



PAT Program

Proficiency Analytical Testing Program

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Introduction

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, National Institute for Occupational Safety and Health (NIOSH). 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 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 three of the four possible metals, and three of the ten possible organic solvents, is rotated for each round. Asbestos alternates between

amosite and chrysotile; no asbestos fiber mixtures are provided. Each set consists of four concentrations and a blank. The metals, silica, and asbestos samples are on filters and the organic solvents are on 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 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 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 consecutive 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) nonproficient if any individual PAT contaminants are rated nonproficient for more than four consecutive times (i.e., one year).¹⁰

PAT Round 116, January 1994

A total of 1427 laboratories were enrolled in the PAT Program with 1319 laboratories submitting results on Round 116. Table II lists the reference values, performance limits, and participants for each sample type in the PAT Program. A total of 90.1 percent of the 1384 laboratories evaluated were rated overall proficient this time. There were no significant changes in the samples provided to the laboratories or any unusual problems encountered for this evaluation period. An automated data entry system has been developed and introduced into the PAT Program so that laboratories can submit analytical results over a modem using a computer and NIOSH software.

Proficiency Ratings — PAT Rounds 113–116, April 1993 — March 1994

A total of 1384 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
			Tetrachloroethylene
			Toluene
			1,1,1-Trichloroethane
			Trichloroethylene
			o-Xylene

TABLE II. Reference Values, Performance Limits, and Participants for Each Sample Type; PAT Round 116 (January 1994)

Contaminant	Sample Number	Number of Reference Labs	Reference Value	Relative Std. Dev. (%)	Performance Limits	Number of Labs	Number of Outliers
Cadmium	1	66	0.0177 mg	4.3	0.0155–0.0199 mg	389	30
	2	66	0.0050 mg	4.4	0.0043–0.0056 mg	389	29
	3	66	0.0098 mg	4.0	0.0087–0.0109 mg	389	36
	4	66	0.0079 mg	4.0	0.0070–0.0087 mg	389	49
Chromium	1	66	0.1474 mg	6.1	0.1203–0.1744 mg	386	30
	2	66	0.0939 mg	5.0	0.0799–0.1079 mg	386	40
	3	66	0.2387 mg	5.3	0.2005–0.2769 mg	386	41
	4	66	0.1946 mg	6.8	0.1548–0.2345 mg	386	29
Lead	1	66	0.0212 mg	3.5	0.0190–0.0234 mg	396	76
	2	66	0.0835 mg	3.1	0.0757–0.0913 mg	396	37
	3	66	0.0420 mg	3.4	0.0378–0.0463 mg	396	46
	4	66	0.0685 mg	3.7	0.0609–0.0761 mg	396	38
Silica	1	66	0.0625 mg	23.3	0.0188–0.1062 mg	92	3
	2	66	0.0942 mg	22.5	0.0307–0.1577 mg	92	2
	3	66	0.0678 mg	26.4	0.0141–0.1215 mg	92	3
	4	66	0.1055 mg	23.1	0.0323–0.1787 mg	92	3
Asbestos (amosite)	1	66	762 f/mm ²	18.2	403–1233 f/mm ²	1128	72
	2	66	359 f/mm ²	17.9	193–575 f/mm ²	1128	70
	3	66	283 f/mm ²	22.0	129–495 f/mm ²	1128	57
	4	66	540 f/mm ²	19.5	267–907 f/mm ²	1128	36
1,1,1-Trichloroethane	1	66	0.2220 mg	5.7	0.1839–0.2602 mg	363	27
	2	66	0.6729 mg	4.5	0.5813–0.7644 mg	363	23
	3	66	0.9827 mg	4.7	0.8443–1.1211 mg	363	21
	4	66	0.9479 mg	4.7	0.8132–1.0826 mg	363	22
Tetrachloroethylene	1	66	0.9933 mg	3.6	0.8859–1.1007 mg	363	38
	2	66	0.5080 mg	4.7	0.4371–0.5788 mg	363	33
	3	66	0.3304 mg	4.5	0.2854–0.3754 mg	363	36
	4	66	1.0064 mg	3.6	0.8967–1.1161 mg	363	36
Trichloroethylene	1	66	0.8553 mg	3.2	0.7733–0.9373 mg	363	38
	2	66	1.1494 mg	3.3	1.0366–1.2622 mg	363	38
	3	66	0.4545 mg	3.8	0.4031–0.5058 mg	363	32
	4	66	0.6817 mg	3.1	0.6184–0.7450 mg	363	43

TABLE III. PAT Proficiency Ratings Based Upon Rounds 113 to 116 (April 1993–March 1994)

Contaminant	Number of Labs Rated	Number of Labs Rated Nonproficient	Percent Labs Rated Nonproficient
Metals	404	33	8.2
Silica	96	0	0.0
Asbestos	1193	86	7.2
Organic Solvents	374	46	12.3
Overall	1384	137	9.9

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

Upcoming PAT Round 117, April 1994

PAT Round 117 was sent on April 1, 1994. The organic solvents in this round were chloroform, carbon tetrachloride,

and 1,2-dichloroethane. Metals in this round included cadmium, lead, and zinc. Also, silica had a calcite background and the asbestos was chrysotile.

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).

Editorial Note: Paul C. Schlecht and Jensen H. Groff are with the Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.