Statistics
Special Study 72-5
Job No. 8505016

ROUND ROBIN STUDY - PCB IN WATER

INTRODUCTION

In order to establish the accuracy and precision in the method used for estimating PCB content in the environment, a round robin testing experiment was set up. Samples were prepared by spiking water with PCB's at the level of about 500 ppb. Individual preparations included blanks (no PCB), Aroclor 1242 only, Aroclor 1254 only, Aroclor 1260 only, all 50-50 two component mixtures, and a 1/3, 1/3, 1/3 preparation containing all three Aroclors. Six samples of each mixture were prepared, and three of each sent to the W. G. Krummrich Plant Lab, and three tested by Applied Sciences (cf Table I). Tables II and III show the results obtained by the laboratories.

Each result, expressed in ppb of the individual components was converted to % of the total PCB added. Analysis of variance was run on all the data taken together (Table IV) and on each lab independently. Two obviously defective samples were deleted from the Krummrich data.

CONCLUSIONS

1. There was a significant difference between the laboratories in per cent of total PCB found. Significance - 99.0%.

2. There was a significant difference between the laboratories in variety of results. Significance - 99.9%.

3. The 95% confidence limits for individual results were as follows:

Either Lab	87.5 ± 55.2%
WGK	81.3 ± 46.4%
Applied Sciences	93.7 ± 19.2%

4. The repeatability for the individual labs, based on repeat tests of samples having identical prepared compositions is as follows:

WGK	±42.0%
Applied Sciences	±11.6%

5. In general, Applied Sciences comes closer to properly identifying the individual Aroclors, with one exception. Applied Sciences found Aroclor 1254 in a mixture of Aroclor 1242 and Aroclor 1260. See below:

Mixture	Present	Found WGK	Found A/S
1	1242	1242,(1254)	1242
2	1242,1254	1242,1254,(1260)	1242,1254
3	1242,1254,1260	1242,( ),1260	1242,1254,1260
4	1254	1254,(1260)	1254
5	1242,1260	1242,1260	1242,(1254),1260
6	1260	(1248),1260	1260
7	1254,1260	(1248),1254,1260	1254,1260

Numbers in parentheses indicate misidentifications.

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Apparently the technique is not yet sufficiently developed to permit accurate identification of mixtures of Aroclors.

6. A previous study, based on fewer data points gave the following confidence limits (95%):

Total PCB 113.8 ± 58.7% (3 laboratories participating)

Confidence limits of means for individual labs:

Applied Sciences	99.3 ± 48.8%
WGK	133.6 ± 48.8%
Anniston	118.0 ± 48.8%

Note that the previous results tended to show higher recovery than the present set.

DISCUSSION

Prior to the analysis of variance, two test results from W. G. Krummrich were discarded. These were samples B26 and B29 on Table II. It was felt that there might have been an error in the preparation of these samples.

The Applied Sciences laboratory had significantly more precise results on samples having the same composition than on overall % recovery over all samples. This lower variability did not show up on the Krummrich tests (WGK showed the same variability within compositions as between compositions). It is possible that the improved precision for Applied Sciences was due to similarities in technique (dilution, etc.) on samples having identical compositions.

Details of the statistical analyses on this and the previous study are available.

db

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Table 2

Round-Robin Water Samples - Spike Level

Sample	Aroclor	Level (ppb)
A - 1 B - 23 C - 45	None	Blank
A - 2, 9, 16 B - 24, 31, 38 C - 46, 53, 60	1242	502
A - 3, 10, 17 B - 25, 32, 39 C - 47, 54, 61	1242 1254	251 250
A - 4, 11, 18 B - 26, 33, 40 C - 48, 55, 62	1242 1254 1260	251 250 250
A - 5, 12, 19 B - 27, 34, 41 C - 49, 56, 63	1254	501
A - 6, 13, 20 B - 28, 35, 42 C - 50, 57, 64	1242 1260	251 250
A - 7, 14, 21 B - 29, 36, 43 C - 51, 58, 65	1260	501
A - 8, 15, 22 B - 30, 37, 44 C - 52, 59, 66	1254 1260	250 250

A - Applied Sciences
B - WCK
C - Anniston

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Round Robin Water Samples — WGK

Sample	Aroclor & Level (ppb)			
B-23	1242 2 1254 1			
B-24, 31, 38	1242 - 298 1254 - 64	1242 - 222	1242 - 273	2[illegible] -[illegible]
B-25, 32, 39	1242 - 314 1254 - 280	1242 - 170 1254 - 168	1242 - 128 1260 - 245	43 -13
B-26, 33, 40	1242 - 1 1254 - 1	1242 - 171 1260 - 487	1242 - 144 1260 - 477	63[illegible] -15
B-27, 34, 41	1254 - 448	1254 - 232	1260 - 462	38[illegible] -25
B-28, 35, 42	1242 - 141 1260 - 345	1242 - 96 1260 - 252	1242 - 133 1260 - 317	4[illegible] -12
B-29, 36, 43	1260 - 100	1260 - 546	1248 - 8 1260 - 530	39[illegible] -[illegible]
B-30, 37, 44	1248 - 120 1260 - 96	1254 - 285	1248 - 5[illegible] 1260 - 513	35[illegible] -[illegible]

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Round Robin Water Samples - Applied Sciences

Sample	Aroclor & Level (ppb)			
A-1	1242 - 15			
A-2, 9, 16	1242 - 474	1242 - 507	1242 - 548	5. +9
A-3, 10, 17	1242 - 165 1254 - 287	1242 - 165 1254 - 290	1242 - 169 1254 - 279	1. -1
A-4, 11, 18	1242 - 160 1254 - 253 1260 - 129	1242 - 172 1254 - 281 1260 - 216	1242 - 227 1254 - 272 1260 - 215	6 -1
A-5, 12, 19	1254 - 511	1254 - 524	1254 - 550	5 +8
A-6, 13, 20	1242 - 117 1254 - 108 1260 - 102	1242 - 110 1254 - 111 1260 - 186	1242 - 153 1254 - 115 1260 - 157	1 -1
A-7, 14, 21	1260 - 436	1260 - 430	1260 - 455	1 -1
A-8, 15, 22	1254 - 282 1260 - 200	1254 - 300 1260 - 208	1254 - 262 1260 - 210	1 -3

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TABLE IV

ROUND ROBIN WATER SAMPLES

TOTAL PCB - % OF SPIKE LEVEL

Composition No.	W. G. Krummrich	Applied Sciences
1	72.0	94.3
	44.1	100.9
	54.3	109.1
2	118.2	89.9
	74.2	90.5
	72.2	89.2
3		72.1
	87.5	89.0
	82.6	95.0
4	89.2	107.6
	46.1	104.3
	91.9	109.5
5	96.7	83.0
	69.3	87.0
	89.6	90.5
6		86.8
	108.7	85.6
	107.1	90.5
7	43.2	96.4
	57.0	101.6
	112.6	94.4