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Jensen H. Groff & Paul C. Schlecht Column Editors

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PAT Program Report

Background and Current Status

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; but 2) nonproficient if any individual PAT contaminants are rated nonproficient for more than four consecutive times (i.e., one year).

PAT Round 104, January 1991

A total of 1445 laboratories were enrolled in the PAT Program with 1369 laboratories submitting results on Round 104. Table II lists the reference values, performance limits, and participants for each sample type in the Program. There were no changes or items of special interest noted during PAT Round 104.

Proficiency Ratings: PAT Rounds 101–104, April 1990–March 1991

A total of 1409 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.

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 104 (January 1991)

Contaminant	Sample Number	Number of Reference Labs	Reference Value	Relative Std. Dev.	Performance Limits	Number of Labs Analyzed	Number of Labs Outliers
Cadmium	1	73	0.0092 mg	3.3%	0.0083–0.0101 mg	376	49
	2	73	0.0118 mg	3.8%	0.0105–0.0131 mg	376	41
	3	73	0.0149 mg	3.4%	0.0134–0.0163 mg	376	46
	4	73	0.0168 mg	3.4%	0.0151–0.0184 mg	376	41
Lead	1	73	0.0358 mg	3.6%	0.0319–0.0397 mg	380	53
	2	73	0.0779 mg	3.6%	0.0694–0.0863 mg	380	43
	3	73	0.0446 mg	3.1%	0.0405–0.0487 mg	380	58
	4	73	0.0612 mg	3.6%	0.0546–0.0678 mg	380	43
Zinc	1	73	0.1505 mg	3.9%	0.1328–0.1682 mg	373	42
	2	73	0.1115 mg	5.5%	0.0930–0.1300 mg	373	30
	3	73	0.2125 mg	3.3%	0.1916–0.2334 mg	373	54
	4	73	0.1770 mg	3.9%	0.1562–0.1978 mg	373	41
Silica	1	72	0.1160 mg	22.0%	0.0586–0.2299 mg	107	3
	2	72	0.1006 mg	24.3%	0.0476–0.2128 mg	107	3
	3	72	0.0885 mg	20.2%	0.0475–0.1648 mg	107	7
	4	72	0.0654 mg	24.3%	0.0312–0.1372 mg	107	4
Asbestos	1	73	238.0 f/mm^2	22.2%	107.6–419.5 f/mm^2	1238	42
	2	73	603.5 f/mm^2	17.9%	320.2–975.8 f/mm^2	1238	47
	3	73	838.4 f/mm^2	17.5%	455.2–1337.7 f/mm^2	1238	46
	4	73	416.3 f/mm^2	21.5%	191.6–727.0 f/mm^2	1238	27
1,1,1-Trichloroethane	1	72	1.0121 mg	4.7%	0.8694–1.1547 mg	367	33
	2	72	0.5112 mg	4.8%	0.4383–0.5839 mg	367	36
	3	72	0.8764 mg	4.3%	0.7646–0.9882 mg	367	38
	4	72	1.2244 mg	3.8%	1.0862–1.3625 mg	367	47
Tetrachloroethylene	1	72	0.5678 mg	5.2%	0.4798–0.6557 mg	367	29
	2	72	0.8797 mg	4.6%	0.7584–1.0010 mg	367	38
	3	72	1.0753 mg	4.4%	0.9336–1.2169 mg	367	39
	4	72	0.4294 mg	4.8%	0.3676–0.4911 mg	367	44
Trichloroethylene	1	72	0.4771 mg	4.1%	0.4189–0.5353 mg	367	45
	2	72	0.7274 mg	3.9%	0.6418–0.8129 mg	367	48
	3	72	0.9451 mg	3.6%	0.8416–1.0485 mg	367	47
	4	72	0.8049 mg	3.8%	0.7130–0.8968 mg	367	41

Upcoming PAT Round 105, April 1991

PAT Round 105 was sent on April 1, 1991. 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.

TABLE III. PAT Proficiency Ratings Based Upon Rounds 101 to 104 (April 1990–March 1991)

Contaminant	Number of Labs Rated	Number of Labs Rated Nonproficient	Percent Labs Rated Nonproficient
Metals	392	46	11.7%
Silica	113	5	4.4%
Asbestos	1279	43	3.4%
Organic Solvents	377	54	14.3%
Overall	1409	95	6.7%

Jensen H. Groff and Paul C. Schlecht are with the National Institute for Occupational Safety and Health in Cincinnati, Ohio.