

December 11, 1997

Participant

Centers for Disease Control and Prevention (CDC)

Susceptibility Testing of *Mycobacterium tuberculosis* Performance Evaluation Program

Subject: Analyses of Participant Laboratory Results for the June 1997 Shipment and  
Announcement of Changes in the Performance Evaluation Program

Dear Participant:

Enclosed are analyses of laboratory test results reported to the Centers for Disease Control and Prevention (CDC) by participant laboratories for the drug-resistant strains of *Mycobacterium tuberculosis* shipped in June 1997. Participant laboratories received five individual strains. Testing results were received and analyzed from 149 of 158 (94.3%) of laboratories participating in this shipment.

The enclosed aggregate report is prepared in a format that will allow laboratories to compare their results with results obtained by other participants for the same strain using the same method, drug, and concentration. The first three pages contain descriptive information about the participant laboratories. We encourage you to circulate this report to all personnel who are involved with drug susceptibility testing, reporting, or interpretation for *M. tuberculosis*.

CDC is separately notifying participants of several changes in this program. We will be reducing the number of *M. tuberculosis* strains for each panel shipment while also including additional strains of non-tuberculous mycobacteria (NTM). Laboratories that only perform testing for *M. tuberculosis* will continue to receive 3 *M. tuberculosis* strains twice a year. Laboratories that perform susceptibility testing for NTM strains and want to evaluate test performance will receive 2 NTM strains in addition to 3 *M. tuberculosis* strains.

If you have any comment or suggestions on the results in this report or have questions regarding the changes in this program, you may call me at (770) 488-4674.

Sincerely yours,

John C. Ridderhof, Dr.P.H.  
Science Administrator  
Division of Laboratory Systems  
Public Health Practice Program Office

Enclosures

## **Analyses of the June 1997 Performance Evaluation Results for *M. tuberculosis* Drug Susceptibility Testing Reported to the Centers for Disease Control and Prevention by Participating Laboratories**

This report is an analysis of laboratory test results reported to the Centers for Disease Control and Prevention (CDC) by participant laboratories for the strains of *M. tuberculosis* shipped in June 1997. Participant laboratories received five individual strains. Testing results were received and analyzed from 149 of 158 (94.3%) participating laboratories in this shipment (data from one result form could not be analyzed).

Figure 1 shows the laboratory classification reported by 147 of the participants. Participants consisted of 71 health departments, 61 hospitals, 13 independents, and 2 “other” type of laboratories.

Figure 2 provides the distribution of the annual volume of *M. tuberculosis* isolates tested for drug susceptibilities by participating laboratories in calendar year 1996.

Figure 3 lists the biosafety levels reported by participant laboratories. All laboratories are strongly encouraged to consult the CDC/NIH manual, Biosafety in Microbiological and Biomedical Laboratories (3rd edition) for recommendations and to determine their correct biosafety level.

Figure 4 provides a breakdown of the test procedures used by the participating laboratories. Participants were asked to check all of the test methods used. Participants also provided the number of days that were required to obtain all the susceptibility results: for participants using the BACTEC method, this equaled a mean of 18.3 days (median of 14.5 days) with a range of 5 to 68 days; for participants using conventional methods, this equaled a mean of 23.7 days (median of 21 days) with a range of 7 to 42 days.

The aggregate test results are provided in separate tables, representing cultures P, Q, R, S, and T, to facilitate comparison among laboratories. The tables are constructed to include the results for both the radiometric (BACTEC) and conventional (agar) methods at each concentration of drug. The test results are listed in the appropriate (susceptible or resistant) columns with a corresponding total number of tests (Sum) column provided as a denominator for determining the level of consensus.

The concentrations recommended by CDC and the NCCLS (tentative standard) for the primary (isoniazid, rifampin, pyrazinamide, ethambutol, and streptomycin) and secondary (ethionamide, kanamycin, capreomycin, cycloserine, p-amino-salicylic acid) antituberculosis drugs are highlighted for the conventional and radiometric method. Participants should note that these recommended combinations reflect the critical concentrations of antituberculosis drugs in 7H10 agar and those concentrations for the BACTEC method that directly correlate with the critical concentrations in the conventional method (1-7). When two concentrations are highlighted, such

as for isoniazid, ethambutol and streptomycin, the lower concentration is the critical concentration that should always be included to determine whether the *M. tuberculosis* isolate is resistant.

The intent of this performance evaluation program is to provide feedback to the individual participants about consensus with other laboratories using identical methods. This report contains all results reported by participating laboratories, including many drug concentrations with only one result. In many instances these isolated non-standard concentrations may represent attempts to determine the minimal inhibitory concentrations (MICs) for each drug and strain of *M. tuberculosis*.

Both P and Q are strains of *M. tuberculosis* that were obtained from the World Health Organization and International Union against Tuberculosis and Lung Disease (WHO/IUATLD) quality assurance programme for drug susceptibility testing. The WHO/IUATLD have a program very similar to the CDC performance evaluation program, and we are sharing strains to assess the comparability of susceptibility testing result received from laboratories in different countries and with different test methods. For strain P there was 100% agreement between 149 CDC and 19 WHO/IUATLD participants on detecting isoniazid resistance and rifampin resistance. Isoniazid and rifampin resistance for the CDC participants was determined at the critical concentrations of drug for both the conventional and BACTEC methods. An additional 5/19 (26%) of the WHO/IUATLD participants detected streptomycin resistance for strain P.

For strain Q there was also 100% agreement between 149 CDC and 19 WHO/IUATLD participants on detection of Isoniazid resistance. All 100% (19/19) WHO/IUATLD participants detected streptomycin resistance in strain Q. Among CDC participants, 91% (45/49) detected streptomycin resistance at the critical concentration (2  $\mu\text{g/ml}$ ) in the conventional method, and 84% (95/112) detected streptomycin resistance at the equivalent concentration (2  $\mu\text{g/ml}$ ) with the BACTEC method.

Rifampin resistance was reported by 90.6% (48/53) participants for Strain T at the critical concentration (1  $\mu\text{g/ml}$ ) in the conventional method, and by 62.2% (74/119) participants at the equivalent concentration (2  $\mu\text{g/ml}$ ) with the BACTEC method. A total of 10 rifampin resistant strains, including strain T, have been sent out in this CDC program. For the 9 strains other than strain T, the participant consensus in detecting resistance has been  $\geq 98\%$  for both the conventional and BACTEC methods.

The provision of test results for all drugs that are reported to CDC should not be construed as a recommendation or endorsement for testing particular drugs or concentrations with patient isolates of *M. tuberculosis*. It is assumed that some of the drugs are being tested for the purpose of research or for potential use in the few referral institutions that may treat patients with *M. tuberculosis* isolates resistant to almost all standard drugs. Laboratories should not add drugs to their testing regimen without the consultation of physicians with expertise in the treatment of multi-drug resistant tuberculosis. Laboratories may contact their local TB control program for referrals of physicians with experience and expertise in treating multi-drug resistant tuberculosis.

## REFERENCES

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7. **NCCLS.** Antimycobacterial Susceptibility Testing for *Mycobacterium tuberculosis*; Tentative standard. NCCLS document M24-T, December, 1995
8. **Laszlo, A., Rahman, M. Raviglione, M., Bustreo, F., WHO/IUATLD Network of Supranational Reference Laboratories.** 1997. Quality assurance programme for drug susceptibility testing of *Mycobacterium tuberculosis* in the WHO/IUATLD Supranational Laboratory Network: first round of proficiency testing. Int.J. Tuberc. Lung Dis. 1 (3):231-238

Figure 1. Primary Classification of Participating Laboratories

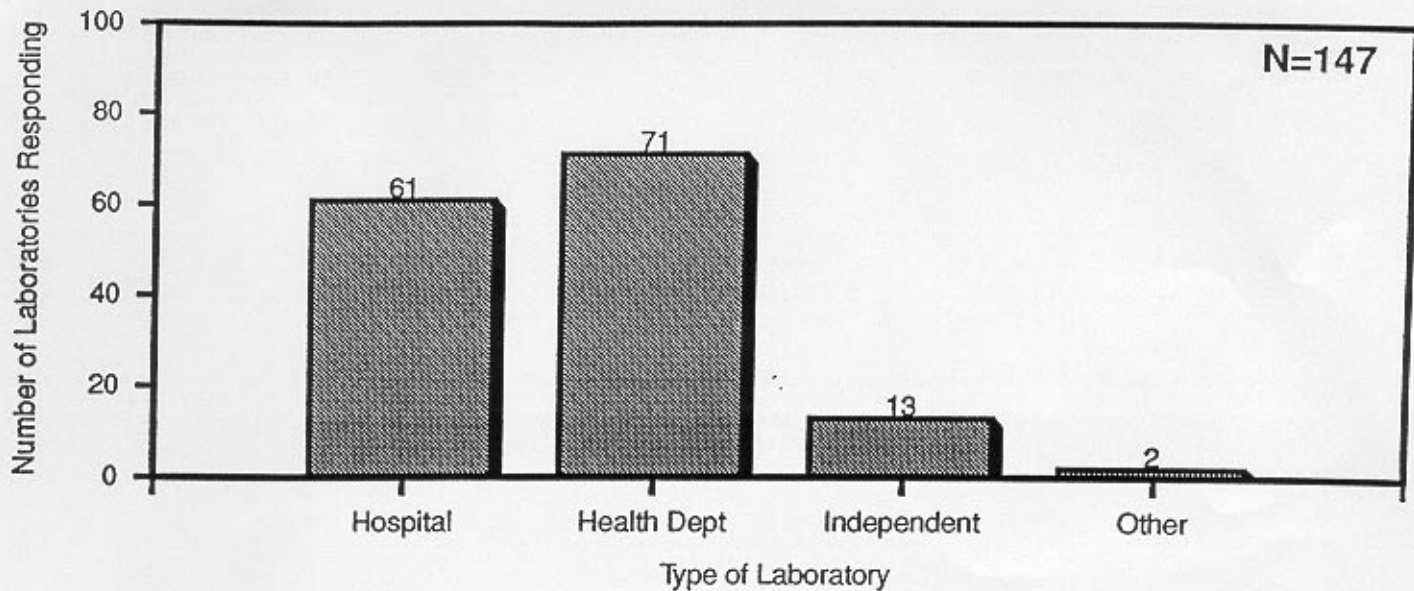
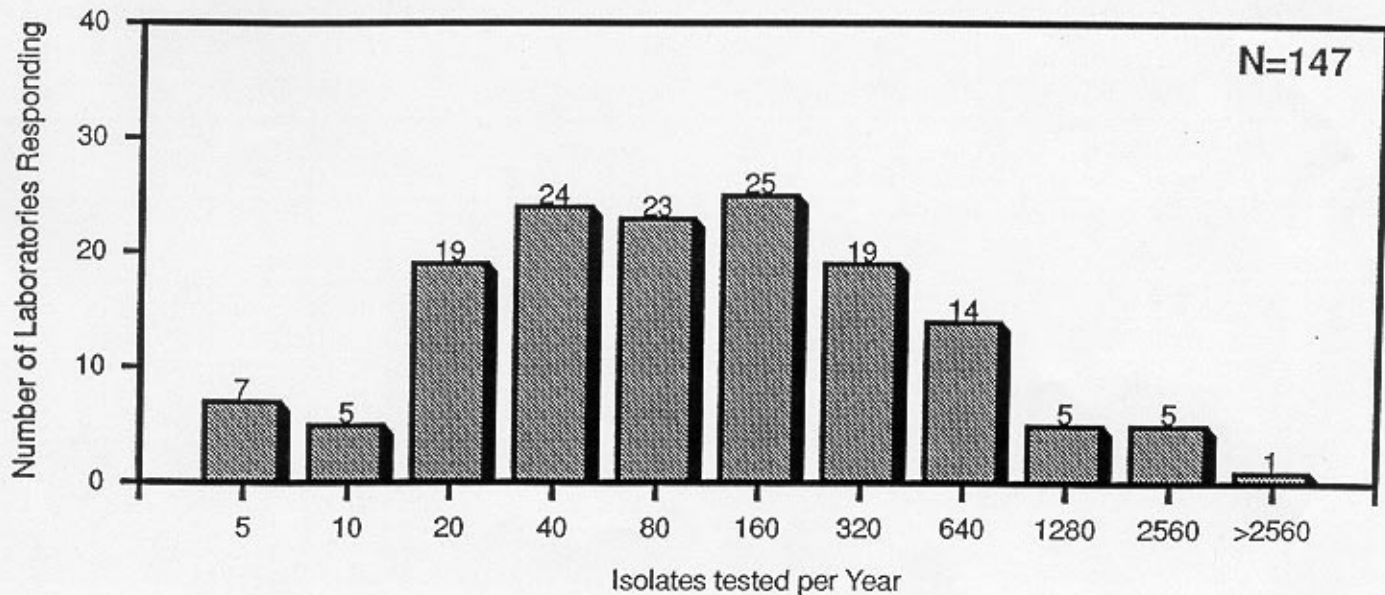
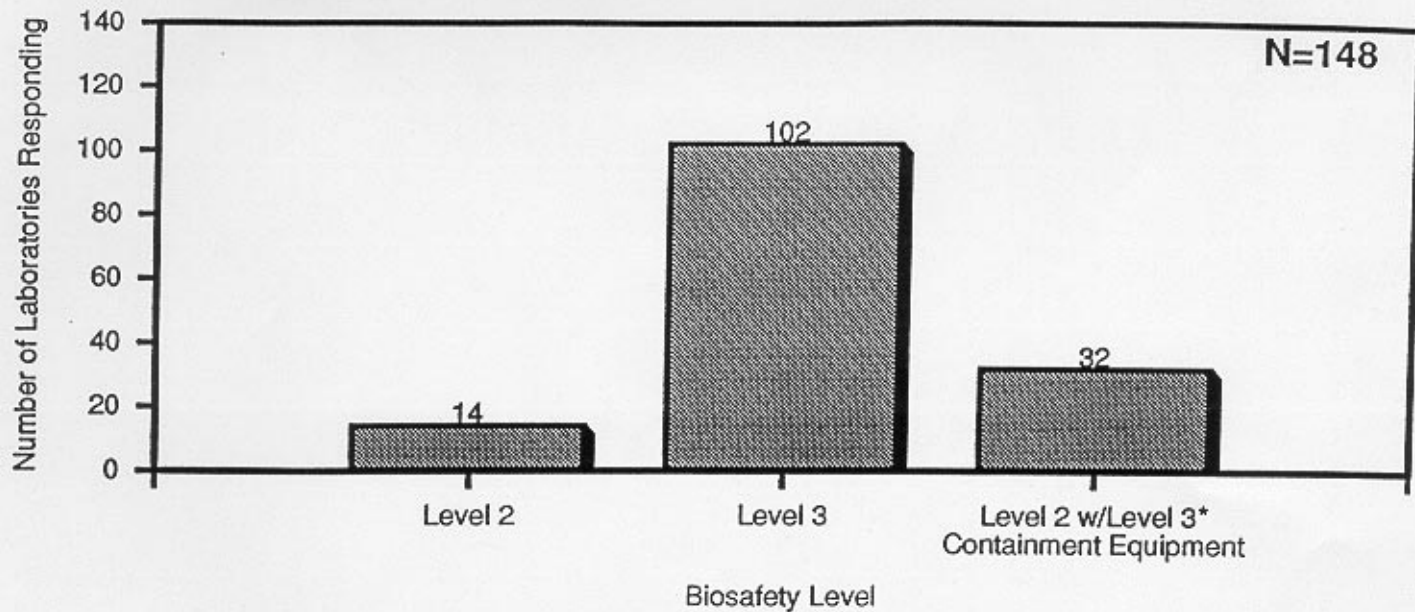


Figure 2. 1996 Annual Volume of M.tb Isolates for Participating Laboratories



Group labels indicate upper limit of the group

**Figure 3. Biosafety Levels of Participating Laboratories**



\* Biosafety level 2 for facilities with level 3 containment equipment

**Figure 4. Participant Laboratory Test Procedures**

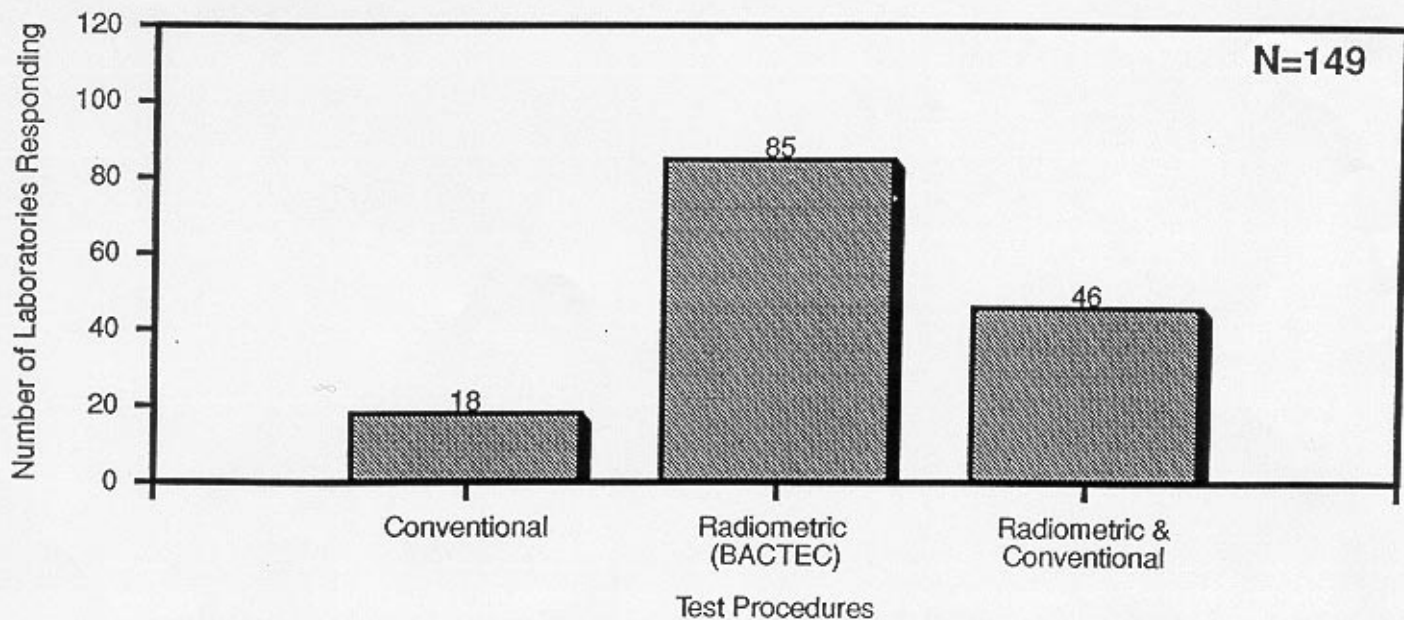


Table - Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1997 shipment

Culture P		Test Method							Test Method						
		Conventional			BACTEC				Conventional			BACTEC			
		Result			Result				Result			Result			
		Drug	Conc.	S	R	Sum	S	R	Sum	Drug	Conc.	S	R	Sum	S
Isoniazid	0.01				1	1		Capreomycin	1.25				1		1
Isoniazid	0.04				1	1		Capreomycin	2.50				3		3
Isoniazid	0.10		1	1	112	112		Capreomycin	5.00	1		1	6		6
Isoniazid	0.12		1	1				Capreomycin	10.00	20		20			
Isoniazid	0.20		51	51	9	9		Cycloserine	10.00	1		1			
Isoniazid	0.25		1	1				Cycloserine	20.00	2		2			
Isoniazid	0.40				1	23	24	Cycloserine	25.00	2		2			
Isoniazid	0.50		1	1				Cycloserine	30.00	16		16			
Isoniazid	1.00		48	48	10	10		Cycloserine	50.00	1		1	1	1	1
Isoniazid	1.10		1	1				Cycloserine	60.00	1		1	1	1	1
Isoniazid	2.00		1	1	1	1	2	p-Amino-salicy	2.00	20		20			
Isoniazid	5.00	4		4	2		2	p-Amino-salicy	4.00				1	1	2
Isoniazid	6.10				1	1		p-Amino-salicy	8.00	3		3	1		1
Rifampin	0.50		1	1				p-Amino-salicy	10.00	8		8			
Rifampin	1.00		54	54	11	11		Amikacin	0.30		1	1			
Rifampin	1.20		1	1				Amikacin	0.60	1		1			
Rifampin	2.00				1	121	122	Amikacin	1.00	1		1			
Rifampin	5.00		12	12	2	2		Amikacin	1.20	1		1			
Rifampin	6.00		1	1				Amikacin	2.00	1		1			
Rifampin	10.00				1	1		Amikacin	2.50	1		1	1	1	1
Pyrazinamide	2.50				1		1	Amikacin	4.00	4		4	1		1
Pyrazinamide	25.00	1		1	1		1	Amikacin	5.00	2		2	1		1
Pyrazinamide	100.0				95	1	96	Amikacin	6.00	6		6			
Pyrazinamide	125.0				1		1	Amikacin	8.00	1		1			
Pyrazinamide	300.0				1		1	Amikacin	10.00	1		1			
Pyrazinamide	900.0				1		1	Amikacin	12.00	2		2			
Ethambutol	2.00	1		1				Amikacin	18.00	1		1			
Ethambutol	2.50	1		1	109		109	Amikacin	20.00	1		1			
Ethambutol	3.75				1		1	Amikacin	30.00	1		1			
Ethambutol	4.00				1		1	Amikacin	48.80	1		1			
Ethambutol	5.00	45		45	10		10	Ciprofloxacin	0.60	1		1			
Ethambutol	7.50	6		6	19		19	Ciprofloxacin	1.00	5		5	2		2
Ethambutol	10.00	21		21				Ciprofloxacin	2.00	15		15	1		1
Ethambutol	12.50				1		1	Ciprofloxacin	2.50				1		1
Streptomycin	2.00	48		48	113		113	Ciprofloxacin	4.00	1		1	1		1
Streptomycin	2.50	1		1	1		1	Ofloxacin	1.00	6		6	1		1
Streptomycin	4.00				2		2	Ofloxacin	1.25	1		1	1		1
Streptomycin	5.00	1		1				Ofloxacin	2.00	4		4	5		5
Streptomycin	6.00				25		25	Ofloxacin	4.00	2		2	1		1
Streptomycin	10.00	37		37				Rifabutin	0.25		1	1			
Ethionamide	1.00	1		1				Rifabutin	0.50		3	3			
Ethionamide	2.00	1		1				Rifabutin	1.00		3	3	3		3
Ethionamide	2.50				2		2	Rifabutin	2.00	1	5	6			
Ethionamide	5.00	35		35	6		6	Clofazamine	0.25				1		1
Ethionamide	10.00	5		5				Clofazamine	1.00	2		2			
Kanamycin	2.50				1		1								
Kanamycin	5.00	14		14	3		3								
Kanamycin	6.00	21		21											

Footnote: Those concentrations that are recommended by CDC for the primary and secondary antituberculosis drugs are highlighted for the conventional and radiometric methods.

Table - Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1997 shipment

Culture Q		Test Method						Test Method							
		Conventional			BACTEC			Conventional			BACTEC				
		Result			Result			Result			Result				
		Drug	Conc.	S	R	Sum	S	R	Sum	Drug	Conc.	S	R	Sum	S
Isoniazid	0.01				1	1		Capreomycin	1.25				1		1
Isoniazid	0.04				1	1		Capreomycin	2.50				2		2
Isoniazid	0.10		1	1	112	112		Capreomycin	5.00	1			6		6
Isoniazid	0.12		1	1				Capreomycin	10.00	22			22		
Isoniazid	0.20		52	52	9	9		Cycloserine	10.00		1	1			
Isoniazid	0.25		1	1				Cycloserine	20.00	1	1	2			
Isoniazid	0.40				1	23	24	Cycloserine	25.00	2		2			
Isoniazid	0.50		1	1				Cycloserine	30.00	17	1	18			
Isoniazid	1.00		48	48	10	10		Cycloserine	50.00	1		1	1	1	1
Isoniazid	1.10		1	1				Cycloserine	60.00	1		1			
Isoniazid	2.00		1	1	1	1	2	p-Amino-salicy	2.00	21		21			
Isoniazid	5.00	2	3	5	2		2	p-Amino-salicy	4.00				1	1	2
Isoniazid	6.10				1	1		p-Amino-salicy	8.00	3		3			
Rifampin	0.50	1		1				p-Amino-salicy	10.00	8		8			
Rifampin	1.00	54		54	11		11	Amikacin	0.30		1	1			
Rifampin	1.20	1		1				Amikacin	0.60	1		1			
Rifampin	2.00				120	120		Amikacin	1.00	1		1			
Rifampin	5.00	11		11				Amikacin	1.20	1		1			
Rifampin	6.00	1		1				Amikacin	2.00	1		1			
Pyrazinamide	2.50				1	1		Amikacin	2.50	1		1	1	1	1
Pyrazinamide	25.00	1		1	1	1		Amikacin	4.00	4		4	1	1	1
Pyrazinamide	100.0				93	4	97	Amikacin	5.00	2		2	1	1	1
Pyrazinamide	125.0				1	1		Amikacin	6.00	7		7			
Pyrazinamide	300.0				1	1		Amikacin	8.00	1		1			
Pyrazinamide	900.0				1	1		Amikacin	10.00	1		1			
Ethambutol	2.00	1		1				Amikacin	12.00	2		2			
Ethambutol	2.50	1		1	107	1	108	Amikacin	18.00	1		1			
Ethambutol	3.75				1	1		Amikacin	20.00	1		1			
Ethambutol	4.00				1	1		Amikacin	30.00	1		1			
Ethambutol	5.00	46		46	10	10		Amikacin	48.80	1		1			
Ethambutol	7.50	5	1	6	19	19		Ciprofloxacin	0.60	1		1			
Ethambutol	10.00	21		21				Ciprofloxacin	1.00	5		5	2	2	2
Ethambutol	12.50				1	1		Ciprofloxacin	2.00	16		16	1	1	1
Streptomycin	2.00	4	45	49	17	95	112	Ciprofloxacin	4.00	1		1	1	1	1
Streptomycin	2.50		1	1		1	1	Ofloxacin	1.00	6		6	1	1	1
Streptomycin	4.00				1	1	2	Ofloxacin	1.25	1		1	1	1	1
Streptomycin	5.00		1	1				Ofloxacin	2.00	4		4	5	5	5
Streptomycin	6.00				17	8	25	Ofloxacin	4.00	2		2	1	1	1
Streptomycin	10.00	36	2	38	1	1		Rifabutin	0.25	1		1			
Ethionamide	1.00		1	1				Rifabutin	0.50	3		3			
Ethionamide	1.25				1	1		Rifabutin	1.00	3		3	3	3	3
Ethionamide	2.00	1		1				Rifabutin	2.00	6		6			
Ethionamide	2.50				1	1		Clofazamine	0.25				1	1	1
Ethionamide	5.00	37		37	6	6		Clofazamine	1.00	2		2			
Ethionamide	10.00	5		5											
Kanamycin	2.50				1	1									
Kanamycin	5.00	16		16	3	3									
Kanamycin	6.00	21		21											

Footnote: Those concentrations that are recommended by CDC for the primary and secondary antituberculosis drugs are highlighted for the conventional and radiometric methods.



Table - Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1997 shipment

Culture R		Test Method						Test Method							
		Conventional			BACTEC			Conventional			BACTEC				
		Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result			
Drug	Conc.	S	R	Sum	S	R	Sum	Drug	Conc.	S	R	Sum	S	R	Sum
Isoniazid	0.01				1		1	Kanamycin	5.00	14		14	3		3
Isoniazid	0.04				1		1	Kanamycin	6.00	19		19			
Isoniazid	0.10	1		1	113		113	Capreomycin	2.50				1		1
Isoniazid	0.12	1		1				Capreomycin	5.00	1		1	6		6
Isoniazid	0.20	48		48	8		8	Capreomycin	10.00	19		19			
Isoniazid	0.25	1		1				Cycloserine	10.00	1		1			
Isoniazid	0.40				24		24	Cycloserine	20.00	1		1			
Isoniazid	0.50	1		1				Cycloserine	25.00	2		2			
Isoniazid	1.00	45		45	9		9	Cycloserine	30.00	14		14			
Isoniazid	1.10	1		1				Cycloserine	50.00	1		1		1	1
Isoniazid	2.00	1		1				Cycloserine	60.00	1		1			
Isoniazid	5.00	4		4				p-Amino-salicy	2.00	19		19			
Isoniazid	6.10				1		1	p-Amino-salicy	4.00				1	1	2
Rifampin	0.50	1		1				p-Amino-salicy	8.00	3		3			
Rifampin	1.00	51		51	11		11	p-Amino-salicy	10.00	7		7			
Rifampin	1.20	1		1				Amikacin	0.30		1	1			
Rifampin	2.00				120		120	Amikacin	0.60	1		1			
Rifampin	5.00	11		11				Amikacin	1.00	1		1			
Rifampin	6.00	1		1				Amikacin	1.20	1		1			
Pyrazinamide	2.50				1		1	Amikacin	2.00	1		1			
Pyrazinamide	25.00	1		1		1	1	Amikacin	2.50	1		1	1		1
Pyrazinamide	100.0				95	2	97	Amikacin	4.00	3		3	1		1
Pyrazinamide	125.0				1		1	Amikacin	5.00	2		2	1		1
Pyrazinamide	300.0				1		1	Amikacin	6.00	6		6			
Pyrazinamide	900.0				1		1	Amikacin	10.00	1		1			
Ethambutol	2.00	1		1				Amikacin	12.00	2		2			
Ethambutol	2.50	1		1	109		109	Amikacin	18.00	1		1			
Ethambutol	3.75				1		1	Amikacin	20.00	1		1			
Ethambutol	4.00				1		1	Amikacin	30.00	1		1			
Ethambutol	5.00	44		44	10		10	Amikacin	48.80	1		1			
Ethambutol	7.50	5		5	20		20	Ciprofloxacin	0.60	1		1			
Ethambutol	10.00	20		20				Ciprofloxacin	1.00	5		5	2		2
Ethambutol	12.50				1		1	Ciprofloxacin	2.00	13		13	1		1
Streptomycin	2.00	46		46	113		113	Ciprofloxacin	4.00	1		1	1		1
Streptomycin	2.50	1		1	1		1	Ofloxacin	1.00	6		6	1		1
Streptomycin	4.00				1		1	Ofloxacin	1.25	1		1			
Streptomycin	5.00	1		1				Ofloxacin	2.00	3		3	4		4
Streptomycin	6.00				25		25	Ofloxacin	4.00	2		2	1		1
Streptomycin	10.00	35		35				Rifabutin	0.25	1		1			
Ethionamide	1.00		1	1				Rifabutin	0.50	3		3			
Ethionamide	2.00	1		1				Rifabutin	1.00	3		3	3		3
Ethionamide	2.50				1		1	Rifabutin	2.00	6		6			
Ethionamide	5.00	32		32	6		6	Clofazamine	0.25				1		1
Ethionamide	10.00	4		4				Clofazamine	1.00	2		2			

Footnote: Those concentrations that are recommended by CDC for the primary and secondary antituberculosis drugs are highlighted for the conventional and radiometric methods.

Table - Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1997 shipment

Culture S		Test Method						Test Method								
		Conventional			BACTEC			Conventional			BACTEC					
		Result			Result			Result			Result					
		Drug	Conc.	S	R	Sum	S	R	Sum	Drug	Conc.	S	R	Sum	S	R
Isoniazid	0.01				1		1	Kanamycin	5.00	16			16	3		3
Isoniazid	0.04				1		1	Kanamycin	6.00	21			21			
Isoniazid	0.10	1		1	112		112	Capreomycin	1.25					1		1
Isoniazid	0.12	1		1				Capreomycin	2.50					1		1
Isoniazid	0.20	51		51	8		8	Capreomycin	5.00	1		1	6		6	
Isoniazid	0.25	1		1				Capreomycin	10.00	22			22			
Isoniazid	0.40				24		24	Cycloserine	10.00		1	1				
Isoniazid	0.50	1		1				Cycloserine	20.00	2		2				
Isoniazid	1.00	47		47	9		9	Cycloserine	25.00	2		2				
Isoniazid	1.10	1		1				Cycloserine	30.00	15	1	16				
Isoniazid	2.00	1		1				Cycloserine	50.00	1		1		1	1	
Isoniazid	5.00	5		5				Cycloserine	60.00	1		1				
Isoniazid	6.10				1		1	p-Amino-salicy	2.00	20			20			
Rifampin	0.50		1	1				p-Amino-salicy	4.00					2		2
Rifampin	1.00		55	55		11	11	p-Amino-salicy	8.00	3		3				
Rifampin	1.20		1	1				p-Amino-salicy	10.00	7		7				
Rifampin	2.00					121	121	Amikacin	0.30		1	1				
Rifampin	5.00	1	11	12		2	2	Amikacin	0.60	1		1				
Rifampin	6.00		1	1				Amikacin	1.00	1		1				
Rifampin	10.00					1	1	Amikacin	1.20	1		1				
Pyrazinamide	2.50				1		1	Amikacin	2.00	1		1				
Pyrazinamide	25.00	1		1	1		1	Amikacin	2.50	1		1	1		1	
Pyrazinamide	100.0				96		96	Amikacin	4.00	4		4	1		1	
Pyrazinamide	125.0				1		1	Amikacin	5.00	2		2	1		1	
Pyrazinamide	300.0				1		1	Amikacin	6.00	7		7				
Pyrazinamide	900.0				1		1	Amikacin	8.00	1		1				
Ethambutol	2.00	1		1				Amikacin	10.00	1		1				
Ethambutol	2.50	1		1	109		109	Amikacin	12.00	2		2				
Ethambutol	3.75				1		1	Amikacin	18.00	1		1				
Ethambutol	4.00				1		1	Amikacin	20.00	1		1				
Ethambutol	5.00	46		46	10		10	Amikacin	30.00	1		1				
Ethambutol	7.50	6		6	20		20	Amikacin	48.80	1		1				
Ethambutol	10.00	21		21				Ciprofloxacin	0.60	1		1				
Ethambutol	12.50				1		1	Ciprofloxacin	1.00	5		5	2		2	
Streptomycin	2.00	49		49	113		113	Ciprofloxacin	2.00	16		16	1		1	
Streptomycin	2.50	1		1	1		1	Ciprofloxacin	4.00	1		1	1		1	
Streptomycin	4.00				1		1	Ofloxacin	1.00	6		6	1		1	
Streptomycin	5.00	1		1				Ofloxacin	1.25	1		1				
Streptomycin	6.00				25		25	Ofloxacin	2.00	4		4	5		5	
Streptomycin	10.00	37		37				Ofloxacin	4.00	2		2	1		1	
Ethionamide	1.00	1		1				Rifabutin	0.25		1	1				
Ethionamide	1.25				1		1	Rifabutin	0.50		3	3				
Ethionamide	2.00	1		1				Rifabutin	1.00	1	2	3		3	3	
Ethionamide	2.50				1		1	Rifabutin	2.00	1	5	6				
Ethionamide	5.00	36		36	6		6	Clofazamine	0.25				1		1	
Ethionamide	10.00	5		5				Clofazamine	1.00	2		2				

Footnote: Those concentrations that are recommended by CDC for the primary and secondary antituberculosis drugs are highlighted for the conventional and radiometric methods.

Table - Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1997 shipment

Culture T		Test Method						Test Method							
		Conventional			BACTEC			Conventional			BACTEC				
		Result			Result			Result			Result				
Drug	Conc.	S	R	Sum	S	R	Sum	Drug	Conc.	S	R	Sum	S	R	Sum
Isoniazid	0.01				1	1		Capreomycin	1.25				1	1	
Isoniazid	0.04				1	1		Capreomycin	2.50				3	3	
Isoniazid	0.10		1	1	112	112		Capreomycin	5.00	1		1	6	6	
Isoniazid	0.12		1	1				Capreomycin	10.00	21		21			
Isoniazid	0.20		51	51		9	9	Cycloserine	10.00		1	1			
Isoniazid	0.25		1	1				Cycloserine	20.00	2		2			
Isoniazid	0.40				24	24		Cycloserine	25.00	2		2			
Isoniazid	0.50		1	1				Cycloserine	30.00	17		17			
Isoniazid	1.00		48	48		10	10	Cycloserine	50.00	1		1	1	1	1
Isoniazid	1.10		1	1				Cycloserine	60.00	1		1	1	1	1
Isoniazid	2.00		1	1		2	2	p-Amino-salicy	2.00	21		21			
Isoniazid	5.00		5	5		2	2	p-Amino-salicy	4.00				1	1	2
Isoniazid	6.10					1	1	p-Amino-salicy	8.00	3		3	1	1	1
Rifampin	0.50		1	1				p-Amino-salicy	10.00	8		8			
Rifampin	1.00	5	48	53	3	8	11	Amikacin	0.30		1	1			
Rifampin	1.20	1		1				Amikacin	0.60	1		1			
Rifampin	2.00				45	74	119	Amikacin	1.00	1		1			
Rifampin	5.00	3	9	12		2	2	Amikacin	1.20	1		1			
Rifampin	6.00	1		1				Amikacin	2.00	1		1			
Rifampin	10.00					1	1	Amikacin	2.50	1		1	1	1	1
Pyrazinamide	2.50				1		1	Amikacin	4.00	4		4	1	1	1
Pyrazinamide	25.00	1		1	1		1	Amikacin	5.00	2		2	1		1
Pyrazinamide	100.0				95	1	96	Amikacin	6.00	6		6			
Pyrazinamide	125.0				1		1	Amikacin	8.00	1		1			
Pyrazinamide	300.0				1		1	Amikacin	10.00	1		1			
Pyrazinamide	900.0				1		1	Amikacin	12.00	2		2			
Ethambutol	2.00	1		1				Amikacin	18.00	1		1			
Ethambutol	2.50	1		1	109		109	Amikacin	20.00	1		1			
Ethambutol	3.75				1		1	Amikacin	30.00	1		1			
Ethambutol	4.00				1		1	Amikacin	48.80	1		1			
Ethambutol	5.00	45		45	10		10	Ciprofloxacin	0.60		1	1			
Ethambutol	7.50	5		5	20		20	Ciprofloxacin	1.00	5		5	2		2
Ethambutol	10.00	21		21				Ciprofloxacin	2.00	15		15	1		1
Ethambutol	12.50				1		1	Ciprofloxacin	2.50				1		1
Streptomycin	2.00	47		47	113		113	Ciprofloxacin	4.00	1		1	1		1
Streptomycin	2.50	1		1	1		1	Ofloxacin	1.00	6		6	1		1
Streptomycin	4.00				1		1	Ofloxacin	1.25	1		1	1		1
Streptomycin	5.00	1		1				Ofloxacin	2.00	4		4	5		5
Streptomycin	6.00				25		25	Ofloxacin	4.00	2		2	1		1
Streptomycin	10.00	37		37				Rifabutin	0.25		1	1			
Ethionamide	1.00		1	1				Rifabutin	0.50		3	3			
Ethionamide	1.25				1		1	Rifabutin	1.00		3	3	3		3
Ethionamide	2.00	1		1				Rifabutin	2.00	2	4	6			
Ethionamide	2.50				2		2	Clofazamine	0.25				1		1
Ethionamide	5.00	35		35	6		6	Clofazamine	1.00	2		2			
Ethionamide	10.00	5		5											
Kanamycin	2.50				1		1								
Kanamycin	5.00	14		14	3		3								
Kanamycin	6.00	21		21											

Footnote: Those concentrations that are recommended by CDC for the primary and secondary antituberculosis drugs are highlighted for the conventional and radiometric methods.