UCMR4: What Are We Seeing, and what are some issues?

Ron Milke
What’s the UCMR?

- **Unregulated Contaminant Monitoring Rule**

- **Contaminant Candidate List (CCL)** – Parameters with known or suspected health effects that may be regulated in the future

- **Occurrence Data – UCMR**

- It’s the first step towards potential regulation (or non regulation).
Data, Data, Data…

- UCMR 4 will ultimately generate more than 1 million sample data points
- Plus a lot of batch QC data
- And information on “matrix” impacts on methods, to really know how rugged the methods are.
A Lot of Methods Means Lots of Opportunities for Analytical Issues

- There are 3 unique methods for cyanotoxins.
  - 544, 545, 546 – all “NEW” methods

- There are 4 unique methods for chemicals.
  - 200.8, 525.3 (SEMI-NEW), 530 (NEW), 541 (NEW)

- There is 1 method for HAA9
  - 552.3 – SEMI-NEW

- There are 2 methods to do Br and TOC.
  - 300.0 (or 300.1) and SM5310C (or SM5310B)
“Non-Analytical Issues”

- The first 3 months of UCMR 4 were “difficult” because the methods had not been thoroughly validated by EPA and others and rules for acceptance limits changed.

- ALL labs are facing challenges with uploads.

- SOME labs are NOT following the requirements and finding out during upload.
What are We ACTUALLY Seeing: Out of a Small Data Set

- ~1000 PWS with results so far
- ~4,000 sample results for chemistry
- ~6,900 sample results for HAA9
- ~6,000 sample results for total microcystins and anatoxin-a/cylindrospermopsin
Number of PWS per State reporting so far
What Are We Actually Seeing in UCMR 4?"

- Germanium – some hits, but not a lot
- Manganese – frequent and some above MCL
- HAA...precursors –
  - TOC
  - Bromide
- HAA – mostly below MCL, as expected
Germanium detected in 333 out of 4757 samples (7%)  

MRL = 0.3 parts per Billion  

145 out of 1,181 (12%) PWS with hits above the MRL  

333 out of 4,757 (7%) samples above the MRL
Manganese detected in 3,283 out of 4739 samples (69%)

MRL = 0.4 parts per Billion

987 of 1,183 (83%) PWS with hits above the MRL

19 of 1183 (1.6%) PWS above 300 ppb, secondary MCL
HAA indicator TOC average = 1.32 mg/L

MRL = 1 parts per million (ppm)

1399 samples with hits above the MRL

Highest result = 57 ppm

- > 5 ppm → 14%
- 2 – 5 ppm → 48%
- < 2 ppm → 38%

Data only includes samples with detections
HAA indicator Bromide average = 172 µg/L

MRL = 20 parts per billion (ppb)

2249 samples with hits above the MRL

Highest result = 11,000 ppb

- > 1000 ppb → 1.6%
- 100 – 1000 ppb → 33%
- < 100 ppb → 65.4%

Data only includes samples with detections
HAA5 detected in 6,668 out of 6,862 samples

MRL = 0.2 parts per billion (ppb)

Higher than 60 ppb MCL*: 
- 178 samples (2.6%)
- 79 PWS (7.4%)

Highest result = more than 300 ppb

*Results are not reflective of compliance with DBPR
Non-Regulated HAA detections

- **HAA6Br**
  - Detected in 6,556 out of 6,874 samples (~95%)
  - 97% PWS with at least one above MRL

- **HAA9**
  - Detected in 6,659 out of 6,845 samples (~97%)
  - 98% PWS with at least one above MRL
Total Microcystins, method 546, occurrence

Individual microcystins by 544: 0 hits above Reference Concentration – means total is not confirmed
14 of 846 PWS (1.6%) above MRL for anatoxin-a
1 of 846 PWS (0.1 %) above MRL for cylindrospermopsin
Method 530 Analytes
Method 530 Detections by Analyte – O-Toluidine

- **O-Toluidine**
  - MRL = 0.007 parts per billion (ppb)
  - 14 of 4,030 (0.3%) samples with detects
  - 10 of 1,043 (0.1%) PWS with detects
Method 530 Detections by Analyte – Quinoline

- **Quinoline**
  - **MRL = 0.02 parts per billion (ppb)**
  - **Note:**
    - $10^{-6}$ cancer risk is 0.01 ppb *(this is less than the MRL)*
    - $10^{-4}$ cancer risk is 1 ppb

- 38 of 4,041 (0.9%) samples and 2.4% of PWS exceed the 0.01 ppb Reference Concentration

- 1 of 4,041 (0.02%) samples and 0.1% of PWS exceed the 1 ppb Reference Concentration
Method 541 analytes:

- **1-butanol**
  - MRL = 2 parts per billion (ppb)
  - 33 of 4,055 (0.8%) samples with detects
  - 24 of 1,059 (2.2%) PWS with detects
  - No detects above the 700 ppb reference level

- The other compounds no significant occurrence
  - 2-methoxyethanol
  - 2-propen-1-ol
Pesticides by Analyte – 525.3: Permethrins and Ethoprop

- Total Permethrins → 5 detections out of 4,093 samples (0.12%)
- Tribufos → 2 detections out of 3,982 samples (0.05%)
- Oxyfluorfen and tebuconazole each detected in 0.02% of samples

No pesticides or ethoprop detected above their reference levels
Some analytes the MRL ≥ the Reference Limit

- MRL = Minimum Reporting Limit
- Expect 50 – 150 % recovery at MRL

50% of samples at MRL will be detected
50% of samples will not be detected
Total Cyanotoxins, the MRL and potential interferences

• The MRL for Method 546, Total Cyanotoxins is 0.3 µg/L
  • Detections near MRL could be statistical error
• Method lists “unknown interferences” resulting in false positives
  • Possible 15% high bias, or more, depending on matrix
Quinoline and the MRL

- The MRL for Quinoline is 0.02 µg/L
  - Detections near MRL could be statistical error
  - For example → a 0.02 µg/L MRL acceptance is 0.01 – 0.03 µg/L
  - Any detect exceeds the $10^{-6}$ reference concentration of 0.01 µg/L
UCMR Methods in general

- UCMR methods are limited validations specifically for UCMR
  - Limited matrices
  - Not as “rugged” as regular SDWA method
  - Many samples “fail” preservation checks
    - Preservation reagents may not be correct
    - Specified ranges (pH) may be too narrow
    - Rapid checks may be insufficient
Any Questions?

Ron Milke (ronmilke@eurofinsus.com)
William Lipps (williamlipps@eurofinsus.com)

Eurofins Eaton Analytical, LLC
www.eurofinsus.com/eaton