**Preliminary results for CCQM-K184/P235 :**

**PAHs in sediment**

**Track A environmental key comparison:**

# Low-polar Analytes in Abiotic Matrix: PAHs in Sediment

**NIM CHINA**

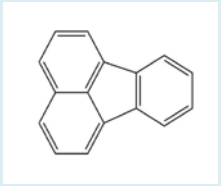
**October 24, 2024**

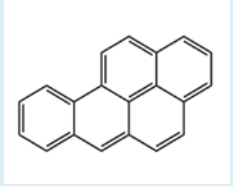
# Outline

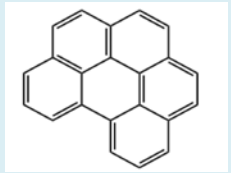
- ✓ The Progress of CCQM-K184/P235.
- ✓ Summary and analysis of reported results for CCQM-K184/P235.
- ✓ Discussion meeting on October 16, 2024.

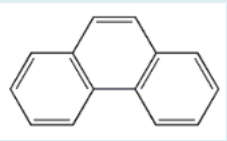
# The Progress of CCQM-K184/P235

- **CCQM-K184/P235 PAHs in sediment.**
  - **Matrix: River sediment**
  - **Measurands: 4 PAHs**
    - **Fluoranthene, Benzo[a]pyrene , Benzo[ghi]perylene.**
    - **Optional analyte: Phenanthrene ( volatility and lower molecular PAHs).**
  - **Mass fraction rang of 3 PAHs: 400- 4000 μg/kg**

| Fluoranthene | |
|---|---|
| CAS | 206-44-0 |
| Molecular formula | $C_{16}H_{10}$ |
| $M_W$ | 202.25 |
| $pK_{ow}$ | -5.16 |
| Structure |  |

| Benzo[a]pyrene | |
|---|---|
| CAS | 50-32-8 |
| Molecular formula | $C_{20}H_{12}$ |
| $M_W$ | 252.31 |
| $pK_{ow}$ | -6.13 |
| Structure |  |

| Benzo[ghi]perylene | |
|---|---|
| CAS | 206-44-0 |
| Molecular formula | $C_{22}H_{12}$ |
| $M_W$ | 276.33 |
| $pK_{ow}$ | -6.63 |
| Structure |  |

| Phenanthrene | |
|---|---|
| CAS | 85-01-8 |
| Molecular formula | $C_{14}H_{10}$ |
| $M_W$ | 178.23 |
| $pK_{ow}$ | -4.46 |
| Structure |  |

# How far does the light shine

- ✓ The analyte (PAHs)： **Low-polarity (pKow < -2).**
- ✓ Matrix type: **Abiotic dried Matrix.**
- ✓ Molecular mass: **170g/mol to 500g/mol.**
- ✓ Mass fraction range: **100 μg/kg to 1000000 μg/kg.**

# Sample Description

- Sample: PAHs in river sediment.
- Mass-fraction : (400～4000 μg/kg) samples.
- Each participant received: Three packages of sediment (10 g/pack) ;
- Each participant is requested to determine the mass fractions (in μg/kg) of PAHs: **Phenanthrene (Optional), Fluoranthene, Benzo[a]pyrene, Benzo[ghi]perylene** with their preferred methods.
- The minimum sample intake: 1 g.

# Result in Report

- The results for 4 PAHs are reported in µg/kg on a dry mass basis;
- The standard and expanded uncertainties with detailed description of the full uncertainty budget.
- The reported result will be the mean value of 2 sample units.
- A description of the analytical procedure (extraction, clean-up, GC-MS column and conditions, quantification approach).
- Details of purity statement and/or laboratory assessment for calibration and internal standards.

# Timeline of CCQM-K184/P235

**2023**

**Registration**

6th Oct. 2023 — 19 labs registered to participate CCQM-K184/ P235, 17 labs registered for CCQM-K184, 2 labs registered for CCQM-P235.

**Sample distribution**

31th Oct. 2023 — Samples were sent to participants.

3rd Dec. 2023 — All registered labs received samples of CCQM-K184/ P235.

**2024**

**Submission of results**

30th Jun. 2024 — 18 labs submitted their results for CCQM-K184 / P235 (17 results for CCQM-K184, 1 result for CCQM-P235), except for NBL-Phil.

**Confirmation of results**

14th Sept. 2024 — Preliminary results summary of CCQM-K184/P235 were sent to participants for confirmation.

8th Oct. 2024 — All participating laboratories affirmed the summary of preliminary results of CCQM-K184/P235, and a few proposed alterations.

**Discussion of results**

16th Oct. 2024 — Online discussion of the preliminary results of CCQM-K184/P235.

24th Oct. 2024 — OAWG meeting

# Reported Results-Moisture

| Code | Moisture | | |
|---|---|---|---|
| | Bottle 1 | Bottle 2 | Average |
| Lab 1 | 1.90% | 1.95% | 1.93% |
| Lab 2 | 1.76% | 1.78% | 1.77% |
| Lab 3 | 1.96% | 1.92% | 1.94% |
| Lab 4 | 1.90% | | 1.90% |
| Lab 5 | 1.8% | 1.9% | 1.85% |
| Lab 6 | 1.93% | 1.97% | 1.95% |
| Lab 7 | 2.02% | 2.08% | 2.05% |
| Lab 8 | 1.90% | 1.94% | 1.92% |
| Lab 9 | 2.20% | 2.21% | 2.21% |
| Lab 10 | 2.65% | 3.09% | 2.87% |
| Lab 11 | 2.12% | 2.11% | 2.12% |
| Lab 12 | 2.12% | 2.29% | 2.21% |
| Lab 13 | 3.1% | 2.8% | 2.95% |
| Lab 14 | 1.77% | 1.78% | 1.77% |
| Lab 15 | 1.9% | 1.9% | 1.90% |
| Lab 16 | 1.55% | 1.36% | 1.45% |
| Lab 17 | 2.03% | 2.23% | 2.13% |
| mean | 2.05% | | |
| Median | 1.94% | | |
| Lab 18 | 1.26% | 1.19% | 1.23% |

- The 18 Labs were randomly numbered and represented by Lab+code.
- The 17 labs from Lab1 to Lab17 participated in CCQM-K184.
- Lab 18 participated in CCQM-P235，is not in the results statistics.
- Lab1 provides the results of another extraction method, but is not put into the results statistics.
- The average value of moisture measurement by 17 labs was 1.45%~ 2.95%.

# Reported Results-4PAHs

| Code | Phenanthrene (optional), µg/kg | | | | Fluoranthene, µg/kg | | | | Benzo[a]pyrene, µg/kg | | | | Benzo[ghi]perylene, µg/kg | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *x* | *u*(x) | *k* | *U*(x) | *x* | *u*(x) | *k* | *U*(x) | *x* | *u*(x) | *k* | *U*(x) | *x* | *u*(x) | *k* | *U*(x) |
| Lab 1 | NA | NA | NA | NA | 2602 | 51 | 2.36 | 120 | 728 | 32 | 2.78 | 89 | 637 | 25 | 2.36 | 59 |
| Lab 2 | 2255 | 69 | 2 | 138 | 2297 | 82 | 2 | 164 | 839 | 34 | 2 | 68 | 708 | 27 | 2 | 53 |
| Lab 3 | 2573 | 50 | 2.145 | 106 | 2130 | 58 | 2.138 | 123 | 656 | 41 | 2.13 | 87 | 700 | 24 | 2.139 | 51 |
| Lab 4 | 885.1 | 105 | 2 | 210 | 1243 | 95 | 2 | 190 | 907.3 | 43.8 | 2 | 87.6 | 619 | 46.8 | 2 | 93.6 |
| Lab 5 | 2920 | 111 | 2 | 230 | 2490 | 105 | 2 | 210 | 776 | 32 | 2 | 64 | 728 | 35 | 2 | 70 |
| Lab 6 | 1781 | 221 | 2 | 442 | 2012 | 250 | 2 | 500 | 504 | 64 | 2 | 128 | 444 | 68 | 2 | 136 |
| Lab 7 | 726.84 | 54.07 | 2 | 108.15 | 1020.64 | 32.93 | 2 | 65.86 | 418.57 | 19.66 | 2 | 39.33 | 357.47 | 16.2 | 2 | 32.4 |
| Lab 8 | 2437 | 58 | 2 | 115 | 2238 | 63 | 2 | 126 | 853 | 27 | 2 | 54 | 630 | 23 | 2 | 45 |
| Lab 9 | 2724 | 111.3 | 2 | 223 | 2419 | 89.5 | 2 | 179 | 749 | 22.6 | 2 | 45.2 | 680 | 23.7 | 2 | 47.5 |
| Lab 10 | 2235 | 162 | 2 | 324 | 2277 | 105 | 2.03 | 213 | NA | NA | NA | NA | 474.25 | 31 | 2 | 62 |
| Lab 11 | NA | NA | NA | NA | 2100 | 130 | 2 | 260 | 742 | 88 | 2 | 180 | 742 | 37 | 2 | 74 |
| Lab 12 | 3010 | 96.65 | 2 | 193 | 2538 | 89.95 | 2 | 180 | 882.9 | 40.51 | 2 | 81 | 673 | 30.54 | 2 | 61.1 |
| Lab 13 | 2550 | 91 | 2.09 | 190 | 2300 | 66 | 2.12 | 140 | 748 | 28 | 2.31 | 64 | 643 | 39 | 2.11 | 82 |
| Lab 14 | 1580 | 108 | 2 | 216 | 1400 | 110 | 2 | 221 | 427 | 55 | 2 | 111 | 417 | 44 | 2 | 87 |
| Lab 15 | 2528 | 114 | 2 | 228 | 2183 | 103 | 2 | 206 | 699 | 33 | 2 | 66 | 665 | 54 | 2 | 108 |
| Lab 16 | 2562 | 74 | 2 | 149 | 2172 | 66 | 2 | 133 | 710 | 31 | 2 | 63 | 668 | 26 | 2 | 53 |
| Lab 17 | NA | NA | NA | NA | 2299 | 68 | 2 | 136 | 531 | 17 | 2 | 34 | 474 | 14 | 2 | 28 |
| mean | 2197.6 | | | | 2101.2 | | | | 698.2 | | | | 603.5 | | | |
| Median | 2483 | | | | 2238 | | | | 735 | | | | 643 | | | |
| Lab 18 | 2360 | 103 | 2 | 205 | 1907 | 100 | 2 | 201 | 608 | 77.2 | 2 | 154 | 418 | 36.3 | 2 | 72.7 |
| Lab 1* | NA | NA | NA | 2283 | 43 | 2.31 | 100 | 547 | 16 | 2.78 | 45 | 495 | 17 | 2.78 | 48 | NA |

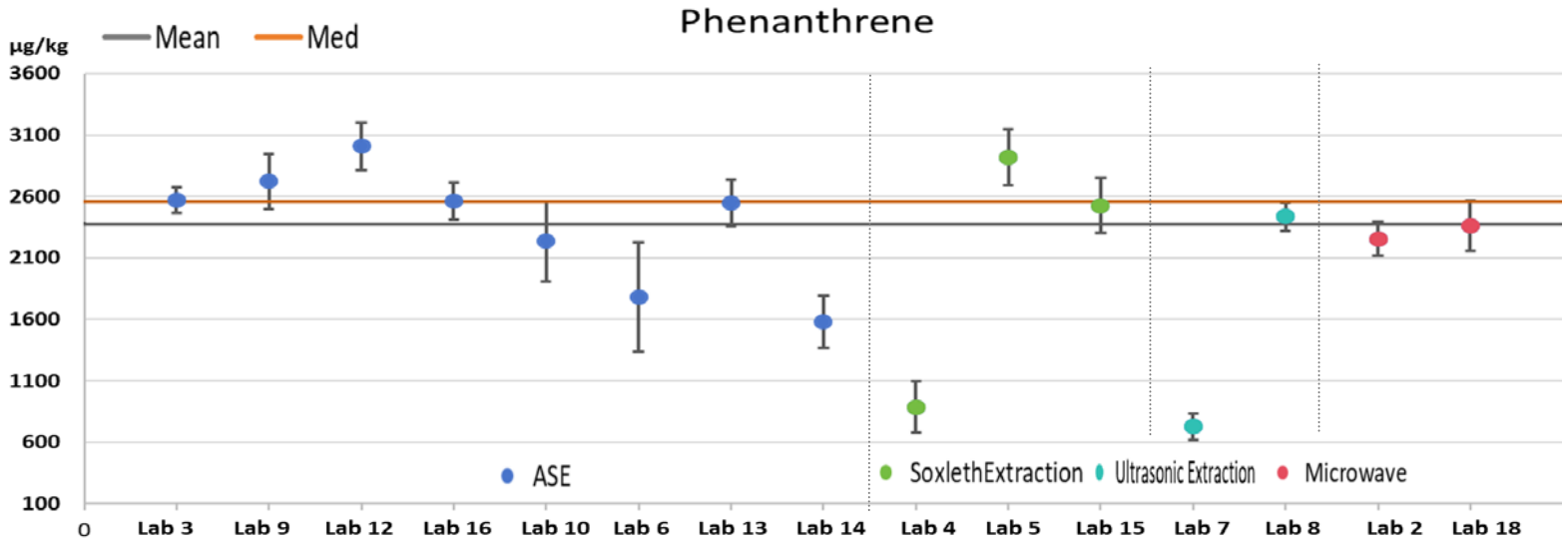
# Summary of Key Technologies

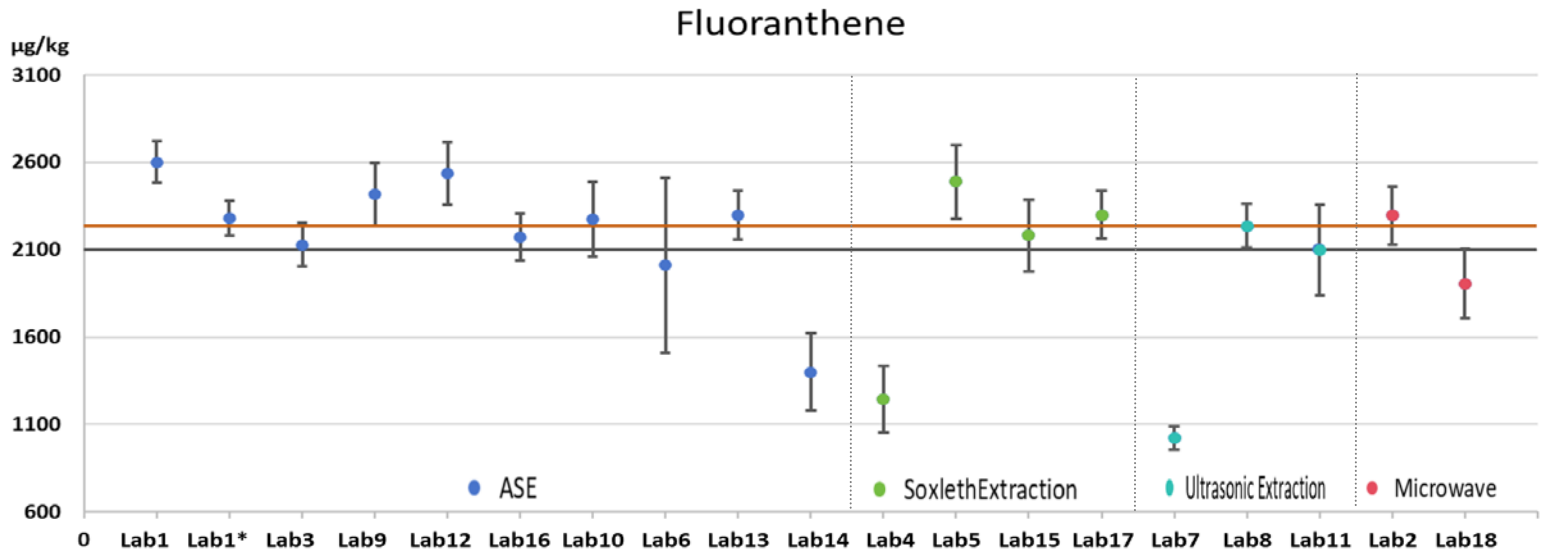
- Extraction method.
- Clean-up Methods .
- Analytical Techniques & Type of Calibration;
- Source of Traceability
- Moisture determination

# Extraction method-Key Factors

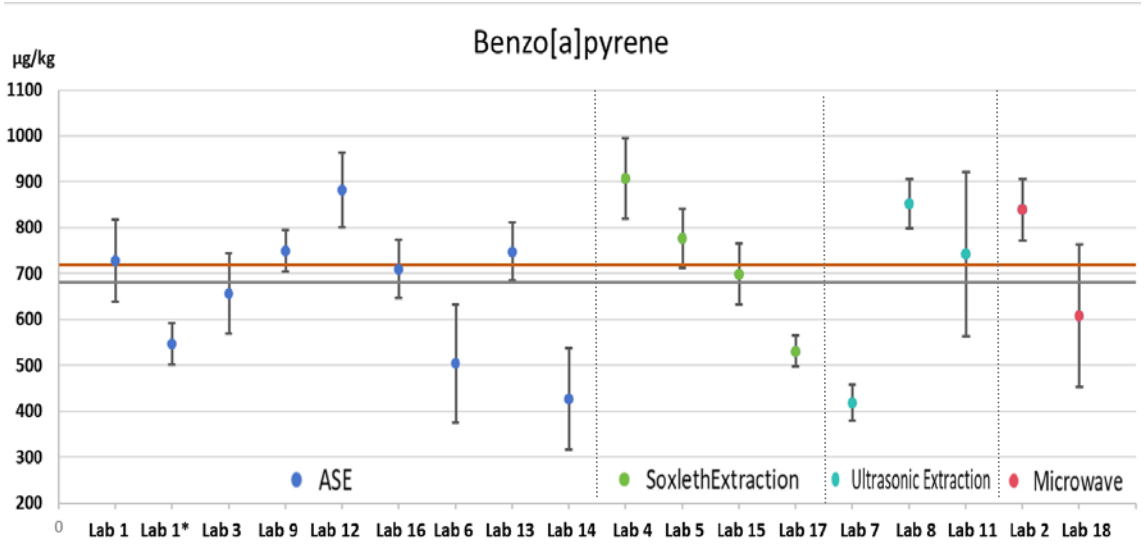
- **Extraction techniques: 4 extraction techniques.**
  - ASE - 9 labs;
  - Soxhlet extraction- 4 labs;
  - Ultrasonic extraction- 3 labs;
  - Microwave extraction - 2 lab.
- **Parameters of Extraction:**
  - Type and amount of solvent;
  - Temperature;
  - Extraction cycles;
  - Duration time

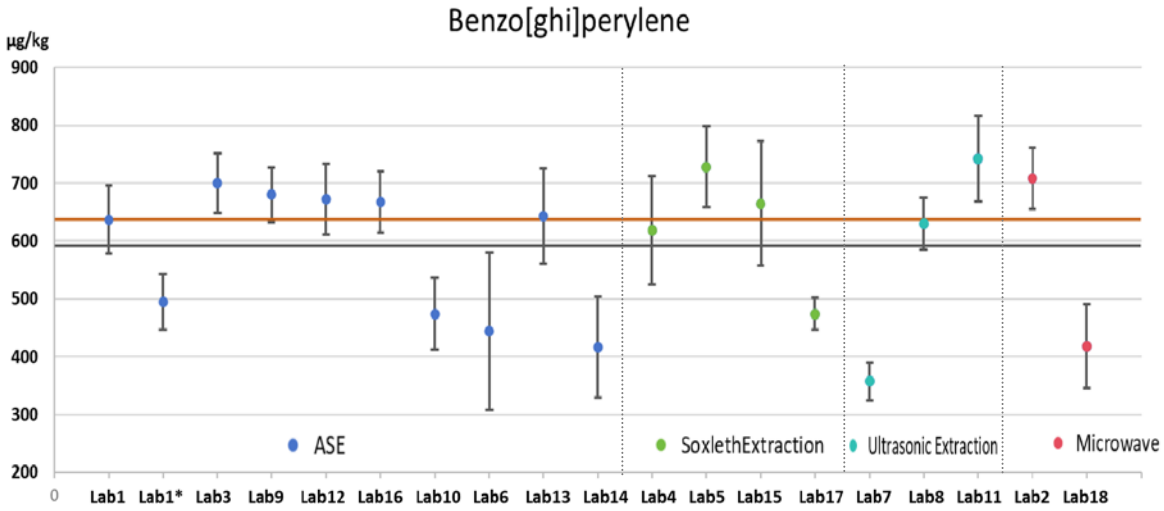
# Results of different extraction technique



# Results of different extraction methods




►None of the extraction methods demonstrated significant extraction superiority.

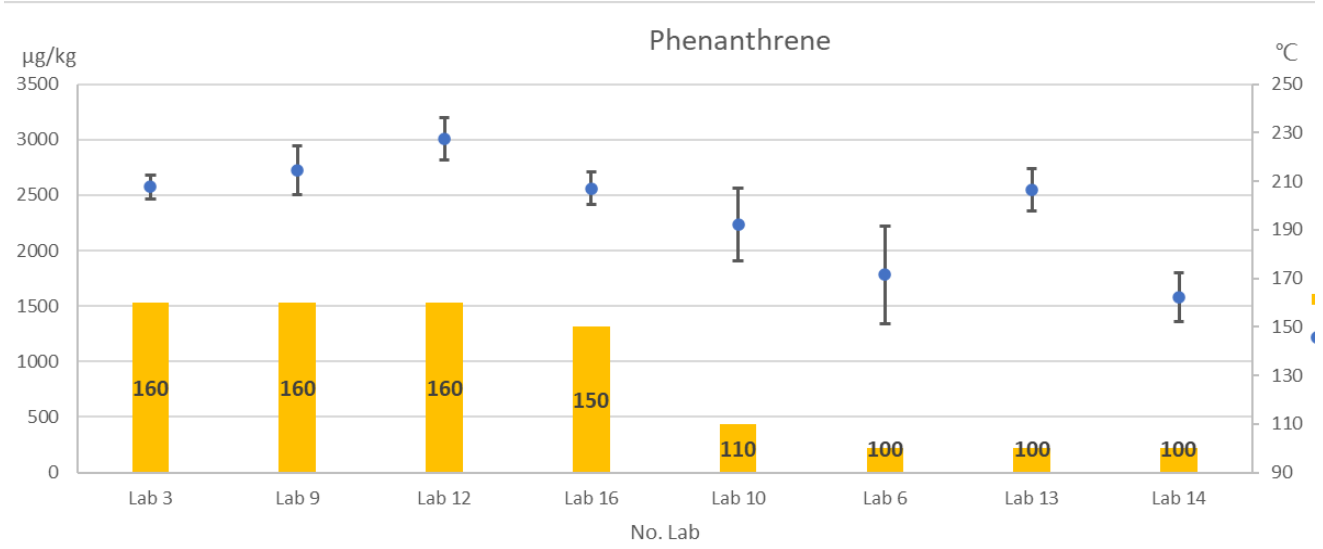
►The key parameters in each extraction method may be the decisive factors affecting the extraction efficiency.

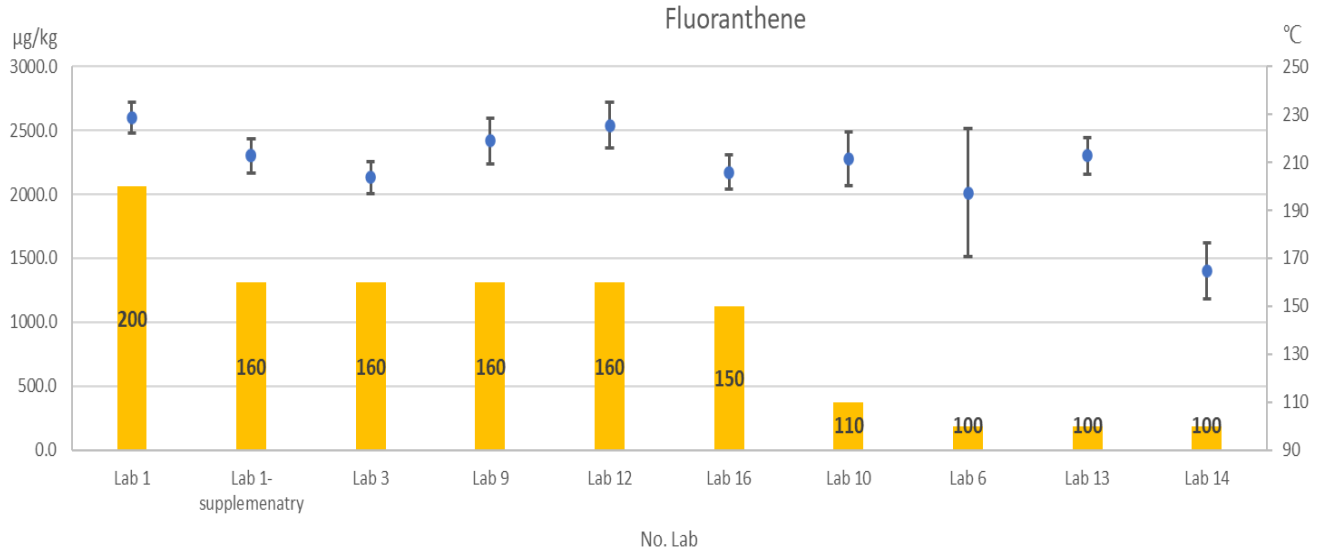
# Extraction-ASE extraction

| Code | Sample size | Extraction solvent | Temp/°C | Extraction cycles | Extraction time |
|---|---|---|---|---|---|
| Lab 1 | 1 g | Toluene: MeOH (1:1, v:v) | 200 | 2 | 20 min |
| Lab 1 supplemenatry | 1 g | Acetone/Hexane (1:1, v:v) | 160 | 5 | 25 min, 5 min |
| Lab 3 | 1 g | | 160 | 6 cycles, 2 rounds | 5 min static, |
| Lab 6 | 2 g | | 100 | 2 | 5 min/cycle |
| Lab 16 | 1 g | 15mL Acetone/n-Hexane (1:1, v:v) for each cycle | 150 | 6 | 15mL, 3 min/cycle. |
| Lab 9 | 1 g | Toluene | 160 | 8 | Static time/cycle: 10 min |
| Lab 12 | 1 g | | 160 | 6 | 30min |
| Lab 10 | 1 g | Acetone/DCM (1:1, v/v) | 110 | 6 | 15 min for 6 cycles |
| Lab 14 | 2 g | | 100 | 2 | 20 time |
| Lab 13 | 1 g | 2 mL of DCM was added mixed with the sample. Phenanthrene & fluoranthene with DCM: ACN; benzo(a)pyrene & benzo(ghi)perylene with both solvent mixtures (1:1 hexane:acetone & 9:1 DCM: ACN. | 100 | 2 | 5 min/cycle |

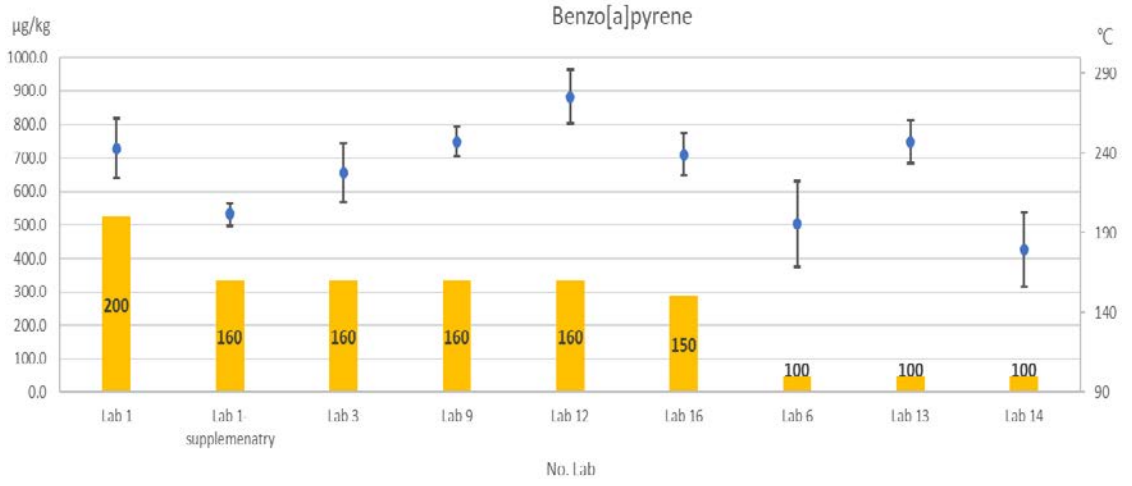
# Effect of Temperature of ASE

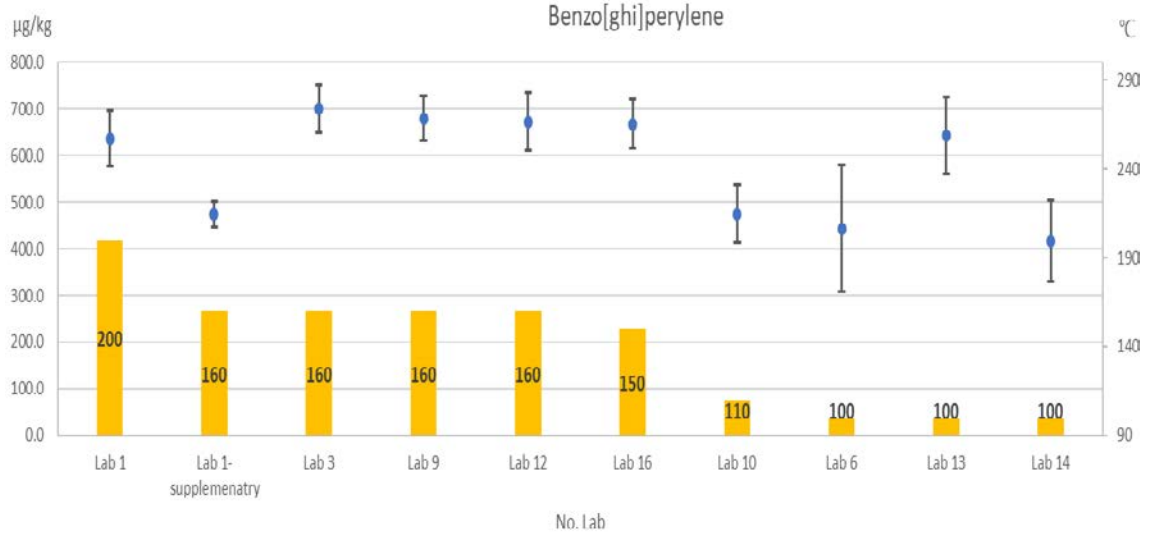
- **Results from 9 labs using ASE extraction are listed in order of extraction temperature from highest to lowest.**



# Extraction-ASE extraction




- **The overall performance shows that extraction at higher temperatures (≥150℃) shows higher results .**
- **Lab13 was extracted at 100℃, the results remained stably in the same level range as the results of other higher temp extraction.**
- **Lab13 is mixed sample with DCM before ASE extraction, and extracted with 34mL extraction cell.**

# Extraction method other than ASE

| Code | Extraction method | Sample size | Extraction solvent | Temp/°C | Other key parameters | |
|---|---|---|---|---|---|---|
| | | | | | Cycles | Time |
| **Lab 4** | Automated Soxleth extraction | 1 g | Acetone/Hexane (1:1, v:v) | - | 60 cycles | 4 hours |
| **Lab 5** | Soxhlet extraction | 0.5 g | Toluene /Acetone (50/50) | - | - | 24 hours |
| **Lab 15** | Soxhlet (Buchi b 811) | 1 g | Acetone/Hexane (1:1, v:v) (130 mL ) | - | - | 18 hours |
| **Lab 17** | Soxhlet extraction | 1 g | 250 mL DCM/MeOH (2:1, v/v) | - | - | 72 hours |
| **Lab 7** | Ultrasonic extraction | 2 g | **6.8g**, n-Hexane: Acetone (1:1, v/v) | - | | **15** minutes. |
| **Lab 8** | Ultrasonic extraction | 1 g | 25 mL DCM/Hexane (50:50, v:v) each circle | 70 | 4 cycles | 20 minutes |
| **Lab 11** | Sonication-saponification -liquid/ liquid extraction | 1 g | Potassium hydroxide in MeOH, hexane | - | - | - |
| **Lab 2** | Microwave | 1 g | 20 mL Acetone/Hexane (1:1, v:v) | In 3 mins, increase temperature to 110°C（for 15min) , final temperature 45°C | 850W and 600rpm | |
| **Lab 18** | Microwave | 1.2 g | 40 mL n-Hexane/ DCM(1:1) | the temperature is programmed to 115 °C in 10 min. and then isothermal at 115 °C for 30 min. | The oven is set at 1200 Watts | |

# Clean-up Methods

| Code | Clean-up method | Sorbent of SPE/ Column purification |
|---|---|---|
| Lab 1 | SPE | Silica |
| Lab 4 | | Silica 1g |
| Lab 8 | | Silica 1g , 30:9 m:m Zn/Cu mixture and sodium sulfate (Na2SO4) |
| Lab 9 | | Silica 1g |
| Lab 15 | | Silica 1g |
| Lab 16 | | Silica |
| Lab 18 | | Si/CN-S 1g/0.5g |
| Lab 6 | Copper for removing sulfur & Column purification | 2 g of copper, 5 g of silica gel and 5 g of basic aluminum oxide, both deactivated at 5%. |
| Lab 11 | | Activated copper granule, silica gel |
| Lab 14 | Column Chromatography | Silica Gel |
| Lab 7 | d-SPE | 900 mg of anhydrous magnesium sulfate, 150 mg of PSA, and 150 mg of C18, |
| Lab 3, Lab 12, Lab 13 | Filtration | - |
| Lab 2, Lab 5, Lab 10, Lab 17 | - | |

- 11 labs used adsorbents to purify the extracted sample solution.
- 3 Labs used filtration, and 4 Labs have no Clean-up steps.
- Most laboratories use silica gel as the adsorbent in purification, and copper is also used in some laboratories to purify possible sulfur.

# Analytical Techniques & Type of Calibration

| Code | Analytical Technique | Type of Calibration |
|---|---|---|
| **Lab 1** | GC-IDMS | Single point |
| **Lab 2** | GC-IDMS | 6 point calibration curve |
| **Lab 3** | GC-IDMS | Multipoint calibration |
| **Lab 4** | GC-IDMS/MS, GC-IDMS, IS method of HPLC-FLD, IS method of HPLC-DAD | Internal standard, 4-5 points, calibration curve |
| **Lab 5** | GC-IDMS/MS | Single point |
| **Lab 6** | GC-IDMS | 8-point calibration curve |
| **Lab 7** | GC-IDMS/MS | Bracketing, Matrix matched calibration |
| **Lab 8** | GC-IDMS | Bracketing |
| **Lab 9** | GC-IDMS | Single point |
| **Lab 10** | GC-IDMS/MS | Single-point, bracketing calibration and 5-7 point calibration curve |
| **Lab 11** | GC-IDMS, GC-HR-IDMS | 4 point calibration curve and IDMS with bracketing |
| **Lab 12** | GC-IDMS | 4-10 point calibration curves |
| **Lab 13** | GC-IDMS/MS | 8 point calibration curve |
| **Lab 14** | GC-IDMS/MS | Calibration curve |
| **Lab 15** | GC-IDMS | 6 point calibration curve |
| **Lab 16** | GC-IDMS/MS | 9-point calibration |
| **Lab 17** | GC-IDMS/MS | Bracketed single point exact matching |
| **Lab 18** | GC-IDMS | Single point |

- **9 labs adopted GC-IDMS method, Lab 11 also uses an additional GC-HR-IDMS approach.**
- **7 labs adopted GC-IDMS/MS method.**
- **Lab 4 used 4 methods .**
- **Lab 6 only uses the isotope diluent for Phenanthrene, and the other internal standard is Chrysene-D12, Peryelene-D12.**

# Calibrants and Traceability-Solution CRM

| Code | Analyte | Source of Traceability | Producer |
|---|---|---|---|
| Lab 2 | 4 PAHs | SRM 2260a | NIST |
| Lab 3 | 4 PAHs | SRM 2260a | NIST |
| Lab 5 | 4 PAHs | SRM 1647f | NIST |
| Lab 7 | 4 PAHs | SRM 1647f | NIST |
| Lab 10 | Fluoranthene | GBW(E)080477 | NIM |
| | Phenanthrene, Benzo(ghi)perylene | SRM 1647f | NIST |
| Lab 11 | 3 PAHs | GBW 08736 | NIM |
| Lab 12 | 4 PAHs | SRM 1647f / SRM 2260a | NIST |
| Lab 13 | 4 PAHs | SRM 2260a | NIST |
| Lab 14 | 4 PAHs | SRM 1647f / SRM 2260a | NIST |
| Lab 15 | 4 PAHs | SRM 1647f | NIST |
| Lab 16 | 4 PAHs | SRM 1647f | NIST |
| Lab 17 | 4 PAHs | SRM 1647f | NIST |
| Lab 18 | 4 PAHs | SRM 2260a | NIST |

- **13 laboratories adopted certified solution reference materials from NIST or NIM.**
- **In addition to GBW(E)080477, the other 3 CRMs used are all multi-PAH CRMs, including not only the 4 PAHs in this comparison.**

# Calibrants and Traceability -Certified purity PAHs

| Code | Analyte | Source of Traceability | Producer | Purities/Concentration and Uncertainties (95% CI) | Purity techniques |
|---|---|---|---|---|---|
| **Lab 1** | Fluoranthene | **Lab 1** | sigma-aldrich | 98.80 ± 0.13 % (k=2.04) | mass- balance |
| | Benzo[a]pyrene | | Supelco | 98.76 ± 0.50 % (k=2.05) | |
| | Benzo[ghi]perylene | | Accustandard | 97.59 ± 0.35 % (k=2.45) | |
| **Lab 4** | Phenanthrene | **Lab 4** | Aldrich Chem | (992.5 ± 4.4) mg/g | **GC-FID with two different columns and water content by Karl Fischer titration** |
| | Fluoranthene | | Aldrich Chem | (986.5 ± 3.8) mg/g | |
| | Benzo[a]pyrene | | Supelco | (975.8 ± 4.3) mg/g | |
| | Benzo[ghi]perylene | | Ultra scientific | (989.5 ± 6.4) mg/g | |
| **Lab 8** | Phenanthrene | **Lab 8** | Sigma-Aldrich | (996.0 ± 2.8) mg/g | q-NMR |
| | Fluoranthene | | Sigma-Aldrich | (993.8 ± 1.7) mg/g | |
| | Benzo[a]pyrene | | Dr. Ehrenstorfer GmbH | (971.6 ± 3.8) mg/g | |
| | Benzo[ghi]perylene | | Sigma-Aldrich | (980.1 ± 2.0) mg/g | |
| **Lab 9** | Phenanthrene | **Lab 9** | Supelco | 98.9%, urel=0.44% | Mass- balance: HPLC-DAD, GC-FID and moisture content by Karl Fischer titration |
| | Phenanthrene | | Supelco | 98.9%, urel=0.45% | |
| | Benzo[a]pyrene | | Cerilliant | 99.4%, urel=0.27% | |
| | Benzo[ghi]perylene | | AccuStandard | 98.3%, urel=0.23% | |

➢ **4 labs used calibration solution made from certified pure products of PAHs.**

# Calibrants and Traceability

| Code | Analyte | Source of Traceability | Producer | Purities/Concentration and Uncertainties (95% CI) | Purity techniques |
|---|---|---|---|---|---|
| Lab 6 | Phenanthrene | EPA Method 610/8100 PAH Mixture | Dr Ehrenstorfer, Ref[a] DRE- GA09000161BD, Batch 2-H473805NA | (2000 ± 110) µg/mL | - |
| | Fluoranthene | | | (2008 ± 100) µg/mL | - |
| | Benzo[a]pyrene | | | (1999 ± 130) µg/mL | - |
| | Benzo[ghi]perylene | | | (2000 ± 130) µg/mL | - |

- **Lab 6 employed Dr.E's calibration solution and does not conduct purity analysis.**

# Moisture determination

| Code | Moisture | Temperature | Number of subsamples | Sample amount (g) |
|---|---|---|---|---|
| Lab 1 | 1.93% | 105°C | 3 | - |
| Lab 3 | 1.94% | | - | 1 |
| Lab 5 | 1.85% | | 3 | 1 |
| Lab 6 | 1.95% | | | |
| Lab 7 | 2.05% | | | |
| Lab 8 | 1.92% | | | |
| Lab 11 | 2.12% | | | |
| Lab 13 | 2.95% | | - | 1 |
| Lab 14 | 1.77% | | 3 | 0.5 |
| Lab 15 | 1.90% | | - | - |
| Lab 16 | 1.45% | | 3 | 1 |
| Lab 18 | 1.23% | | - | - |
| Lab 9 | 2.21% | 105°C±2°C | 3 | 1 |
| Lab 10 | 2.87% | | | |
| Lab 12 | 2.21% | | - | - |
| Lab 17 | 2.13% | | - | 1 |
| Lab 2 | 1.77% | 105°C±5°C | - | 1 |
| Lab 4 | 1.90% | 110°C | - | 1 |

- In all laboratories, the moisture content was tested by oven heating method.

# Discussion the Preliminary results

## CCQM K184/ P235 Track A key comparison:PAHs in Sediment

## Seminar Agenda

10:00 -13:00 GMT on October 16, 2024

**Microsoft Teams**

| **Agenda - Wednesday 16 October 2024** | |
|---|---|
| 10:00 | **Welcome –** Maria Fernandes-Whaley NMISA |
| 10:05 | **1. Introduction of the experiments in CCQM-K184/P235 by participants (5 min for each lab, in the following order)** |

| | |
|---|---|
| **1.1** | **Lab 4** |
| **1.2** | **Lab 11** |
| **1.3** | **Lab 14** |
| **1.4** | **Lab 1** |
| **1.5** | **Lab 16** |
| **1.6** | **Lab 3** |
| **1.7** | **Lab 13** |
| **1.8** | **Lab 6** |

| | |
|---|---|
| 10:45 | 2. **Preliminary results for CCQM-K184/P35 Track A key comparison: PAHs in sediment** – Tang Hua -NIM |
| 11:10 | **3. Discussion** – All participants |

# Discussion Meeting Summary

## ➢ The main problem discussed：

### 1. The effect of extraction parameters on extraction efficiency；

♦Lab 7 only used 6.8g n-Hexane: Acetone to extract 2g sample;

♦Lab14 did not perform optimization on extraction efficiency by using standard methods.

### 2. The validity of the certification techniques for 4 PAHs；

♦Lab 4 only used one method (GC-FID ) to determine the purites of 4 PAHs;

### 3. Traceability of calibrated substances；

♦Lab 6 used Dr.E calibrant solution.

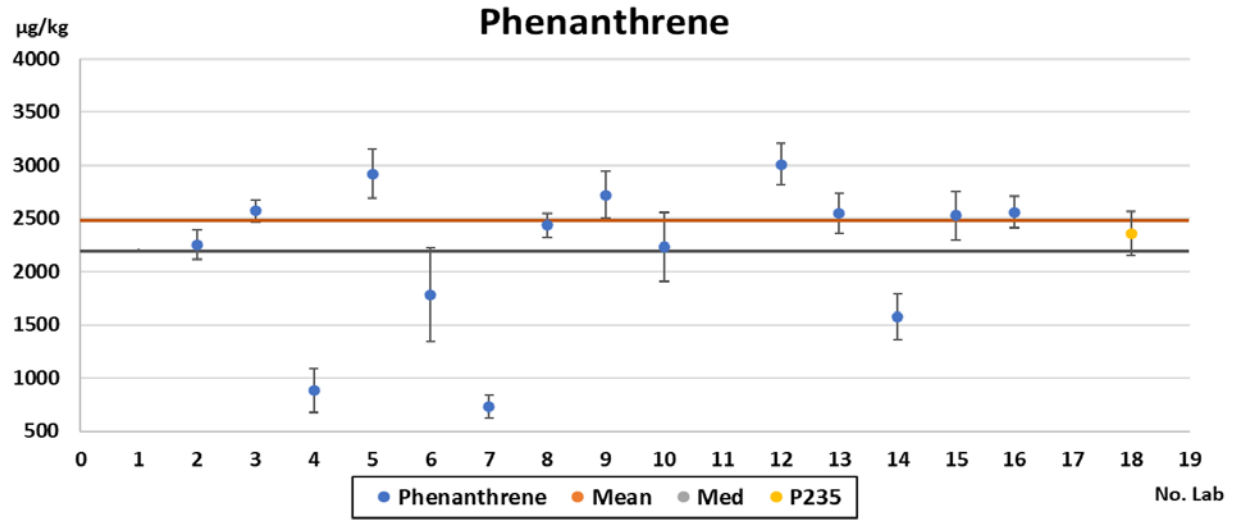
### 4. Whether the comparison results can be selectively withdrawn from the 3 non-selected PAHs when calculating KCRV;

♦Lab 11 did not submit the results of Bap.

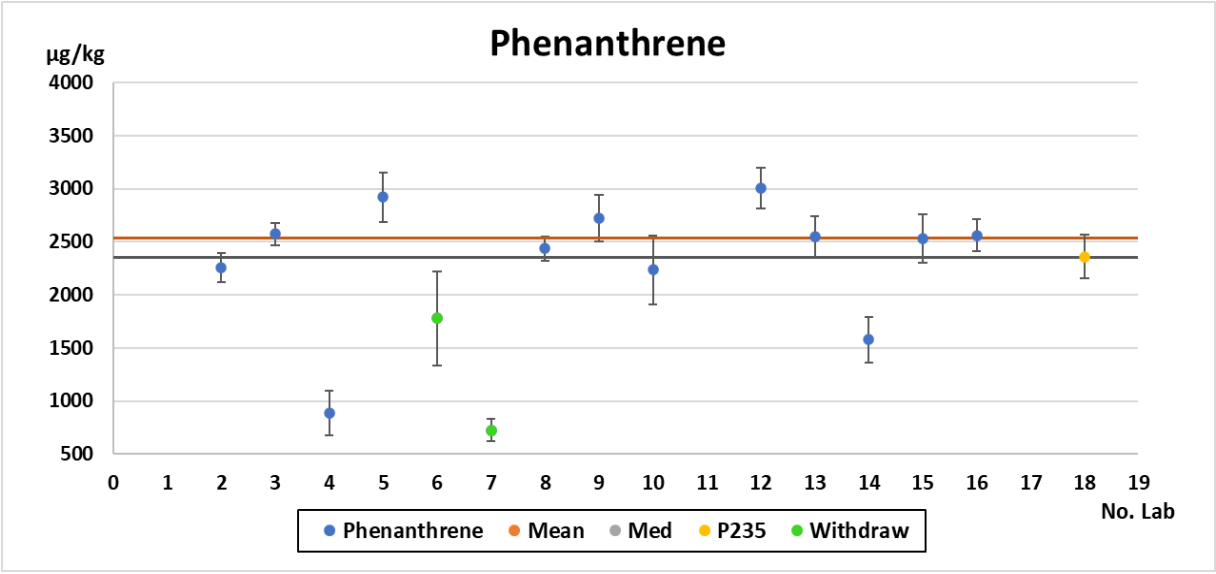
♦Whether other participating laboratories can selectively withdraw their results.

# Dot-and-Bar Display of Phenanthrene

**Mean and median from 17 Labs**

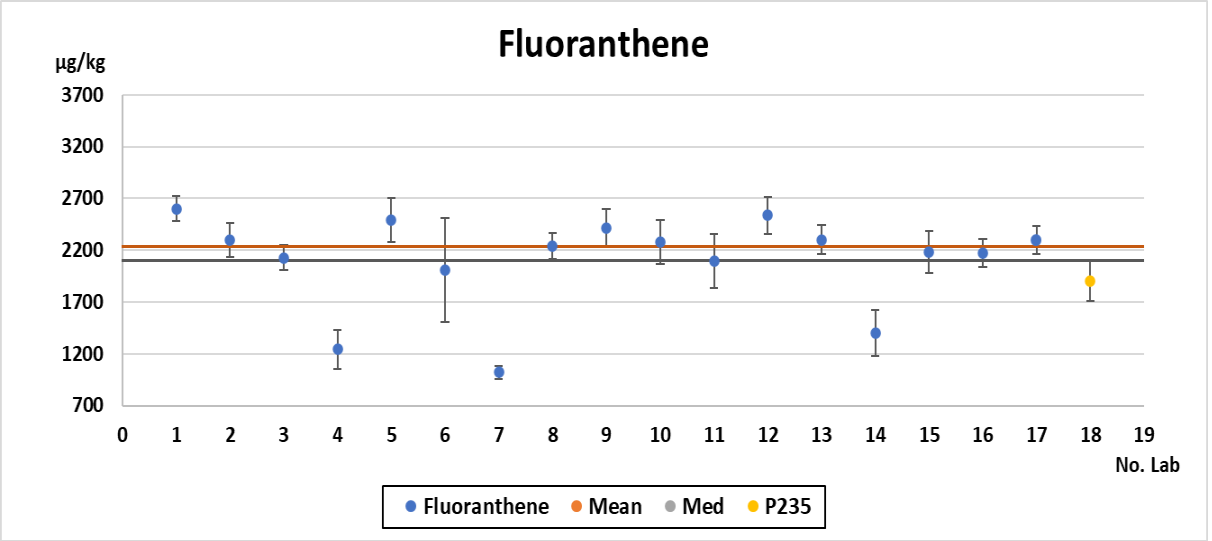



**Mean and median from 15 Labs ( Lab 6 & Lab 7 withdrawed their results).**

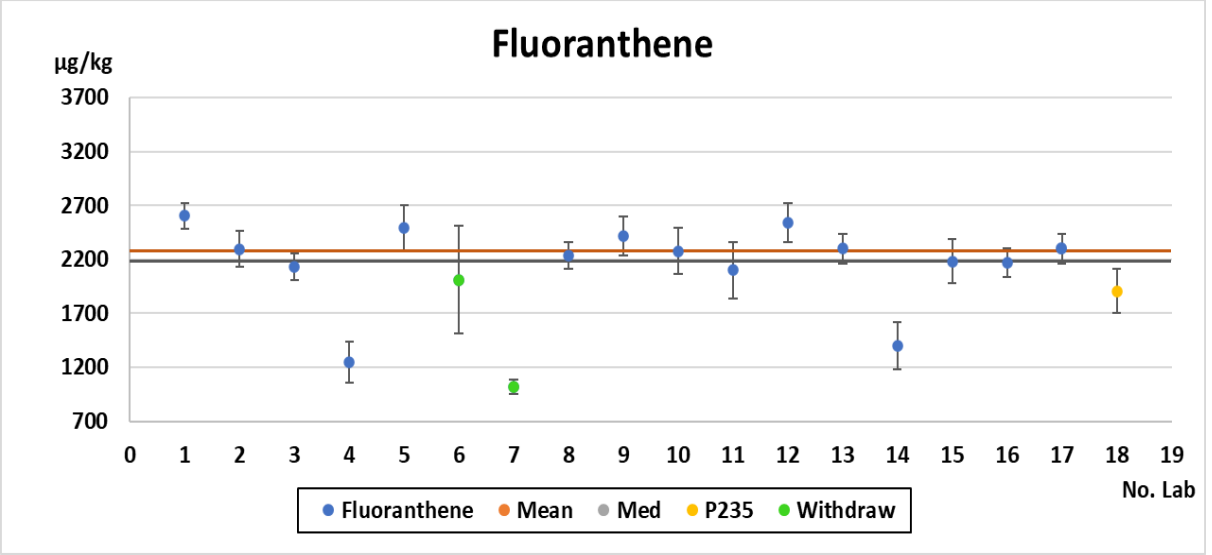


# Dot-and-Bar Display of Fluoranthene

**Mean and median from 17 Labs**

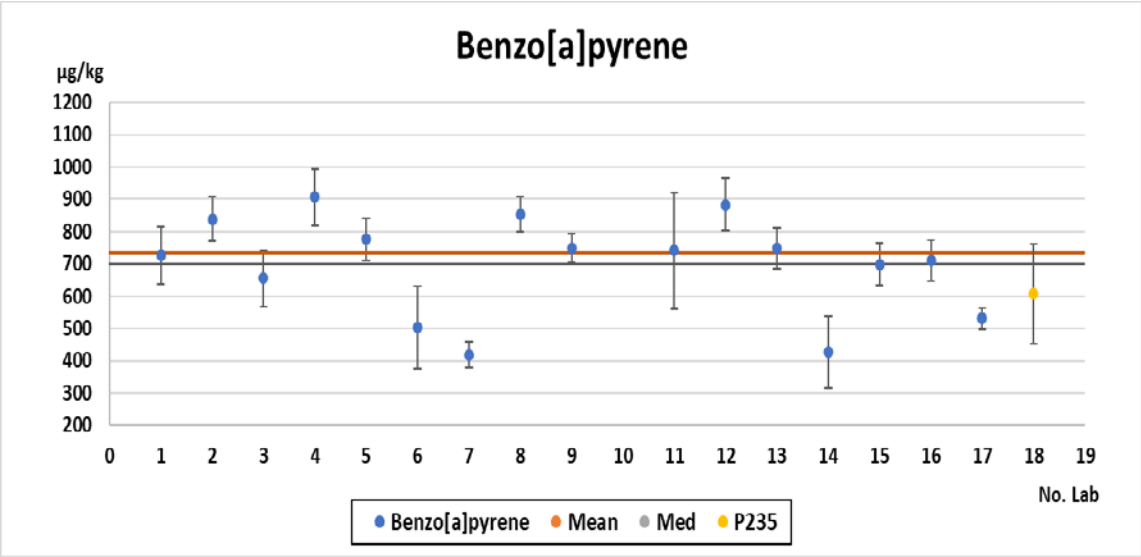



**Mean and median from 15 Labs**

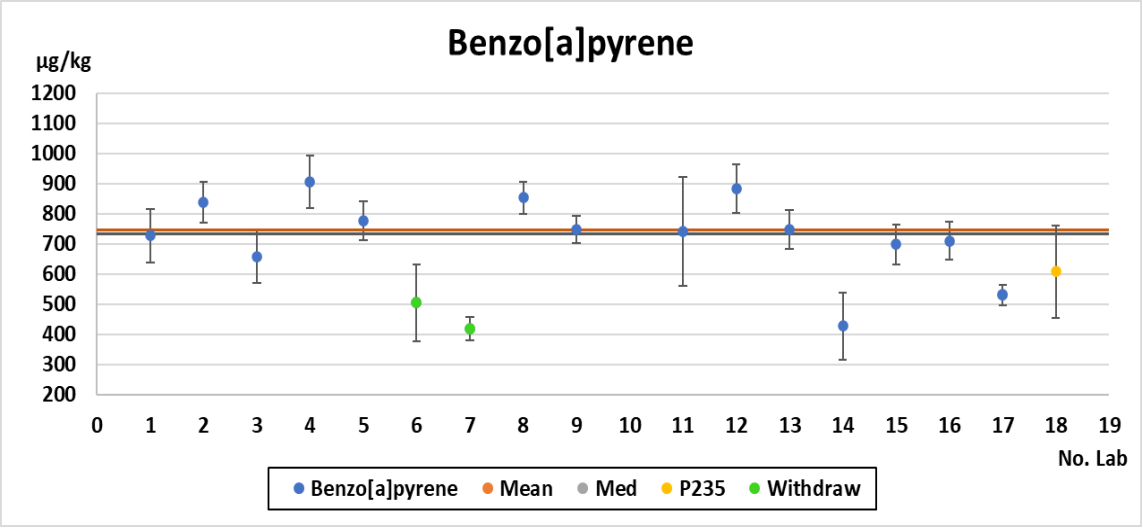


# Dot-and-Bar Display of Benzo[a]pyrene

**Mean and median from 16 Labs**

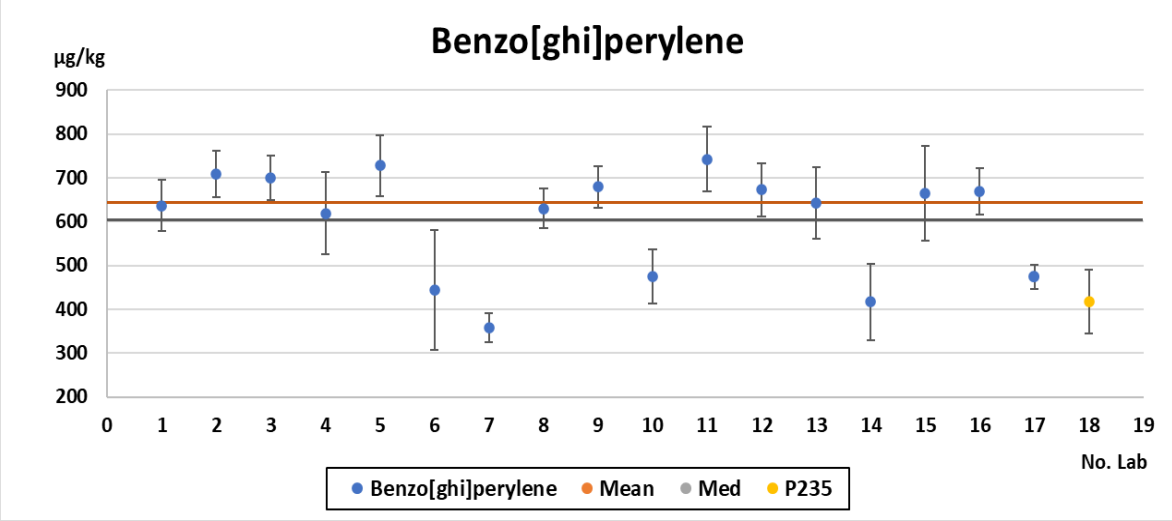



**Mean and median from 15 Labs**

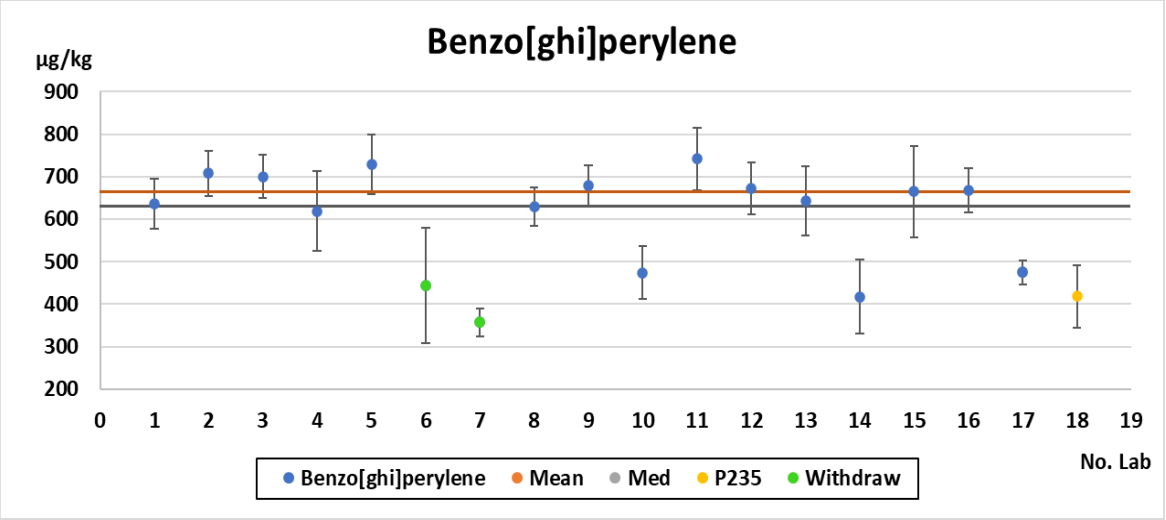


# Dot-and-Bar Display of Benzo[ghi]perylene

**Mean and median from 17 Labs**




**Mean and median from 15 Labs**



# Next Plan

- We are still waiting for feedback from participating laboratories on whether to retain the comparison results in KCRV.

- An online meeting on KCRV calculation and evaluation is planned for November or early December.。

# *Thank You for Attention*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