Biomonitoring: Metabolism, Analytical Considerations, and Effects on Cholesterol Homeostasis

Presentation: Libin Xu, PhD, Assistant Professor, Department of Medicinal Chemistry, School of Pharmacy, University of Washington

The Panel and guest speakers discussed various aspects of QAC metabolism and cholesterol homeostasis, such as:

- Lipid-solubility of benzalkonium chlorides and didecyldimethyl ammonium chloride and how that could relate to the preferred sample matrix for biomonitoring.
- Relatively rapid QAC metabolism following oral exposure in rodents, and optimal time points for sample collection and biomarker detection.
- The detection of fecal QAC metabolites in animal studies.
- The importance of sterol and lipid homeostasis in embryonic neurodevelopment and the association between low cholesterol and autism spectrum disorder.

Discussion: Quaternary Ammonium Compounds as Potential Designated Chemicals

Guest discussant remarks: Robert Harrison, MD, MPH, Occupational Health Surveillance and Evaluation Program, CDPH

Comments from the Work-Related Asthma Prevention Program, CDPH

The Panel, guest discussant, and audience remarked on:

- The potential power of QAC biomonitoring to:
 - Proactively identify sub-populations with higher exposures before health symptoms develop.
 - Influence business procurement decisions that protect worker health and safety over the near- and long-term, such as the purchase of alternatives to QAC-containing disinfectants for appropriate applications.
 - Characterize unique high-exposure scenarios, such as the expected increase in disinfectant use during the current COVID-19 emergency.
- The risk-benefit considerations in using QAC disinfectants versus alternatives in various scenarios (e.g., infection control and disease prevention in patients, classroom surfaces, public transit, etc.).
- The importance of evaluating whether disinfectants are really needed in a given situation, and when it would be possible to not use them at all.

Public comment presentation: Keith Hostetler, PhD, on behalf of the ADBAC and DDAC Issues Steering Committees

Public comment presentation: Thomas Osimitz, PhD, DABT, on behalf of the Quat Residue Group

The Panel, public commenters, and audience discussed various factors related to QAC chemistry, toxicity, and distribution, including:

- Common detections of QACs in various media, suggesting widespread human exposure.
 - The tendency of QACs to bind to many surfaces, including glass, which could explain frequent detections at low levels.
- The chemical diversity of the class and challenges in clearly delineating subclasses.
- Difficulty in quantifying ambient exposures occurring in laboratory animal housing facilities that use cleaning and disinfecting products containing QACs.
- The value of toxicity information obtained from “non-guideline” studies (i.e., research studies not conducted for regulatory purposes), which can:
 - Apply newer technologies capable of detecting subtle molecular changes
 - Capture additional adverse outcomes like neural tube defects
 - Examine the impacts of various QAC mixtures.
- Evidence for absorption of QACs based on detection of QAC metabolites in rodent feces.
- The potential for enterohepatic circulation and metabolism following oral QAC exposure.

- Optimal time points for biologic sample collection in laboratory studies, given that rodents are faster metabolizers than humans.
- The importance of collecting robust QAC exposure information to better evaluate the potential for human health effects.

Panel Recommendation: Quaternary Ammonium Compounds as Potential Designated Chemicals

[Presentation](#): Options for the Panel, OEHHA

Public comment: [Comments from the Quat Residue Group](#)

The Panel unanimously voted to recommend that the class of “quaternary ammonium compounds (QACs)” be added to the list of designated chemicals for Biomonitoring California. In making this recommendation, Panel members highlighted the:

- Rapidly increasing production and use of QACs.
- Significant data gaps in QAC exposure information.
- High potential for QAC exposure to the public and specific subgroups, such as custodians, and hospital staff.
- Known human health effects, including asthma, associated with QAC exposure.
- Suspected health effects based on evidence from peer-reviewed scientific studies, like developmental and reproductive outcomes and impacts on cholesterol biosynthesis.

The Panel also requested that OEHHA prepare a document on QACs for future consideration as potential priority chemicals.

Open Public Comment Period

Taylor Bradley from the American Cleaning Institute asked for clarification on the meaning of the term “priority chemical,” and whether the specific QACs that will be biomonitoring would be publicly released. OEHHA staff explained what a priority chemical is under Biomonitoring California (refer to this link: <https://biomonitoring.ca.gov/chemicals/priority-chemicals>), and confirmed that the Program will provide public notice of any QACs selected for measurement in a future study.

