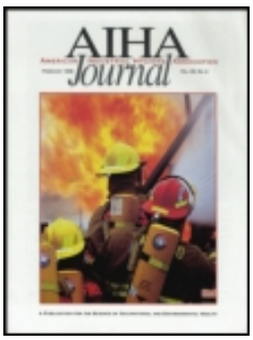

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PAT Program Report

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Proficiency Analytical Testing (PAT) Program (May 30, 1997)

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The Proficiency Analytical Testing (PAT) Program is a collaborative effort of the American Industrial Hygiene Association (AIHA) and researchers at the Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH). The PAT Program provides quality control reference samples to over 1200 occupational health and environmental laboratories in 17 countries. Although one objective of the PAT Program is to evaluate the analytical ability of participating laboratories, the primary objective is to assist these laboratories in improving their laboratory performance.

Each calendar quarter (designated as a round), samples are mailed to participating laboratories and the data are analyzed to evaluate laboratory performance on a series of analyses. Each mailing and subsequent data analysis is completed in time for participants to obtain repeat samples and to correct analytical problems before the next calendar quarter starts. The PAT Program currently includes four sets of samples as shown in Table I. A mixture of 3 of the 4 possible metals, and 1 to 3 of the 12 possible organic solvents are rotated for each round. Fibers alternate between amosite and chrysotile asbestos and man-made fibers; no fiber mixtures are provided. Each set consists of four concentrations and a blank. The metals, silica, and fiber samples are on filters and the organic solvents are on charcoal, carbon molecular sieve, or silica gel tubes. The organic solvent set also includes five blank charcoal, carbon molecular sieve, or silica gel tubes for desorption efficiency determination.

Laboratories are evaluated for each analysis by comparing their reported results against an acceptable performance limit for each PAT Program sample the laboratory analyzes. Reference laboratories are preselected to provide the performance limits for each sample. These reference laboratories must meet the following criteria: 1) the laboratory was rated proficient in the last PAT evaluation of all the contaminants in the program; and 2) the laboratory, if located in the United States, is AIHA accredited. After the data from the reference laboratories are collected and statistically treated, the mean of the collected data is called the reference value and the performance limits equal the mean ±3 standard deviations. Data are acceptable if they fall within the performance limits. Data falling outside the performance limits are reported as outliers.

Laboratories are rated based on performance in the PAT Program over the last year (i.e., four calendar quarters), as well as on individual contaminant performance. Individual contaminants are metals, silica, asbestos/fibers, and organic solvents. Individual contaminant performance is rated as 1) proficient if all results have been reported and all are classified as acceptable for the last two consecutive rounds; and 2) proficient in all other cases if three-fourths or more of the results reported in the last four consecutive rounds are classified as acceptable.[1]

TABLE I. Current Sets of Samples in Proficiency Analytical Testing (PAT) Program

Metals	cadmium	
	chromium	
	lead	
	zinc	
Silica	quartz	
Asbestos/fibers	amosite	
	chrysotile	
	man-made fibers	
Organic solvents	benzene	methyl isobutyl ketone
	chloroform	tetrachloroethylene
	1,2-dichloroethane	toluene
	p-dioxane	1,1,1-trichloroethane
	methanol	trichloroethylene
	methyl ethyl ketone	o-xylene

PAT Round 129 April 1997

A total of 1240 laboratories were enrolled in the PAT Program with 1154 laboratories submitting results on Round 129. Table II lists the reference values, performance limits, and participants for each sample type in the PAT Program. Table III presents the summary of the PAT proficiency ratings for each analytical area.

PAT Passive Monitor Practice Round 128 January 1997

A total of 173 sample kits containing benzene, toluene, and o-xylene were sent to participating laboratories for the second practice round (Round 128) of the PAT Passive Monitor Program on January 2, 1997. There were 142 3M monitors, 19 SKC monitors, and 12 Assay Technology

Mention of company names or products does not constitute endorsement by the CDC.

TABLE II. Reference Values, Performance Limits, and Participants for Each Sample Type PAT Round 129 (April 1997)

Contaminant	Sample Number	No. of Reference Labs	Reference Value	RSD (%)	Performance Limits Lower	Performance Limits Upper	No. of Labs	No. of Outliers
Cadmium (mg)	1	57	0.0125	4.5	0.0108	0.0142	352	31
	2	57	0.0024	5.9	0.0020	0.0028	352	26
	3	57	0.0100	4.5	0.0087	0.0114	352	19
	4	57	0.0183	4.4	0.0159	0.0207	352	24
Lead (mg)	1	57	0.0834	4.1	0.0731	0.0937	356	25
	2	57	0.0687	4.3	0.0598	0.0775	356	19
	3	57	0.0443	4.4	0.0384	0.0502	356	16
	4	57	0.0206	5.6	0.0171	0.0241	356	20
Zinc (mg)	1	57	0.0670	4.3	0.0583	0.0757	351	35
	2	57	0.1144	4.6	0.0987	0.1300	351	24
	3	57	0.1773	5.3	0.1490	0.2056	351	17
	4	57	0.0869	4.6	0.0748	0.0989	351	29
Silica (mg)	1	57	0.1047	23.3	0.0315	0.1779	77	0
	2	57	0.1329	24.8	0.0341	0.2318	77	0
	3	57	0.0584	25.8	0.0133	0.1035	77	0
	4	57	0.0840	23.1	0.0258	0.1422	77	2
Asbestos/fibers	1	57	255	28.8	82	524	980	66
(chrysotile) (f/mm^2)	2	57	109	17.8	59	175	980	110
	3	57	114	26.8	41	223	980	100
	4	57	210	34.6	49	486	980	36
1,2-Dichloroethane (mg)	1	57	0.1995	4.0	0.1755	0.2235	309	33
	2	57	0.3133	3.7	0.2787	0.3480	309	29
	3	57	0.5841	3.4	0.5247	0.6436	309	24
	4	57	0.6816	3.6	0.6071	0.7560	309	24
Tetrachloroethylene (mg)	1	57	0.6720	4.1	0.5886	0.7554	309	27
	2	57	1.0542	4.2	0.9216	1.1868	309	37
	3	57	0.2027	4.7	0.1739	0.2315	309	40
	4	57	0.3837	5.0	0.3259	0.4415	309	22
Trichloroethylene (mg)	1	57	0.3883	3.5	0.3478	0.4288	309	36
	2	57	0.6284	3.4	0.5648	0.6920	309	39
	3	57	1.0019	3.1	0.9092	1.0945	309	34
	4	57	0.2212	4.7	0.1900	0.2525	309	28

monitors. Based on data collected in the first practice round, the laboratories were asked to provide corrected sample weights as well as concentrations in parts per million. The reason for this was to assess whether observed errors were analytical or calculation in nature. Of the 960 reported results, there were 76 analytical errors, 22 calculation errors, and 27 that were probably a combination of both. Proficiency ratings provided to laboratories were for informational purposes only, as this was a practice round. A performance limit of the reference value ±18% was chosen based on data from the first practice round. Laboratory analyses within this performance

TABLE III. PAT Proficiency Ratings Based on Rounds 126 to 129 (July 1996–June 1997)

Contaminant	No. Labs Rated	No. Labs Rated Proficient	Percent Labs Rated Proficient
Metals	351	330	94
Silica	77	76	98.7
Asbestos/fibers	980	935	95.4
Organic solvents	309	278	90

TABLE IV. Passive Monitor Round 128—Summary of All Laboratories Performance, Reference Values, and Performance Limits

		Summary of All Laboratories			Reference Values and Acceptable Performance Limits		
						Acceptable Performance Range	
Compound	Sample	Mean (ppm)	STD (ppm)	RSD (%)	Reference Value (ppm)	Low (ppm)	High (ppm)
Benzene	1	11.667	3.421	29.3	11.850	9.717	13.983
	2	28.302	8.476	29.9	30.060	24.649	35.471
Toluene	1	14.991	4.357	29.1	14.900	12.218	17.582
	2	34.641	10.643	30.7	36.180	29.668	42.692
o-Xylene	1	12.403	3.145	25.4	12.000	9.840	14.160
	2	15.519	4.857	31.3	14.520	11.906	17.134

limit were rated as acceptable. A laboratory was rated proficient if three-fourths or more of the analyses reported are rated as acceptable. For the second practice round, a total of 149 laboratories submitted results, and 121 were rated proficient. These ratings did not count toward accreditation. Table IV presents the summary of reported results from all laboratories, reference values, and performance limits for passive monitors. Table V lists the distribution of acceptable results and outliers.

TABLE V. Passive Monitor Round 128—Distribution of Results Compared to the Acceptable Performance Limits

		Acceptable		High		Low		Total
Compound	Sample	N	%	N	%	N	%	N
Benzene	1	143	89	9	6	8	5	160
	2	137	86	4	3	19	12	160
Toluene	1	143	89	8	5	9	6	160
	2	139	87	5	3	16	10	160
o-Xylene	1	141	88	12	8	7	4	160
	2	132	83	19	12	9	6	160
Total		835	87	57	6	68	7	960

PAT ROUND 130 JULY 1997

PAT Round 130, which included the first official round of passive monitors, was sent to participating laboratories on July 1, 1997. In the PAT Program, organic solvents were ethyl acetate, n-butyl acetate, and isopropanol. Metals in this round included cadmium, chromium, and lead. Silica had no background, and asbestos/fibers were amosite with one man-made fiber sample. For passive monitors, the organic solvents were benzene, toluene, and o-xylene. The monitors used included 3M, SKC, and Assay Technology.

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