

Accreditation program for microplastics monitoring in drinking water

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Background

- ❑ SB 1422 (fall 2018) requires microplastic monitoring in drinking water starting in 2021
- ❑ Addressing this goal requires standardized, state-approved measurement methods
 - Data needed from this to understand method performance
- ❑ Also requires applying information on method performance to establish procedures and expectations for laboratories monitoring for microplastics

SCCWRP microplastics measurements intercalibration study

- ❑ Conducted to get performance data needed for microplastics monitoring program
- ❑ Blind clean water samples with known spikes of microplastics and other particles sent to 26 laboratories in 6 countries
- ❑ Labs analyzed samples using 5 major methods with common SOP
- ❑ Quantified method performance to characterize capabilities and limitations
 - accuracy, precision, time required

Products from measurements intercalibration study

- Standard Operating Procedures
 - Everyone uses their own, so hard to compare results

- Understanding method performance
 - How to select among methods
 - How to interpret results

- Accreditation for laboratories
 - How to use first 2 products for developing accreditation

Accreditation for microplastics monitoring

- ❑ SOPs and performance data from intercalibration used to provide guidance & recommendations to **ELAP**
 - To develop accreditation for labs monitoring microplastics in drinking water
- ❑ **Three parts to accreditation:**
 - Inspections
 - Documentation
 - Performance Evaluation Samples



Products from intercalibration study for accreditation

- Good lab inspection **checklists**
- Clarity on **documentation** needs
- Clarity on composition of **Performance Evaluation Samples**

Inspection needs (checklists)

- ❑ Checklists used by ELAP inspectors for on-site visits of labs in accreditation process

- ❑ Many checkpoints quite general
 - Already exist in accreditation of other analytes
 - Can be readily applied to developing microplastics methods accreditation programs

- ❑ Some aspects are specific to microplastics analysis
 - Unique given that microplastics are different type of contaminant than “usual”
 - Or need some tweaking from existing checkpoints to adapt to microplastics

Examples of microplastic-specific checkpoints

□ Lab facility quality assurance

- Cleanliness practice
- Contamination check

□ Instrumentation/equipment

- Logs
- Maintenance record

□ Sample preparation

- Methods
- Spikes
- Verification of calculations

Example checklist

Laboratory Assessment Checklist

Method Name
Revision X.X (Year)

Name of Assessor: _____

Assessment Date: _____

Reference		Satisfactory	
		Yes	No
	1. Laboratory Facilities		
	Does laboratory appear to have established appropriate safety and health practices prior to use of this method?		
	Do all laboratory personnel wear gloves when handling samples, and change gloves before touching other surfaces and equipment?		
	Is the clothing policy documented and utilized?		
	Cleanliness level of the lab is in accordance with work instructions		
	Is contamination prevented by the lab layout and is sample preparation and analysis performed in areas allowing for isolation from sources of contamination? (method language)		
	Cleanliness practice (described on method)		
	Acceptable glassware washing procedure?		
	Microscopy room requirements (described in method)		
	2. Sample Collection and Storage	Yes	No
	Is there any testing of the sample required upon receipt? (if any, described in method)		
	Criteria for sample acceptance and corrective action procedures?		
	Sample bottle and volume requirements		
	Sample transportation requirements		
	Field testing requirements		
	Filtration during sampling requirements		
	Contamination check? (i.e., travel blank)		
	Holding times		
	Sample storage		
	3. Instrument & Equipment		
	Make & model of instrument:		
	Make & model of microscope:		
	Last date of major instrument maintenance:		
	Minimum instrument requirements (from method)		

Documentation needs

- ❑ Recordkeeping to demonstrate proper analysis capability on the (many) days without on-site inspectors

- ❑ Many documentation needs also quite general, or in other programs
 - Example: microscopy (e.g., analysis of *Cryptosporidium*)

- ❑ As with checklist, microplastic-specific items exist

Examples of microplastic-specific record-keeping

□ Blanks

- air blanks

□ Positive control samples

- Known spike
- Use control charts to monitor performance; will help refine acceptance criteria

□ Demonstration of capabilities

- Initial: instrument calibration, analysis of positive control sample replicates
- Ongoing: analysis of Performance Evaluation Samples, ongoing analysis of QA/QC samples

Performance Evaluation Samples

- ❑ Samples with known/verified materials, but composition unknown to lab

- ❑ Analysis within specified parameters demonstrate basic proficiency
 - Needed for initial and ongoing accreditation
 - Also for performance standardization

How to deal with Performance Evaluation Samples

- ❑ How **complex** do they need to be?
 - Which characteristics of microplastics are important?
 - Too complex is a waste of time
 - Too simple doesn't assess lab capabilities

- ❑ What are **acceptance criteria** (i.e., how good is good enough)?
 - too stringent = nobody passes
 - too weak = poor performance

- ❑ Alternatives?
 - regulations allow when not available e.g., verification of QA/QC data

How complex should Performance Evaluation Samples be?

❑ Characteristics to include:

- Two or more sizes
- Two (or more) polymers
- Non-fibers and fibers

❑ Other characteristics to consider:

- Color
- False positives

What are appropriate acceptance criteria for PES?

Size Fraction (μm)	Recovery Efficiency minimum (%)	Recovery Efficiency 25 th percentile (%)	Recovery Efficiency median (%)
1-20	0.56	3.7	16.1
20-212	5.3	35.5	57.6
212-500	20.2	72.2	106.2
>500	34.8	54.6	76.1

- ❑ Data from visual microscopy data on blind samples
- ❑ ELAP can decide on appropriate acceptance criteria and policy around it, with guidance from intercalibration study data, experience, and expertise

Summary of achievements

- ❑ Inspection checklists ready

- ❑ Clear documentation needs established

- ❑ Strong recommendations for composition of Performance Evaluation Samples

- ❑ Guidance for ELAP on acceptance criteria from intercalibration study
 - Performance data on recoveries from participating labs
 - Performance data on polymer ID recommendations