



PAT Program Report

Background and Current Status

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Jensen H. Groff and Paul C. Schlecht, Column Editors

Introduction

The Proficiency Analytical Testing (PAT) Program is a collaborative effort of the American Industrial Hygiene Association (AIHA) and researchers at the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). The PAT Program provides quality control reference samples to over 1400 occupational health and environmental laboratories in over 15 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 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 are completed in time for participants to obtain repeat samples and correct analytical problems before the next calendar quarter starts. The PAT Program currently includes four sets of samples as shown in Table I.

A combination of three metals and three organic solvents are rotated for each round. Asbestos is rotated among amosite and chrysotile; no mixtures are provided. Each set consists of four concentration levels and a blank. The metals, silica, and asbestos samples are on filters and the organic solvents are in charcoal tubes. The organic solvent set also includes five blank charcoal 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 for 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 \pm 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 upon performance in the PAT Program over the last year (i.e., four calendar quarters) as well as on individual contaminant performance and overall performance. Individual contaminants are metals, silica, asbestos, 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 consecu-

tive rounds are classified as acceptable. Overall laboratory performance is rated as 1) proficient if two-thirds or more of the individual PAT contaminants are rated proficient, but 2) non-proficient if any individual PAT contaminants are rated nonproficient for more than four consecutive times (i.e., 1 year).¹⁰

PAT Round 111, October 1992

A total of 1525 laboratories were enrolled in the PAT Program with 1371 laboratories submitting results on Round 111. Table II lists the reference values, performance limits, and participants for each sample type in the Program. A total of 91.4 percent of the 1446 laboratories evaluated were rated overall proficient this time. There were no changes in the samples provided to the laboratories or any significant problems encountered for this evaluation period.

Proficiency Ratings: PAT Rounds 108-111. January-December 1992

A total of 1446 laboratories were rated based upon their performance

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

Metals	Silica	Asbestos (PCM Fiber Counting)	Organic Solvents
Cadmium	Quartz	Amosite	Benzene
Chromium		Chrysotile	Carbon tetrachloride
Lead			Chloroform
Zinc			1,2-Dichloroethane
			p-Dioxane
			Hexane
			Methyl chloroform
			Methylene chloride
			Methyl ethyl ketone
			Methyl isobutyl ketone
			Octane
			Tetrachloroethylene
			Toluene
			Trichloroethylene
			o-Xylene

TABLE II. Reference Values, Performance Limits, and Participants for Each Sample Type; Pat Round 111 (October 1992)

Contaminant	Sample Number	Number of Reference Labs	Reference Value	Relative Standard Deviation (%)	Performance Limits	Number of Labs	Number of Outliers
Cadmium	1	66	0.0175 mg	4.4	0.0152-0.0197 mg	388	30
	2	66	0.0098 mg	4.5	0.0085-0.0111 mg	388	33
	3	66	0.0059 mg	5.1	0.0050-0.0067 mg	388	30
	4	66	0.0136 mg	4.1	0.0120-0.0152 mg	388	30
Lead	1	66	0.0291 mg	4.8	0.0249-0.0333 mg	394	38
	2	66	0.0734 mg	3.9	0.0650-0.0819 mg	394	42
	3	66	0.0414 mg	3.2	0.0375-0.0454 mg	394	57
	4	66	0.0627 mg	4.0	0.0552-0.0701 mg	394	35
Zinc	1	66	0.0745 mg	5.7	0.0617-0.0873 mg	386	30
	2	66	0.1434 mg	5.4	0.1202-0.1665 mg	386	28
	3	66	0.2067 mg	5.5	0.1724-0.2410 mg	386	24
	4	66	0.1782 mg	5.2	0.1506-0.2058 mg	386	28
Silica	1	64	0.1259 mg	19.3	0.0530-0.1987 mg	98	2
	2	64	0.0862 mg	24.1	0.0239-0.1485 mg	98	2
	3	64	0.1579 mg	18.1	0.0721-0.2436 mg	98	1
	4	64	0.0579 mg	30.6	0.0049-0.1110 mg	98	4
Asbestos (chrysotile)	1	66	646 f/mm ²	24.8	256-1213 f/mm ²	1206	86
	2	66	382 f/mm ²	26.5	138-747 f/mm ²	1206	68
	3	66	164 f/mm ²	32.8	43-361 f/mm ²	1206	64
	4	66	413 f/mm ²	24.6	168-766 f/mm ²	1206	88
Carbon tetrachloride	1	67	0.8184 mg	4.7	0.7038-0.9330 mg	371	27
	2	67	1.1169 mg	4.7	0.9583-1.2755 mg	371	34
	3	67	0.5043 mg	5.9	0.4144-0.5941 mg	371	41
	4	67	1.4787 mg	3.5	1.3242-1.6332 mg	371	54
1,2-Dichloroethane	1	67	0.9175 mg	3.6	0.8186-1.0163 mg	371	44
	2	67	1.2509 mg	4.0	1.0993-1.4025 mg	371	37
	3	67	0.7604 mg	3.7	0.6758-0.8451 mg	371	38
	4	67	0.5450 mg	3.6	0.4856-0.6044 mg	371	38
Trichloroethylene	1	67	1.3639 mg	3.6	1.2166-1.5112 mg	371	33
	2	67	0.7089 mg	4.1	0.6220-0.7959 mg	371	29
	3	67	1.2642 mg	3.8	1.1189-1.4095 mg	371	31
	4	67	0.4651 mg	3.9	0.4104-0.5198 mg	371	36

TABLE III. PAT Proficiency Ratings Based Upon Rounds 108-111 (January-December 1992)

Contaminant	Number of Labs Rated	Number of Labs Rated Nonproficient	Percent of Labs Rated Nonproficient
Metals	405	32	7.9
Silica	102	1	1.0
Asbestos	1275	70	5.5
Organic solvents	388	53	13.7
Overall	1446	125	8.6

over the last four rounds (1 year). Table III presents the PAT proficiency ratings by analytical area and overall.

Upcoming PAT Round 112, January 1993

PAT Round 112 was sent on January 4,

1993. The organic solvents in this round were 1,1,1-trichloroethane, tetrachloroethylene, and trichloroethylene. Metals in this round included cadmium, chromium, and lead. Also, silica had a coal mine dust background and the asbestos was amosite.

Reference

1. Groff, J.H.; Schlecht, P.C.; Shulman, S.: Laboratory Reports and Rating Criteria for the Proficiency Analytical Testing (PAT) Program. DHHS (NIOSH) Pub. No. 91-102. National Institute for Occupational Safety and Health, Cincinnati, OH (1990).