



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). 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 participating 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 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 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-quarters 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 or 2) nonproficient if any individual PAT contaminants are rated nonproficient for more than four consecutive times (i.e., one year).

This article is intended to be the first in a continuing series on the PAT Program. An updated summary of the statistics and laboratory performance will be included as well as any changes and general items of interest noted in the most recent quarterly round of the PAT Program.

PAT Round 103, October 1990

Chromium was included in the PAT Program for the first time as chromium (III) nitrate nonahydrate. The results reported by the reference laboratories had a relative standard deviation range of 5.7 percent to 6.3 percent. The total number of outliers for chromium by all laboratories was similar to the number of outliers usually identified for cadmium, lead, and zinc. The addition of a fourth metal analyte necessitated a change in the evaluation procedure for the metals. This round of results has only one overall rating for the met-

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
			Hexane
			Methylene Chloride
			Methyl Chloroform
			Methyl Ethyl Ketone
			Methyl Isobutyl Ketone
			Octane
			p-Dioxane
			Toluene
			Tetrachloroethylene
			Trichloroethylene
			o-Xylene

TABLE II. Reference Values, Performance Limits, and Participants for Each Sample Type; PAT Round 103 (October 1990)

Contaminant	Sample Number	Number of Reference Labs	Reference Value	Relative Std. Dev.	Performance Limits	Number of Labs Analyzed	Number of Labs Outliers
Cadmium	1	75	0.0072 mg	4.9%	0.0062–0.0082 mg	383	34
	2	75	0.0107 mg	5.2%	0.0090–0.0123 mg	383	33
	3	75	0.0111 mg	4.9%	0.0094–0.0126 mg	383	33
	4	75	0.0185 mg	5.0%	0.0157–0.0213 mg	383	28
Chromium	1	75	0.0894 mg	5.7%	0.0743–0.1046 mg	378	35
	2	75	0.0528 mg	5.7%	0.0437–0.0618 mg	378	40
	3	75	0.1015 mg	6.1%	0.0828–0.1200 mg	378	35
	4	75	0.1947 mg	6.3%	0.1578–0.2315 mg	378	42
Lead	1	75	0.0717 mg	3.6%	0.0639–0.0795 mg	388	35
	2	75	0.0265 mg	5.0%	0.0225–0.0304 mg	388	45
	3	75	0.0392 mg	4.5%	0.0339–0.0445 mg	388	32
	4	75	0.0598 mg	4.4%	0.0519–0.0676 mg	388	36
Silica	1	74	0.0978 mg	19.1%	0.0556–0.1720 mg	113	5
	2	74	0.0381 mg	30.9%	0.0149–0.0976 mg	113	8
	3	74	0.0937 mg	19.4%	0.0517–0.1699 mg	113	5
	4	74	0.1206 mg	18.2%	0.0695–0.2094 mg	113	3
Asbestos	1	75	173.3 f/mm ²	28.3%	55.9–355.4 f/mm ²	1321	70
	2	75	361.6 f/mm ²	28.4%	111.9–753.8 f/mm ²	1321	63
	3	75	521.3 f/mm ²	23.0%	221.3–948.0 f/mm ²	1321	123
	4	75	554.4 f/mm ²	21.4%	253.9–970.8 f/mm ²	1321	122
Carbon Tetrachloride	1	75	1.2119 mg	3.7%	1.0775–1.3462 mg	373	52
	2	75	0.4495 mg	4.4%	0.3899–0.5090 mg	373	56
	3	75	0.9283 mg	4.5%	0.8026–1.0540 mg	373	34
	4	75	0.6597 mg	4.4%	0.5731–0.7461 mg	373	45
1,2-Dichloroethane	1	75	0.6528 mg	4.0%	0.5748–0.7308 mg	373	48
	2	75	0.9434 mg	4.3%	0.8229–1.0639 mg	373	40
	3	75	1.1060 mg	3.8%	0.9805–1.2315 mg	373	43
	4	75	0.7943 mg	4.2%	0.6935–0.8950 mg	373	42
Trichloroethylene	1	75	0.8790 mg	3.9%	0.7757–0.9821 mg	373	43
	2	75	0.5839 mg	4.3%	0.5086–0.6592 mg	373	43
	3	75	0.9533 mg	3.5%	0.8522–1.0544 mg	373	40
	4	75	1.1533 mg	4.1%	1.0130–1.2934 mg	373	43

als; it was determined by combining the results for all metals over the past four rounds.

A problem was found with the prepared metal filters. Some of the filters developed severe wrinkles, some had a lot of shrinkage, and some stuck to the filter holders. Most of the problem filters were replaced before shipment, but several filters were sent to laboratories and replaced later after in-

spection by the laboratories. Testing is currently being conducted to try to identify the cause of this problem and correct it.

A total of 1578 laboratories were enrolled in the PAT Program with 1459 laboratories submitting results on Round 103. Table II lists the reference values, performance limits, and participants for each sample type in the Program.

Proficiency Ratings: PAT Rounds 100–103, January–December 1990

A total of 1506 laboratories were rated based upon their performance over the last four rounds (one year). Table III presents the PAT proficiency ratings by analytical area and overall.

Upcoming PAT Round 104, January 1991

PAT Round 104 was sent on January 2, 1991. The organic solvents in this round were 1,1,1-trichloroethane, tetrachloroethylene, and trichloroethylene. Metals in this round included cadmium, lead, and zinc. Also, silica had coal mine dust as the background and asbestos was amosite.

TABLE III. PAT Proficiency Ratings Based Upon Rounds 100 to 103 (January–December 1990)

Contaminant	Number of Labs Rated	Number of Labs Rated Nonproficient	Percent Labs Rated Nonproficient
Metals	404	40	9.9%
Silica	115	7	6.1%
Asbestos	1363	63	4.6%
Organic Solvents	386	49	12.7%
Overall	1506	114	7.6%

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