

Northern Contaminants Program (NCP) – QA/QC Interlaboratory Studies Five Years of Proficiency Testing for Persistent Organic Pollutants (POPs)

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Data comparability is a crucial factor for results delivered by different laboratories and between different projects. Thirty-six laboratories from 12 countries participated in five rounds of interlaboratory studies (ILS) which were conducted to evaluate the quality of the analytical data provided to the Northern Contaminants Program (NCP) and Arctic Monitoring and Assessment Programme (AMAP). This poster focuses on a broad range of organic contaminants, covering the period from 2005–2010 and highlights the following:

- total number of laboratories historical performance – “all laboratories”
- laboratories participating for three to five rounds – “3–5 round”
- NCP laboratories – NCP labs

Introduction

- The Quality Assurance/Quality Control (QA/QC) Program was implemented to ensure that quality data are provided to NCP managers
- ILS are conducted to routinely assess the ability of NCP and AMAP laboratories to meet the data quality objectives (1)
- Participation as broken down by the contaminant class (Fig.1)
- Analysis performed on natural-matrix material: certified reference materials (CRMs) and un-characterized material (UM), and injection-ready analytical standards (IRS)

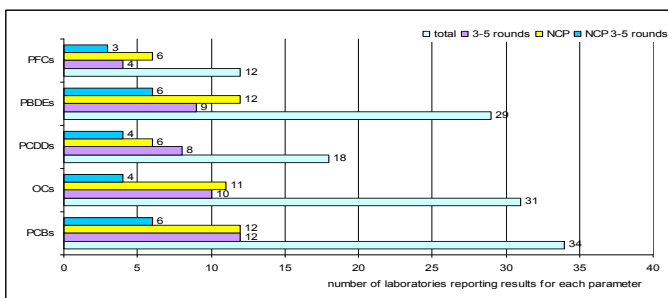


Fig.1. Laboratories contribution for each group of POPs, NCP III Phase 1–5

The progression of the NCP III Phase 1 to Phase 5 clearly shows:

- an increase in total numbers of participating laboratories (Table 1)
- more compounds analyzed in each major class of analytes (2)
- additional class of analytes added to the program (see PFC, Table 1)
- addition of natural matrix certified material and uncharacterized biomaterial (see Table 2)
- consistent performance for NCP laboratories and 3–5 round participants (see Fig.2)

Table 1. Number of participants per contaminant class in each study

Analytes class	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
PFCs		7	4	7	10
PBDEs/BFRs	10	14	8	16	19
PCDDs/PCDFs/DLPCBs	7	10	6	10	14
OCs	12	9	11	18	20
PCBs	12	13	12	21	25
Total Participants	19	25	23	29	30

Table 2. Origins and nature of standard test samples

Samples	Sample distribution	Producer	NCP III Phase				
			1	2	3	4	5
CARP-2 (SRM, Ground Carp)	1 x 9g	NRC	x			x	
SRM 1589a Human Serum	1 x 10mL	NIST	x				
SRM 1946 (Fish Tissue)	1 x 8g	NIST	x	x			
SRM 1947 (Lake Michigan Fish)	1 x 8g	NIST				x	x
WMF-01 (SRM, Fish Tissue)	2 x 10g	MOE	x				
EDF-2524 (Clean Fish)	1 x 10g	CIL					x
Lake Trout fish extracts*	2 x 2.5 mL	MOE					x
Arctic Char*	1 x 12g; 1 x 10g	EC				x	x
Ringed Seal Muscle*	1 x 12 g	EC				x	
Injection ready standard (IRS):							
PBDEs/BFRs (Nonane)	1.2 mL ampouled	WL&MOE	x	x	x	x	x
PCDDs/PCDFs/DL-PCBs (Nonane)	1.2 mL ampouled	WL&MOE	x	x	x	x	x
PCBs (Nonane)	1.2 mL ampouled	WL&MOE	x	x	x	x	x
PFCs (Methanol)	1.2 mL ampouled	WL&MOE	x	x	x	x	x
OCs (Iso-octane)	1.2 mL ampouled	WL&MOE	x	x	x	x	x

Note: NRC – National Research Council, NIST – National Institute of Standards and Technology, CIL – Cambridge Isotope Laboratories, WL Wellington Laboratories Inc. and MOE – Ontario Ministry of the Environment, EC – Environment Canada. *A natural-matrix sample, a un-characterised material used for Arctic research.

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We acknowledge all the work and commitment from all the participating laboratories.

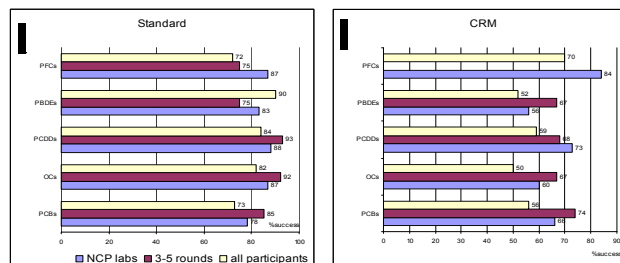


Fig. 2. Laboratories per cent success in ILS, NCP III Phase 1 – 5

Study Design

- Phase 1 – Assessment of calibration and instrumentation via IRS
- Phase 2–5 – Assessment of over all method performance including calibration via CRM, UM and IRS (Table 2)

Data Evaluation Methods

- The results were evaluated using the statistical method “Robust Statistics: a method of coping with outliers” as described in Analytical Methods Committee (3):

$$\text{Study Average} = \text{Median}$$

$$\text{Standard Deviation} = 1.5 \times \text{Median Absolute Deviation}$$

- Laboratory performances were evaluated by determining the number of results reported within 20% of the study median
- At the end of each phase a preliminary annual report was distributed
- Upon completion of each study round a final report was provided
- Yearly results were presented at the NCP annual workshops
- Score performance was rated using the following levels:
 - 80–100% – excellent
 - 60–80% – satisfactory
 - 50–60% – marginal performance
 - <50% – needs improvement

Study Results and Discussion

- Laboratories were instructed to use their routine analytical methods for the sample analyses
- The majority of the laboratories that participated in more than one study round showed acceptable performance in the analysis for POPs standards and CRM
- The laboratories performance for IRS were higher for labs that participated in 3–5 rounds (75–93%) compared to the NCP lab performance (78–88%) and all laboratories total performance (72–90%) in each of the five parameter groups
- Laboratory performances for CRM were satisfactory for those who participated 3–5 rounds (67–74%). NCP labs performed excellent for PFCs, satisfactory for PCDDs, OCs and PCBs (73%, 60%, 66%) and with marginal performance for PBDEs (56%).
- The summarized data demonstrated that the overall performance for the CRM was in the marginal acceptance range (50–60%). “All laboratories” that participated in the analysis for the dioxin and PCBs group of parameters performance was rated satisfactory (62% and 63%, see Fig.2).

Conclusion

- The NCP laboratories are capable of producing excellent results for most of the standards and satisfactory results for natural-matrix materials
- Three or more rounds participants performed excellent for PCBs, OCs, and PCDDs standards, satisfactory for PBDEs and PFCs standards, and satisfactory for all five studied groups of pollutants in the CRM
- “All laboratories” show excellent performance for OCs, PBDEs standards, and satisfactory for PCBs and PFCs.
- Performance of all laboratories for the dioxin group in CRM was satisfactory. However, for the other four groups of parameters some laboratories performance for the biotic material was at the marginal performance level, which shows that some laboratories need to improve.

References:

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