

Northern Contaminants Program (NCP) – QA/QC Interlaboratory Studies

NCP III – Phase 7 of Proficiency Testing

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This poster summarizes the NCP III Phase 7 interlaboratory study (ILS) conducted in 2012–2013 to evaluate the performance of 43 analytical laboratories for the determination of environmental contaminants of concern. The Final Report of Phase 7 is to be released in October 2013.

The results evaluated for PBDE/BFRs, PCDDs/PCDFs/DLPCBs, OCs, PCBs indicate that the overall performance of NCP laboratories are satisfactory and the performance of all participating laboratories was higher for the injection-ready standards (IRS) over natural-matrix samples.

Introduction

- The Quality Assurance/Quality Control (QA/QC) Program was implemented to ensure that quality data are provided to NCP managers (1)
- ILS are conducted to routinely assess the ability of NCP and Arctic Monitoring Assessment Program (AMAP) laboratories to meet the data quality objectives (2)
- Participation as broken down by the contaminant class (Fig.1 A, Table 1)
- Analysis performed on natural-matrix material (Table 2): CRMs and UM, and injection-ready analytical standards (IRS)

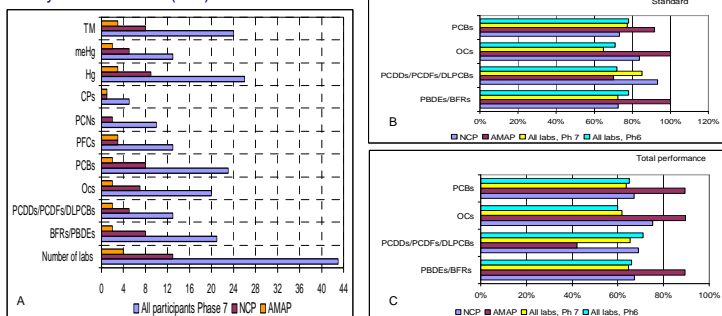


Fig. 1. A) Number of laboratories reporting results for each group of parameters; B) Standard performance, and C) Total percent success, Phase 7 vs Phase 6

Study Design

- The contaminants of concern including the persistent organic contaminants (POPs), trace metals, mercury and methyl mercury are presented in the sample setup in Table 2

Table 1. NCP III-7 PBDE/BFR, PCDD/PCDF/DLPCB, OC, PCB Performance

LAB ID	1201-A	1201-B	1202	1204	1208	1209	1210	1211	1212	1215	1219	1222	1223
PBDE/BFRs			48.7	86.5	89.5	51.3	64.3		68.8	82.9	59.1	94.6	57.10
PCDDs/PCDFs/DLPCBs			67.7			64.9		42.1	51.4	67.6	91.6	70.1	63.10
OCs	100.0	100.0	72.4	73.8	89.7		75.0		69.0	84.8	70.0	80.40	
PCBs	86.8	89.7	71.8	87.2	89.3	62.3	75.5		63.4	74.8	74.4	54.0	37.40
LAB ID	1226	1227	1229	1234	1236	1242	1243	1249	1250	1252	1254	1257	Total
PBDE/BFRs	20.0	47.4		36.8	76.9	70.4			27.3	95.0	67.7	82.6	63.4
PCDDs/PCDFs/DLPCBs						48.9					86.2		67.4
OCs	10.0	36.0	22.2		69.8		36.6	51.7	10.5	60.0		64.3	63.5
PCBs	43.8	70.2	25.0		29.8	45.5	50.0	61.9	38.1	60.9	86.1	85.4	64.4

Percent success of all results that were within 20% of median values. Other results to come upon completion of the data evaluation.

Table 2. Origins and nature of standard test samples, corresponding ID given

Natural-matrix Sample	Sample ID	Injection-ready/Spiking Standard [Solvent]	Sample ID
SRM 2977 mussel tissue (NIST)	NCP III-7 S1	Brominated Flame Retardants/Polybrominated Diphenyl Ethers (BFRs/PBDEa) [nonane], WL	NCP III - 7 PBDE-3
CARP-2 (NRCC)	NCP III-7 S2	Dioxins/Furans/Dioxin-like Polychlorinated Biphenyls (PCDDs/PCDFs/DLPCBs) [nonane], WL	NCP – DFP – 2
SRM 1946 (NIST)	NCP III-7 S3	Organochlorine Pesticides (OCs) [hexane], MOE	NCP III-7-1 OC
WMF-01 fish tissue (WL)	NCP III-7 S4	Polychlorinated Biphenyls (PCBs) [nonane], WL	NCP III-7 BCP-3
Lake trout 2 ml of fish extract in hexane (MOE)	NCP III-7 S5, NCP III-7 S6	Perfluorinated Chemicals (PFCs) [methanol], WL	NCP III-5 PFC-2
		Polychlorinated Naphthalenes (PCNs) [nonane], WL	NCP III-5 PCN 1
		Chlorinated Paraffins (CPs) [iso-octane], MOE	NCP III-7 CPs, NCP III-7 CPs-2
		Metal Mercury (Hg) [2% nitric acid, 5% potassium dichromate solution], SA	NCP III-7 Hg
		Methyl Mercury (MeHg) [water], SA	NCP III-7 MeHg
		Trace metals [water, 3% nitric acid], MOE	NCP III-7 TM-1, NCP III-7 TM-2

NIST – National Institute of Standards and Technology, NRCC – National Research Council Canada, CIL – Cambridge Isotope Laboratories, WL Wellington Laboratories Inc. and MOE – Ontario Ministry of the Environment, SA – Sigma-Aldrich

Acknowledgements

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

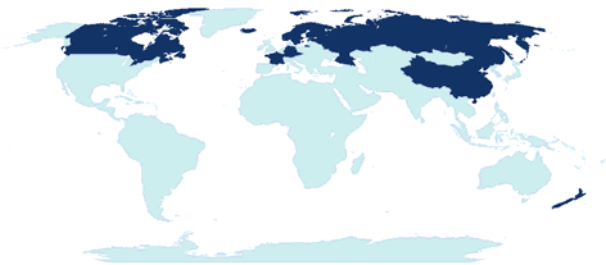


Fig. 2. Map depicting location of NCP III participating laboratories*.

Data Evaluation Methods

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

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

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

- Laboratory performance was evaluated by determining the number of results reported within 20% of the study median
- At the end of phase 7, a preliminary report was distributed
- 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

- Forty-three laboratories from ten countries (Fig.2) performed in Phase 7, thirteen (vs 11 in Phase 6) were NCP and four (vs 6) were AMAP laboratories.
- A summary of laboratory performance for PBDE/BFRs, PCDDs/PCDFs/DLPCBs, OCs and PCBs are given in Table 1. These are the overall performance of each laboratory shown as the percentage of results within 20% of the study’s median values.
- Overall performance of NCP laboratories for PBDE/BFRs, PCDDs/PCDFs/DLPCBs, OCs and PCBs are satisfactory and the performance of laboratories was higher for the standard over natural-matrix samples (Fig.2 B,C)
- Trace metals and methyl mercury were analyzed and are to be evaluated
- The number of participating laboratories has increased from previous studies by 35% compared to Phase 6 (42 vs 32 labs) and 126% from Phase 1 (42 vs 19 labs in 2005/2006)
- Results were reported for the majority of the analytes listed on the report forms and some laboratories reported results for additional analytes

Conclusion

- Compared to the previous studies in this round, laboratories demonstrated:
- higher performances for natural-matrix material for PBDE/BFRs
 - improvement in the performance for OCs, PCDDs/PCDFs/DLPCBs, PCBs
 - ability to analyze a large parameter group of congeners
 - interest to analyze additional groups of the emerging contaminants (PCNs, CPs, trace metals and methyl mercury)
 - The increased number of participating laboratories helps to expand the database and data comparability

The final report will be provided in October 2013

References:

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*Graphics by Alexandra Tkatcheva