Proficiency Analytical Testing (PAT) Program August 1999

H. Amy Feng and Paul Schlecht

Ms. Feng and Mr. Schlecht are with the Department of Health and Human Services, U.S. Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Physical Sciences and Engineering, Analytical Research and Development Branch. They can be reached at HHS/PHS/CDC/NIOSH, Robert A. Taft Laboratories, 4676 Columbia Parkway (MS/R8), Cincinnati, OH 45226; (513) 841-4128.

ROUND 138 JULY 1999

A total of 1134 laboratories were enrolled in the PAT Program with 1014 laboratories submitting results on Round 138. Of the 1014 laboratories submitting results, 865 used the Internet data entry system (www.aiha.org/proftest.htm). Table I lists the reference values, performance limits, and participants for each sample type in the PAT Program. Table II presents the summary of the PAT proficiency ratings for each analytical area.

ROUND 139 OCTOBER 1999

PAT Round 139 was sent to participating laboratories on October 1, 1999. For this round, the organic solvents were ethyl acetate, n-butyle acetate, and 2-propanol, and the metals were cadmium, lead, and zinc. Asbestos/fibers were chrysotile with one man-made fiber sample.

BACKGROUND

The Proficiency Analytical Testing (PAT) Program is managed by AIHA in Fairfax, Virginia. The PAT Program provides quality control reference samples to approximately 1200 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 to correct analytical problems before the next calendar quarter begins. The PAT Program currently includes four sets of

TABLE I. Reference Values, Performance Limits, and Participants for Each Sample Type PAT Round 138 (April 1999)

Contaminant	Sample Number	No. of Labs	Reference Value	RSD (%)	Performance Limits		No. of Outliers
					Lower	Upper	
Cadmium (mg)	1	282	0.0173	4.1	0.0152	0.0194	21
	2	282	0.0187	4.5	0.0075	0.0098	15
	3	282	0.0048	5.0	0.0041	0.0056	25
	4	282	0.0116	4.3	0.0102	0.0131	23
Chromium (mg)	1	280	0.1001	5.7	0.0830	0.1172	19
	2	280	0.2075	6.0	0.1704	0.2446	26
	3	280	0.1789	5.9	0.1473	0.2105	19
	4	280	0.0754	5.6	0.0626	0.0881	30
Lead (mg)	1	285	0.0487	4.3	0.0424	0.0550	15
	2	285	0.0781	4.0	0.0687	0.0874	18
	3	285	0.0245	5.1	0.0208	0.0282	17
	4	285	0.0589	4.2	0.0515	0.0662	17
Silica (mg)	1	78	0.0601	19.0	0.0258	0.0943	6
	2	78	0.0860	17.2	0.0417	0.1303	4
	3	78	0.1147	16.0	0.0596	0.1699	6
	4	78	0.1038	16.4	0.0528	0.1549	10
Asbestos/fibers (amosite) (f/mm²) (man-made fiber)	1	867	171.6	19.6	85.6	287.2	65
	2	867	347.5	16.7	195.6	542.9	62
	3	867	517.6	15.6	303.6	788.3	61
	4	867	422.4	16.1	243.0	651.1	63
Methanol (mg)	1	258	0.8862	6.1	0.7244	1.0481	27
	2	258	0.1456	8.2	0.1097	0.1815	23
	3	258	0.4443	6.6	0.3569	0.5317	24
	4	258	0.6402	6.3	0.5197	0.7608	29

TABLE II. PAT Proficiency Ratings Based on Rounds 135 to 138 (September 1998–October 1999)

Contaminant	Number of Labs Rated	Number of Labs Rated Proficient	Percent Labs Rated Proficient
Metals	280	264	94
Silica	78	73	94
Asbestos/fibers	867	777	90
Organic solvents	258	238	92

samples as shown in Table III. A mixture of 3 of the 4 possible metals, and 1 to 3 of the 15 possible organic solvents are 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, carbon molecular sieve, or silica gel tubes. The organic solvent set also includes five blank tubes for desorption efficiency determination. Every other round includes two diffusive samplers with benzene, o-xylene, and toluene.

Laboratories are evaluated for each analysis by comparing their reported results against an acceptable performance limit for each PAT Program sample the laboratory analyzes. After the data from all laboratories are collected and statistically treated, the mean of the collected data is calculated and the performance limits equal the mean ±3 standard deviations.

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

Metals	cadmium	
	chromium	
	lead	
	zinc	
Silica	quartz	
Asbestos/fibers	amosite	
	chrysotile	
	man-made fibers	
Organic solvents	benzene	methyl isobutyl ketone
	n-butyl acetate	2-propanol
	chloroform	tetrachloroethylene
	1,2-dichloroethane	toluene
	ethyl acetate	1,1,1-trichloroethane
	isopropanol	trichloroethylene
	methanol	o-xylene
	methyl ethyl ketone	

The performance limits for all analytes (metals, silica, asbestos, and organic solvents) are calculated using a maximum relative standard deviation of 20% and a minimum relative standard deviation of 4%. For diffusive samplers, performance limits are based on the reference values ±3 standard deviations, and the relative standard deviation is assumed to be 6%. The reference value is the calculated value from the generation system. 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, organic solvents and diffusive samplers. 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 (two rounds per diffusive samplers) consecutive rounds are classified as acceptable.[1]

References

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