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PAT Program Background and Current Status

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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. The PAT Program provides quality control reference samples to over 1300 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 correct analytical problems before the next calendar quarter starts. The PAT Program currently includes four sets of samples, as shown in Table 1. A mixture of three of the four possible metals and one to three of the 12 possible organic solvents is 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 or silica gel tubes. The organic solvent set also includes five blank charcoal 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 1. Current Sets of Samples in the 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 127, October 1996

A total of 1331 laboratories were enrolled in the PAT Program, with 1212 laboratories submitting results on round 127. Table 2 lists the reference values, performance limits, and participants for each sample type in the PAT Program. Table 3 presents a summary of the PAT proficiency ratings for each analytical area.

New organic solvents are being introduced into the PAT Program. Ethyl acetate, *n*-butyl acetate, and isopropanol will appear in round 130 (July 1997). Also, there will be one man-made fiber sample included with every asbestos/fiber kit. For statistical reasons, laboratories will be instructed to use the "A" rules when counting man-made fibers.

PAT Round 128, January 1997

PAT round 128 was sent to participating laboratories on January 2, 1997. The organic solvents in this round were methyl ethyl ketone and methyl isobutyl ketone. Metals in this round included cadmium, chromium, and lead. Silica had a coal mine dust background, and asbestos/fibers were amosite with one man-made fiber sample.

Round 128 marked the introduction of methyl ethyl ketone and methyl isobutyl ketone into the PAT Program. Round 128 was also the second practice round for passive monitors. Monitors were obtained from three different manufacturers, and the organic solvents used were benzene, *o*-xylene, and toluene. One hundred fifty-eight laboratories participated in the second practice round. Results from the practice round will be published in a future column.

TABLE 2. Reference Values, Performance Limits, and Participants for Each Sample Type: PAT Round 127 (October 1996)

Contaminant	Sample Number	No. of Reference Labs	Reference Value	RSD (%)	Performance Limits		No. of Labs	No. of Outliers
					Lower	Upper		
Cadmium (mg)	1	58	0.0114	4.0	0.0100	0.0127	357	28
	2	58	0.0067	4.2	0.0059	0.0076	357	31
	3	58	0.0024	5.7	0.0020	0.0029	357	43
	4	58	0.0133	3.7	0.0119	0.0148	357	36
Lead (mg)	1	58	0.0349	3.2	0.0315	0.0383	360	42
	2	58	0.0965	3.8	0.0855	0.1075	360	31
	3	58	0.0273	4.4	0.0237	0.0309	360	27
	4	58	0.0815	3.4	0.0731	0.0900	360	29
Zinc (mg)	1	58	0.1238	4.0	0.1090	0.1386	356	40
	2	58	0.0569	4.1	0.0498	0.0639	356	41
	3	58	0.1614	4.3	0.1408	0.1820	356	37
	4	58	0.0912	4.2	0.0797	0.1027	356	33
Silica (mg)	1	58	0.0900	20.0	0.0360	0.1440	79	3
	2	58	0.0606	27.6	0.0104	0.1109	79	1
	3	58	0.1736	22.1	0.0585	0.2887	79	3
	4	58	0.0806	23.5	0.0237	0.1376	79	5
Asbestos/fibers (chrysotile) (f/mm^2)	1	58	223	27.7	76	448	1027	91
	2	58	349	28.5	114	711	1027	78
	3	58	214	30.9	62	457	1027	61
	4	58	89	34.2	21	204	1027	31
Chloroform (mg)	1	57	0.1775	8.4	0.1327	0.2222	312	26
	2	57	0.3284	6.1	0.2687	0.3880	312	23
	3	57	0.7593	4.0	0.6688	0.8498	312	26
	4	57	0.5826	5.4	0.4873	0.6778	312	24
1,2-Dichloroethane (mg)	1	57	0.8476	3.8	0.7511	0.9441	313	37
	2	57	0.2607	6.7	0.2082	0.3133	313	15
	3	57	0.5461	4.3	0.4755	0.6167	313	30
	4	57	0.7685	4.5	0.6655	0.8716	313	27
Tetrachloroethylene (mg)	1	57	0.2548	5.4	0.2135	0.2961	312	30
	2	57	0.7035	4.1	0.6173	0.7898	312	24
	3	57	0.3229	4.5	0.2795	0.3663	312	33
	4	57	0.4706	4.3	0.4103	0.5308	312	29

TABLE 3. PAT Proficiency Ratings Based Upon Rounds 124 to 127 (January 1996–December 1996)

Contaminant	No. of Labs Rated	No. of Labs Rated Proficient	Percent of Labs Rated Proficient
Metals	356	327	91.8
Silica	79	78	98.7
Asbestos/fibers	1027	976	95
Organic solvents	311	288	92.6

Reference

1. Esche, C.A.; Groff, J.H.; Schlecht, P.C.; Shulman, S.A.: Laboratory Evaluations and Performance Reports for the Proficiency Analytical Testing (PAT) and Environmental Lead Proficiency Analytical Testing (ELPAT) Programs. DHHS (NIOSH) Pub. No. 95-104. National Institute for Occupational Safety and Health, Cincinnati, OH (1994).