

## Session G4: Prioritizing Emerging Contaminants for Monitoring

Room A107-109

3:30 – 5:00 pm

0154

G4-1

### Which Unregulated Organic Chemicals Are Highest Priority as Contaminants of Emerging Concern?

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Environmental resource agencies expend a considerable amount of effort and millions of dollars to monitor concentrations of the various organic chemicals that occur in trace amounts in ambient surface waters, sediments, and aquatic animals. Many of these agencies target what they consider to be contaminants of emerging concern (CECs), including pharmaceutical drugs and personal care products. Currently, there is no consensus on which CECs should be monitored and evaluating results from different programs is hampered by the fact that: 1) our ability to detect trace levels of certain organic chemicals is far outpacing our ability to understand what these measurements translate to terms of ecological risks, 2) different organizations work with different sets of chemicals that they identify as CECs, and 3) diagnosing effects of these CECs on aquatic populations and communities is challenging because, by definition, they occur in trace amounts and are often difficult to detect using standard analytical procedures. Therefore, some type of prioritization is needed for monitoring and assessment of CECs and to help focus the screening of ecological effects due to CECs. As a step towards addressing this challenge, our research team developed a framework to help guide monitoring efforts of CECs. Using an occurrence database compiled from over 100 monitoring studies, 3 prioritization approaches were applied to over 500 unregulated organic chemicals that have been detected in water or effluent samples in the US over the past 10 years. The 3 approaches were: (1) risk-based, (2) chemical persistence, bioaccumulation potential, and toxicity (PBT), and (3) a hybrid based on risk, persistence, and bioaccumulation potential. Types of CECs identified as high priority differed among approaches: steroids/hormones, pharmaceuticals, and surfactants comprised most of the high priority CECs based on risk and pesticides, industrial chemicals, and PAHs comprised most of the high priority CECs based on a PBT approach. The results of the prioritization process, along with other tools developed in this research, are intended to help water resource scientists evaluate sites where CECs may pose a risk, as well as to provide a framework to focus future monitoring efforts of those chemicals.

0299

G4-2

### Use of Market Forensics to Estimate the Environmental Load of Ingredients from Consumer Products

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In recent years, attention to anthropogenic chemicals in the environment has expanded beyond conventional industrial chemicals and pesticides to include those used in everyday consumer products such as pharmaceuticals, cosmetics and cleaning products. Simultaneously, advances in analytical chemistry have led to numerous low- concentration observations of consumer product ingredients in environmental media. However, the chemicals selected for analysis are largely the result of analytical capabilities rather than the anticipation of what might actually be present. As such, monitoring is limited by the pace of method development and the driver for analytical advancement is not likely to correlate with occurrence of chemicals in environmental media. Moreover, there are thousands of chemicals used in consumer products such as active pharmaceutical ingredients, surfactants, fragrances, preservatives, colorants and the like. Hence, the need for analytical development is vast in comparison to the development of new methods.

We describe an alternative, “market forensics” approach to predict the load of consumer product chemicals in the environment that is complementary to monitoring programs. This tool uses product formulation and market sales data to estimate usage in a region of interest, such as a watershed. The usage data is used to estimate the local loads to wastewater treatment facilities within regional watersheds. Product formulation information is publicly available through various trade publications. In addition, a number of services survey and report local, regional and national product sales information. When market survey data is used in combination with formulation data, environmental loadings may be estimated quickly and with minimal resource demands.

Market forensics is an inexpensive methodology that can be used to help screen and prioritize consumer product chemicals for environmental monitoring and to help drive methods development.

**0366**  
**G4-3**

### **Prioritization of Constituents and Analytical Methods for National Assessments by the US Geological Survey**

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The US Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Program identified the need for a National Target Analyte Strategy (NTAS) to support planning for the third decade of water-quality assessment activities. The NTAS work group was asked to provide recommendations regarding (1) which previously monitored constituents should be continued in the third cycle (decade), (2) which constituents could be dropped from laboratory schedules, and (3) which emerging contaminants should be added, relative to their national importance from an occurrence, use, and human or aquatic ecosystem health perspective.

The NTAS effort reviewed more than 3,500 individual constituents for monitoring in water and/or sediment. Information reviewed by the NTAS workgroup included national- or regional-scale occurrence datasets, laboratory long-term method detection levels, human-health and aquatic-life benchmarks, calculated benchmark quotients, key journal articles describing salient occurrence and risk findings, state-of-science summaries for a particular group of constituents, and information that identified priority constituents by other State and Federal agencies. For those constituents determined to be of highest priority, method development activities were reviewed to characterize new and existing NAWQA methods.

Approximately 600 candidate constituents for water and 700 candidate constituents for sediment were identified as the highest priority candidates for development (or updating) of analytical methods. Constituent groups identified as priorities (or important) for water methods included pesticides, pharmaceuticals, hormones, volatile organic compounds, and other industrial compounds, requiring seven different analytical methods. For sediment, priority constituent groups include pesticides, polycyclic aromatic hydrocarbons, azaarenes, surfactants, phthalates, phenols, siloxanes, and a variety of halogenated organics, requiring at least five analytical methods. The development of water methods is in progress (fall 2011) and is expected to be completed for implementation at the start of NAWQA's third decade of assessments (fall 2012). Thereafter, constituents in sediment will be the focus of analytical method development. Implementing state-of-the-art analytical techniques and equipment that ensures reliable compound identification and part-per-trillion or lower detection levels is a critical aspect of method development.

**0513**  
**G4-4**

### **Drugs Here, There, and Everywhere – How One Utility Refined Its Approach to Emerging Contaminants**

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The Portland Water Bureau (PWB) started testing its drinking water sources for pharmaceuticals and personal care products (PPCPs) in 2006. After initial detections in both surface and groundwater sources, follow up sampling occurred. As a greater number of results became available, the additional information only clouded the picture. There were detections in blanks where there were no detections in the associated samples. No repeat sampling confirmed any prior detections. Detections in both blanks and samples were at low levels close to the detection limit. A statistical analysis of all monitoring results including field and trip blanks showed that there was no interpretable meaning to the data. This left the PWB with a legacy of detections in its water, but detections that were not meaningful. This complexity is very difficult if not impossible to convey to the public concerned about drugs in the water.

Through its history, the Portland Water Bureau has had a practice of testing its drinking water for emerging contaminants as they come into the spotlight, both to ensure their absence in Portland's water and to assure the public that its drinking water is safe. Based on challenges faced in testing for PPCPs, PWB has developed a more rigorous approach to testing for emerging contaminants.

Because emerging contaminants are by definition being newly incorporated into the group of contaminants considered significant, the testing protocol for them is typically much less established. Both sampling and laboratory protocols may not have well-standardized quality control, making the likelihood of sample contamination more probable. In addition, the lack of Maximum Contaminant Levels (MCLs) or Maximum Contaminant Level Goals (MCLGs) set by the EPA makes communicating to the public the actual risk posed by emerging contaminants very difficult.

Portland has continued to test its drinking water for emerging contaminants, including most recently hexavalent chromium and perchlorate. Based on the experience of testing for PPCPs, many more resources have gone into planning the sampling, ensuring proper sampling protocol, choosing an experienced laboratory, and preparing risk communication materials for either outcome-detection or no detection.