

September 22, 1995

Participant
Centers for Disease Control and Prevention (CDC)
Susceptibility Testing of Multidrug-Resistant *Mycobacterium tuberculosis* (MDR-TB)
Performance Evaluation Program

Subject: Analysis of Participant Laboratory Results for the June 1995 Shipment

Dear Participant:

Enclosed are analyses of laboratory test results reported to the Centers for Disease Control and Prevention (CDC) by participant laboratories for the multidrug-resistant strains of *Mycobacterium tuberculosis* (MDR-TB) shipped in June 1995. Participant laboratories received five individual strains. Testing results were received from 141 of 147 laboratories participating in analyzing 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*.

If you have any comment or suggestions on the format selected for the results, or questions regarding this report, you may call me at (404) 488-7660.

Sincerely yours,

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

Enclosures

Analyses of the June 1995 Performance Evaluation Results for Multidrug-Resistant *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 1995. Participant laboratories received five individual strains. Testing results were received from 141 of 147 participating laboratories in this shipment.

Figure 1 shows the laboratory classification represented by the 141 participants. Participants consisted of 65 health departments, 61 hospitals, 13 independents, and 2 other types 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 1994.

Figure 3 lists the biosafety levels reported by participant laboratories. All laboratories should routinely 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 17 days (median of 13 days) with a range of 5 to 69 days; for participants using conventional methods, this equaled a mean of 24 days (median of 21 days) with a range of 12 to 43 days.

Table 1 provides the percentage of laboratories that include the recommended critical concentration of primary antituberculosis drugs in their test regimens. The manufacturer of BACTEC, Becton-Dickinson Corp., recently revised the operators manual to highlight the recommended critical concentrations for the primary antituberculosis drugs. The June 1995 results reflect a significant increase in laboratories testing the BACTEC equivalent critical concentrations for streptomycin and ethambutol. The percentage of laboratories testing the BACTEC equivalent critical concentration for ethambutol increased from 30.5% (32/105) in August 1994 to 78.6% (88/112) in June 1995. For the BACTEC critical concentration of streptomycin there was an increase in the percentage of laboratories testing from 40.9% (43/105) in August 1994 to 86.4% (95/110) in June 1995. Overall, increases were noted in the use of critical concentrations for all but one combination of primary drug and method.

The aggregate test results are provided in separate tables, representing cultures Q, R, S, T, and W, 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.

Those concentrations that are recommended by CDC 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 (1-6). 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.

Strain T produced discrepant results among participants for both isoniazid and pyrazinamide. Strain T was included in the shipment based on resistance to isoniazid at the critical concentration (0.2 $\mu\text{g/ml}$) in the conventional method. Isoniazid resistance was reported by 43/54 (79.6%) of participants at 0.2 $\mu\text{g/ml}$ with the conventional method, however, 42/98 (42.8%) of participants reported resistance with the BACTEC equivalent concentration of 0.1 $\mu\text{g/ml}$. A total of 11/72 (15.3%) participants also reported resistance to pyrazinamide for strain T.

Most laboratories that include pyrazinamide in their testing regimen reported pyrazinamide resistance (71/72 or 98.6% for BACTEC at 100 $\mu\text{g/ml}$; 3/3 or 100% for conventional with 25 $\mu\text{g/ml}$) for strain S. When laboratories detect pyrazinamide resistance in a *M. tuberculosis* complex DNA probe-positive isolate, especially if the organism is fully susceptible to the other primary drugs, further testing such as niacin, nitrate reductase and TCH susceptibility tests should be performed to determine if the isolate is *M. bovis*. Many laboratories that do not routinely include pyrazinamide for susceptibility testing, perform a niacin test on *M. tuberculosis* complex isolates to confirm *M. tuberculosis* and rule out *M. bovis*.

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*.

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

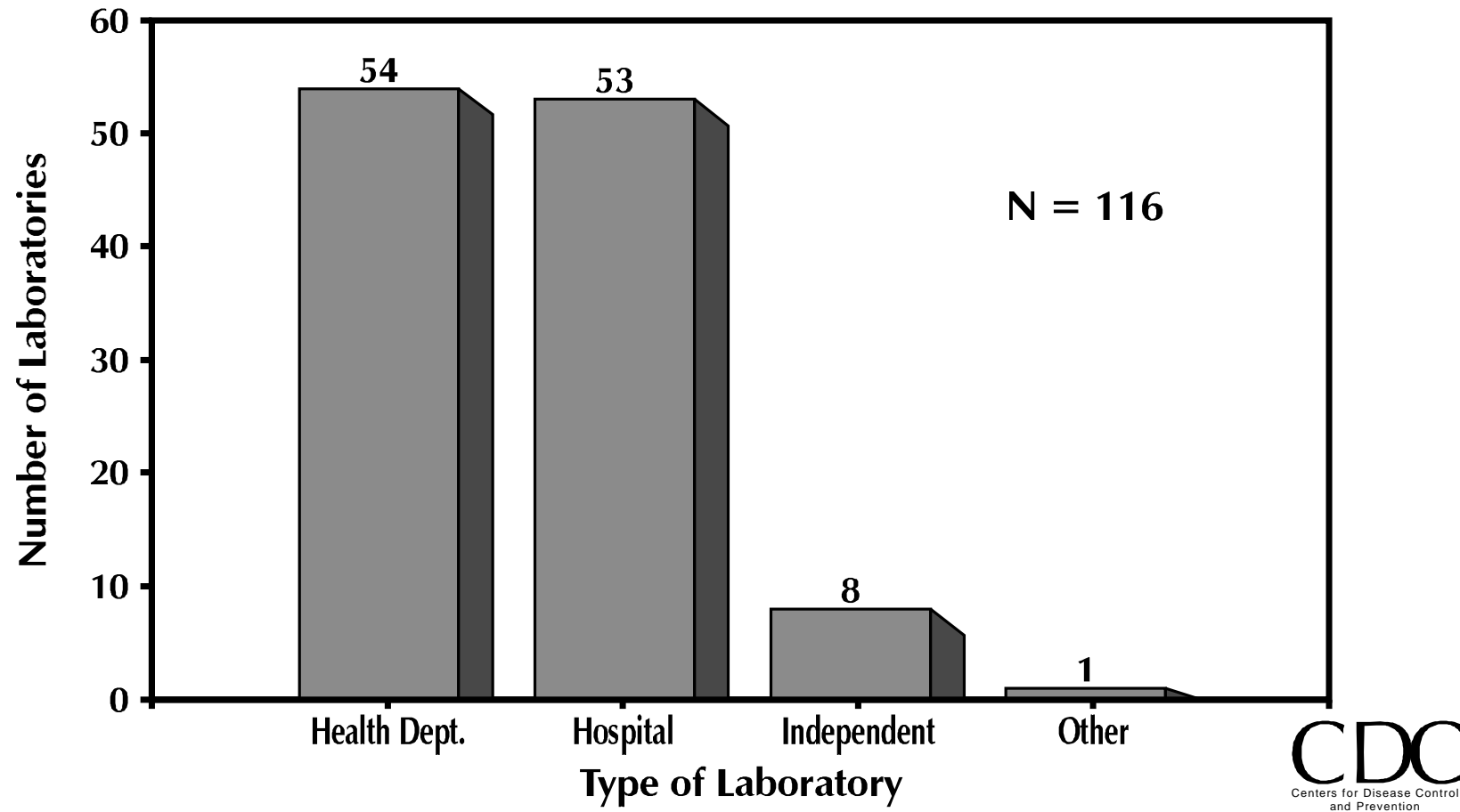
treatment of MDR-TB. Laboratories may contact their local TB control program for referrals of physicians with experience and expertise in treating MDR-TB.

REFERENCES

1. **Inderlied, C. B. and M. Salfinger.** 1995. Antimicrobial Agents and Susceptibility Tests: Mycobacteria, p. 1385-1404. In Murray, Patrick R., Baron, Ellen Jo, Pfaller, Michael A., Tenover, Fred C., Tenover, Fred C., Tenover, Fred C., Yolken, Robert C. (ed.) Manual of clinical microbiology, 6th ed. American Society for Microbiology, Washington, D.C.
2. **David, H. L.** 1971. Fundamentals of drug susceptibility testing in tuberculosis. DHEW Publication No. (CDC) 712165. Center for Disease Control, Atlanta.
3. **Kent, P.T and G.P. Kubica.** 1985. Public health mycobacteriology: a guide for the level III laboratory. Centers for Disease Control, Atlanta.
4. **Siddiqi, S.H., J.E. Hawkins, and A. Laszlo.** 1985. Interlaboratory drug susceptibility testing of *Mycobacterium tuberculosis* by a radiometric procedure and two conventional methods. J. Clin. Microbiol. 22:919-923.
5. **Hawkins, Jean E., Wallace, Richard J. Jr., Brown, Barbara A.** 1991. Antibacterial Susceptibility Tests: Mycobacteria, p. 1138-1152. In Balows, Albert, Hausler, William J. Jr., Herrmann, Kenneth L., Isenberg, Henry D., Shadomy, H. Jean (ed.) Manual of clinical microbiology, 4th ed. American Society for Microbiology, Washington, D.C.
6. **Woodley, C.L.** 1986. Evaluation of streptomycin and ethambutol concentrations for susceptibility testing of *Mycobacterium tuberculosis* by radiometric and conventional procedures. J. Clin. Microbiol. 23:385-386.

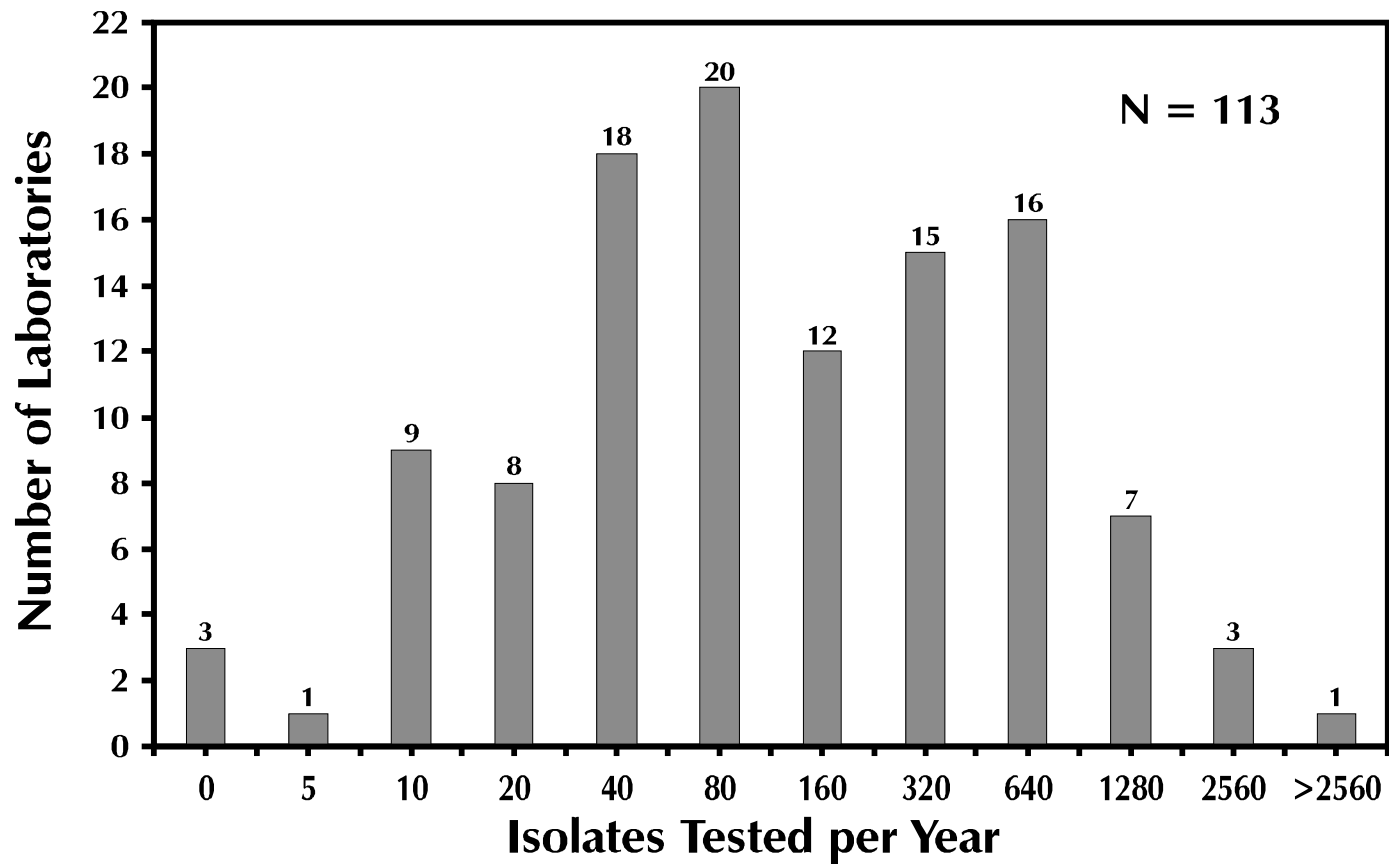
MDR TB Performance Evaluation Data

Figure 1. Laboratory Classification



MDR TB Performance Evaluation Data

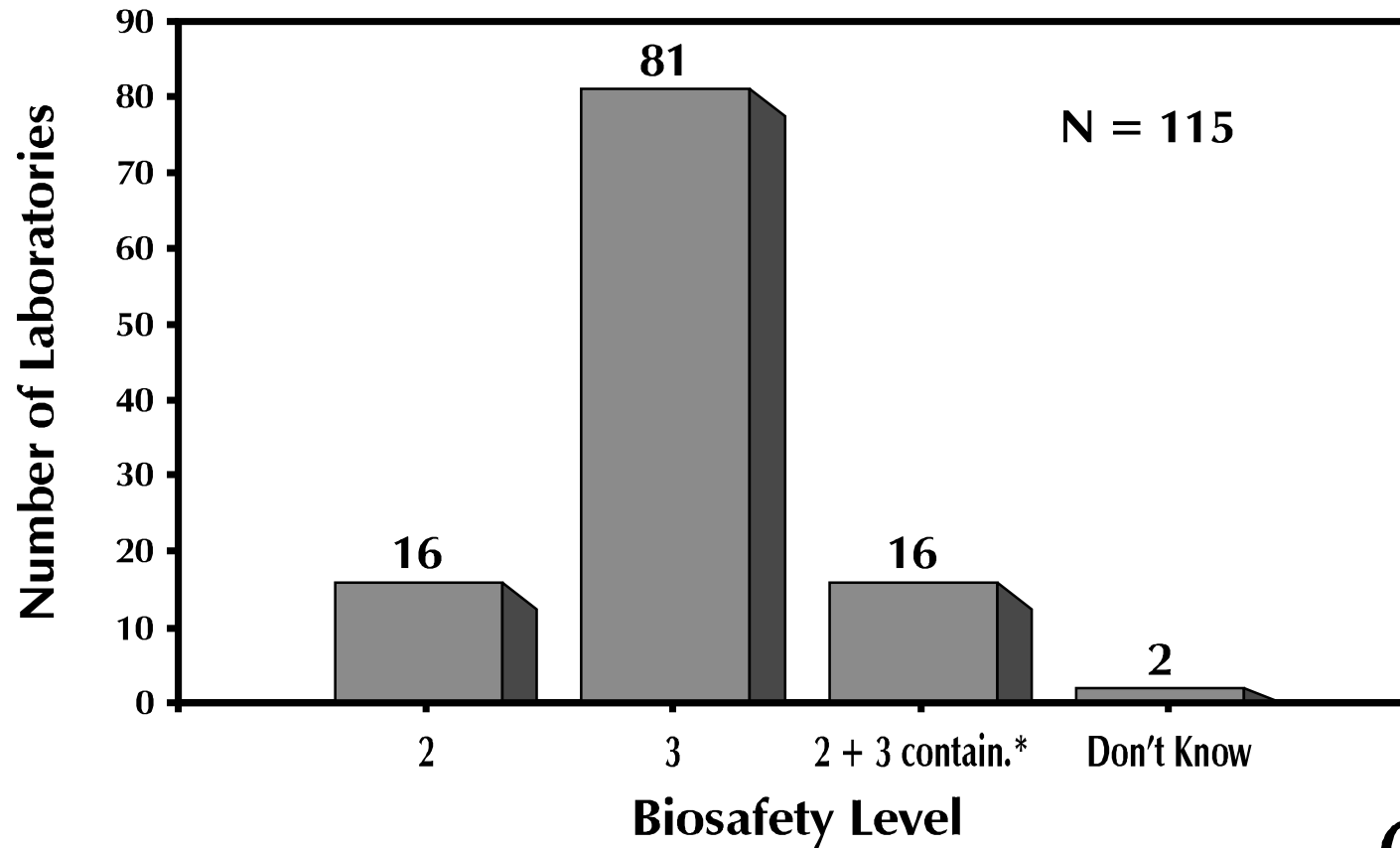
Figure 2. TB Drug Susceptibility Test Volume



Group labels indicate upper limit of the group

MDR TB Performance Evaluation Data

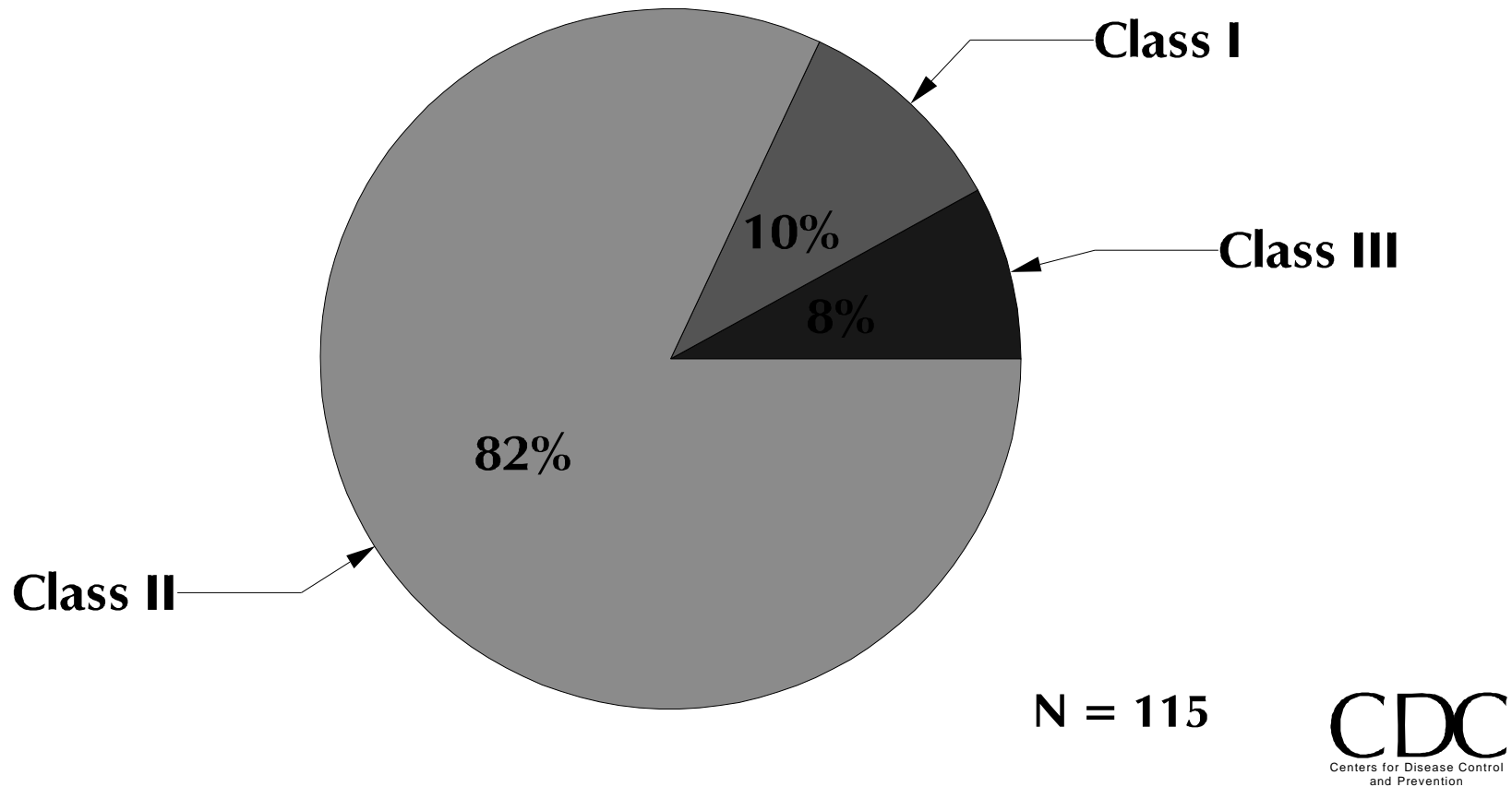
Figure 3. Biosafety Levels of Laboratories



* Biosafety Level 2 for facilities with Level 3 containment equipment

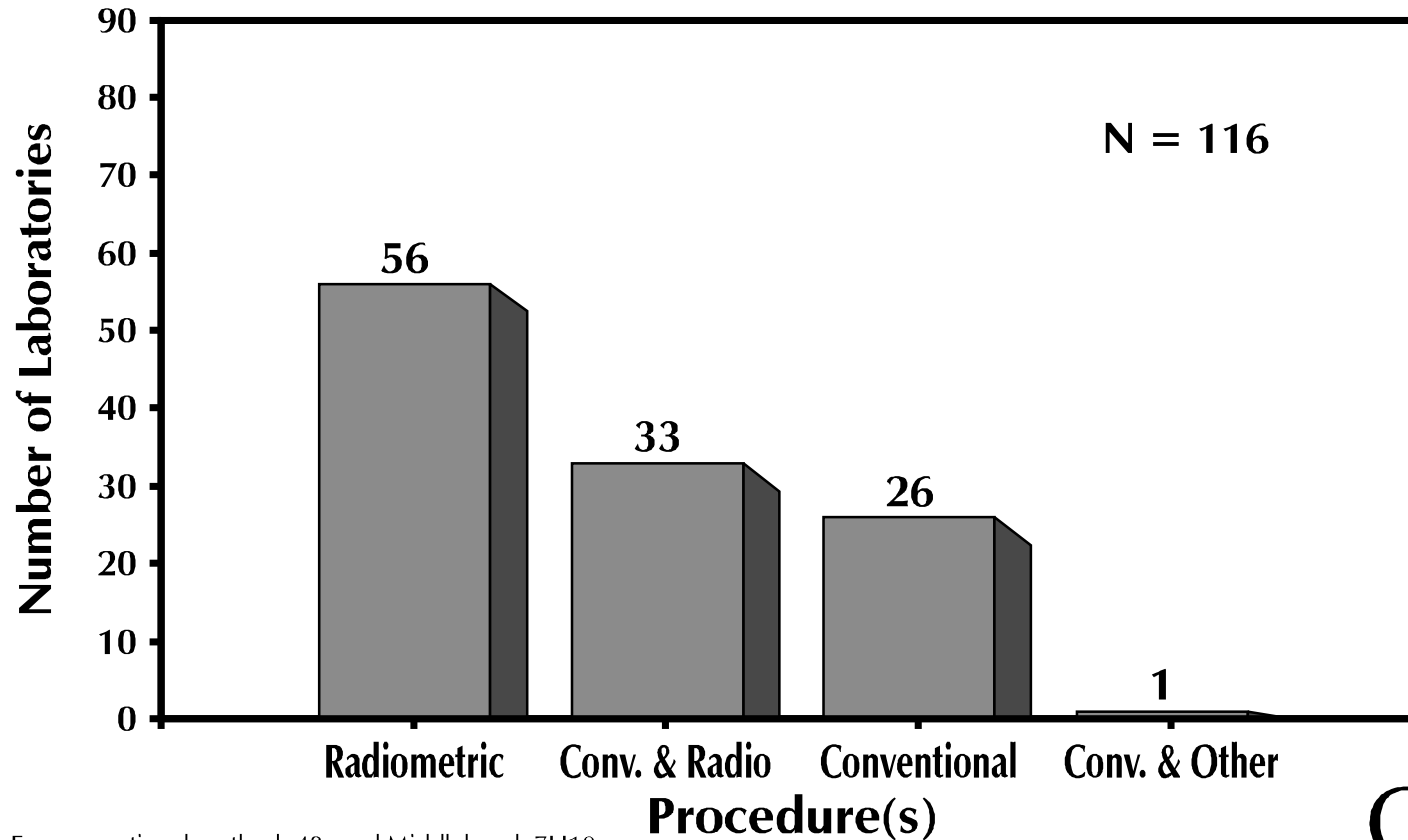
MDR TB Performance Evaluation Data

Figure 4. Biosafety Cabinet Type



MDR TB Performance Evaluation Data

Figure 5. Drug Susceptibility Procedure(s) Used



For conventional method, 48 used Middlebrook 7H10 and 12 used Middlebrook 7H11 media

Table 2. Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1995 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	R	Sum
Isoniazid	0.10	1		1	101	1	102	Cycloserine	3.00		1	1			
Isoniazid	0.12	1		1				Cycloserine	12.00		1	1			
Isoniazid	0.20	52	1	53	10		10	Cycloserine	20.00	1		1			
Isoniazid	0.25	1		1				Cycloserine	25.00	2		2			
Isoniazid	0.40				21		21	Cycloserine	30.00	15		15			
Isoniazid	0.50	1		1				Cycloserine	50.00	2		2	1	1	2
Isoniazid	1.00	50		50	9		9	p-Amino-salicy	2.00	23		23			
Isoniazid	2.00	1		1	1		1	p-Amino-salicy	4.00				2	1	3
Isoniazid	4.00	1		1				p-Amino-salicy	8.00	2		2			
Isoniazid	5.00	8		8				p-Amino-salicy	10.00	7		7			
Rifampin	0.50	2		2	1		1	Amikacin	0.30		1	1			
Rifampin	1.00	59		59	16		16	Amikacin	0.60		1	1			
Rifampin	2.00				100		100	Amikacin	1.20	1		1			
Rifampin	4.00	1		1				Amikacin	2.00	1		1			
Rifampin	5.00	17		17	2		2	Amikacin	2.50	1		1			
Pyrazinamide	25.00	3		3	1		1	Amikacin	4.00	2		2	1		1
Pyrazinamide	50.00	1		1				Amikacin	5.00	2		2	1		1
Pyrazinamide	100.0				71	1	72	Amikacin	6.00	7		7			
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				85	2	87	Amikacin	20.00	1		1			
Ethambutol	4.00	2		2	1		1	Amikacin	30.00	1		1			
Ethambutol	5.00	47	1	48	12		12	Amikacin	48.00	1		1			
Ethambutol	7.50	6		6	32	1	33	Ciprofloxacin	1.00	4		4	2		2
Ethambutol	8.00	2		2				Ciprofloxacin	2.00	13		13	2		2
Ethambutol	10.00	21		21				Ciprofloxacin	4.00	1		1	1		1
Ethambutol	25.00	1		1				Ciprofloxacin	5.00	1		1			
Streptomycin	1.00	1		1				Ofloxacin	1.00	5		5	1		1
Streptomycin	2.00	54		54	93	1	94	Ofloxacin	1.25	1		1			
Streptomycin	2.50	1		1				Ofloxacin	2.00	3		3	5		5
Streptomycin	4.00				1		1	Ofloxacin	4.00	1		1	2		2
Streptomycin	5.00	1		1				Ofloxacin	8.00				2		2
Streptomycin	6.00				37		37	Ofloxacin	12.50				1		1
Streptomycin	8.00	1		1				Rifabutin	0.50	2		2			
Streptomycin	10.00	38		38	1		1	Rifabutin	1.00	4		4	1		1
Streptomycin	16.00	1		1				Rifabutin	2.00	8		8			
Streptomycin	100.0	1		1				Clarithromycin	3.00	1		1			
Ethionamide	1.00	1		1				Clofazamine	0.10		1	1			
Ethionamide	2.00	1		1				Clofazamine	0.25				1		1
Ethionamide	2.50				1		1	Clofazamine	0.50	1		1			
Ethionamide	5.00	36	2	38	5		5	Clofazamine	1.00	3		3			
Ethionamide	10.00	7		7	1		1	Sparfloxacin	0.16	1		1			
Kanamycin	5.00	20		20	4		4	Sparfloxacin	0.30	1		1			
Kanamycin	6.00	19		19				Sparfloxacin	0.60	1		1			
Capreomycin	1.00		1	1											
Capreomycin	2.50				1		1								
Capreomycin	5.00	3		3	3		3								
Capreomycin	10.00	22		22	1		1								
Capreomycin	20.00	1		1											
Capreomycin	25.00	1		1											

Table 2. Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1995 shipment

Culture R		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	0.10		1	1		101	101	Cycloserine	3.00		1	1			
Isoniazid	0.12		1	1				Cycloserine	6.00	1		1			
Isoniazid	0.20		54	54		10	10	Cycloserine	12.00		1	1			
Isoniazid	0.25		1	1				Cycloserine	20.00	2		2			
Isoniazid	0.40					22	22	Cycloserine	25.00	2		2			
Isoniazid	0.50		1	1				Cycloserine	30.00	17		17			
Isoniazid	1.00		53	53		11	11	Cycloserine	50.00	2		2	2		2
Isoniazid	2.00		1	1		1	1	Cycloserine	60.00	2		2			
Isoniazid	4.00		1	1				p-Amino-salic	2.00	24		24			
Isoniazid	5.00	7	2	9		1	1	p-Amino-salic	4.00				3		3
Rifampin	0.50		2	2		1	1	p-Amino-salic	8.00	4		4			
Rifampin	1.00		60	60		15	15	p-Amino-salic	10.00	8		8			
Rifampin	2.00					2	98	100	Amikacin	0.30		1	1		
Rifampin	4.00		1	1				Amikacin	0.60		1	1			
Rifampin	5.00		19	19		4	4	Amikacin	1.20	1		1			
Rifampin	10.00		1	1		1	1	Amikacin	2.00	1		1			
Pyrazinamide	25.00	2		2		1	1	Amikacin	2.50	1		1	1		1
Pyrazinamide	50.00	1		1				Amikacin	4.00	3		3	1		1
Pyrazinamide	100.0					74	74	Amikacin	5.00	2		2	1		1
Pyrazinamide	300.0					1	1	Amikacin	6.00	8		8			
Pyrazinamide	900.0					1	1	Amikacin	8.00	1		1			
Ethambutol	2.00					1	1	Amikacin	10.00	1		1			
Ethambutol	2.50					81	4	85	Amikacin	12.00	2		2		
Ethambutol	4.00	2		2		1		1	Amikacin	18.00	1		1		
Ethambutol	5.00	48		48		11		11	Amikacin	20.00	1		1		
Ethambutol	7.50	7		7		31	2	33	Amikacin	30.00	1		1		
Ethambutol	8.00	2		2					Amikacin	48.00	1		1		
Ethambutol	10.00	21		21					Ciprofloxacin	1.00	5		5	3	3
Ethambutol	15.00	1		1					Ciprofloxacin	2.00	13		13	2	2
Ethambutol	25.00	1		1					Ciprofloxacin	2.50				1	1
Streptomycin	1.00	1		1					Ciprofloxacin	4.00	1		1	1	1
Streptomycin	2.00	54	1	55		86	5	91	Ciprofloxacin	5.00	1		1		
Streptomycin	2.50	1		1					Ofloxacin	1.00	5		5	2	2
Streptomycin	4.00					1		1	Ofloxacin	1.25	1		1		
Streptomycin	5.00	1		1					Ofloxacin	2.00	3		3	5	5
Streptomycin	6.00					36		36	Ofloxacin	4.00	1		1	2	2
Streptomycin	8.00	1		1					Ofloxacin	8.00				2	2
Streptomycin	10.00	39		39		1		1	Rifabutin	0.50		2	2		
Streptomycin	16.00	1		1					Rifabutin	1.00		4	4	2	2
Streptomycin	100.0	1		1					Rifabutin	2.00		8	8		
Ethionamide	1.00	1		1					Clarithromycin	3.00	1		1		
Ethionamide	2.00	1		1					Clofazamine	0.10		1	1		
Ethionamide	2.50					3		3	Clofazamine	0.25				1	1
Ethionamide	5.00	39		39		5		5	Clofazamine	0.50	1		1	1	1
Ethionamide	10.00	8		8		1		1	Clofazamine	1.00	3		3		
Ethionamide	15.00	1		1					Sparfloxacin	0.16	1		1		
Kanamycin	2.50					1		1	Sparfloxacin	0.30	1		1		
Kanamycin	5.00	21		21		4		4	Sparfloxacin	0.60	1		1		
Kanamycin	6.00	21		21											
Kanamycin	12.00	1		1											
Capreomycin	1.00		1	1											
Capreomycin	2.50					3		3							
Capreomycin	5.00	2		2		4		4							
Capreomycin	10.00	24		24		1		1							
Capreomycin	20.00	2		2											
Capreomycin	25.00	1		1											

Table 2. Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1995 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	Sum
Isoniazid	0.10	1		1	100	1	101	Cycloserine	3.00		1	1			
Isoniazid	0.12	1		1				Cycloserine	6.00	1		1			
Isoniazid	0.20	55		55	10		10	Cycloserine	12.00		1	1			
Isoniazid	0.25	1		1				Cycloserine	20.00	1		1			
Isoniazid	0.40				21		21	Cycloserine	25.00	2		2			
Isoniazid	0.50	1		1				Cycloserine	30.00	16		16			
Isoniazid	1.00	52		52	10		10	Cycloserine	50.00	2		2	2		2
Isoniazid	2.00	1		1	1		1	Cycloserine	60.00	1		1			
Isoniazid	4.00	1		1				p-Amino-salicy	2.00	22	1	23			
Isoniazid	5.00	9		9				p-Amino-salicy	4.00				2	1	3
Rifampin	0.50	2		2	1		1	p-Amino-salicy	8.00	4		4			
Rifampin	1.00	61		61	16		16	p-Amino-salicy	10.00	7		7			
Rifampin	2.00				99		99	Amikacin	0.30		1	1			
Rifampin	4.00	1		1				Amikacin	0.60		1	1			
Rifampin	5.00	19		19	3		3	Amikacin	1.20	1		1			
Rifampin	10.00	1		1				Amikacin	2.00	1		1			
Pyrazinamide	25.00		3	3		1	1	Amikacin	2.50	1		1	1		1
Pyrazinamide	50.00	1		1				Amikacin	4.00	3		3	1		1
Pyrazinamide	100.0				1	71	72	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				86	1	87	Amikacin	12.00	2		2			
Ethambutol	4.00	2		2	1		1	Amikacin	18.00	1		1			
Ethambutol	5.00	48	1	49	12		12	Amikacin	20.00	1		1			
Ethambutol	7.50	7		7	32	1	33	Amikacin	30.00	1		1			
Ethambutol	8.00	2		2				Amikacin	48.00	1		1			
Ethambutol	10.00	22		22				Ciprofloxacin	1.00	4		4	3		3
Ethambutol	15.00	1		1				Ciprofloxacin	2.00	13		13	2		2
Ethambutol	25.00	1		1				Ciprofloxacin	2.50				1		1
Streptomycin	1.00	1		1				Ciprofloxacin	4.00	1		1	1		1
Streptomycin	2.00	56		56	93	1	94	Ciprofloxacin	5.00	1		1			
Streptomycin	2.50	1		1				Ofloxacin	1.00	5		5	2		2
Streptomycin	4.00				1		1	Ofloxacin	1.25	1		1			
Streptomycin	5.00	1		1				Ofloxacin	2.00	3		3	5		5
Streptomycin	6.00				35		35	Ofloxacin	4.00	1		1	2		2
Streptomycin	8.00	1		1				Ofloxacin	8.00				2		2
Streptomycin	10.00	40		40	1		1	Rifabutin	0.50	2		2			
Streptomycin	16.00	1		1				Rifabutin	1.00	4		4	2		2
Streptomycin	100.0	1		1				Rifabutin	2.00	8		8			
Ethionamide	1.00	1		1				Clarithromycin	3.00	1		1			
Ethionamide	2.00	1		1				Clofazamine	0.10		1	1			
Ethionamide	2.50				3		3	Clofazamine	0.25				1		1
Ethionamide	5.00	38	1	39	5		5	Clofazamine	0.50	1		1	1		1
Ethionamide	10.00	8		8	1		1	Clofazamine	1.00	3		3			
Ethionamide	15.00	1		1				Sparfloxacin	0.16	1		1			
Kanamycin	5.00	21		21	4		4	Sparfloxacin	0.30	1		1			
Kanamycin	6.00	20		20				Sparfloxacin	0.60	1		1			
Kanamycin	12.00	1		1				TCH	1.00					1	1
Capreomycin	1.00		1	1				TCH	2.00					1	1
Capreomycin	2.50				2		2	TCH	5.00					2	2
Capreomycin	5.00				4		4								
Capreomycin	10.00	24		24	1		1								
Capreomycin	20.00	2		2											
Capreomycin	25.00	1		1											

Table 2. Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1995 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	0.10	1		1	56	42	98	Cycloserine	3.00		1	1			
Isoniazid	0.12		1	1				Cycloserine	6.00	1		1			
Isoniazid	0.20	11	43	54	8	2	10	Cycloserine	12.00		1	1			
Isoniazid	0.25		1	1				Cycloserine	20.00	1		1			
Isoniazid	0.40				22		22	Cycloserine	25.00	2		2			
Isoniazid	0.50	1		1				Cycloserine	30.00	15	1	16			
Isoniazid	1.00	51	2	53	10		10	Cycloserine	50.00	2		2	2		2
Isoniazid	2.00	1		1	1		1	Cycloserine	60.00	1		1			
Isoniazid	4.00	1		1				p-Amino-salicy	2.00	23		23			
Isoniazid	5.00	9		9				p-Amino-salicy	4.00				2	1	3
Rifampin	0.50	2		2	1		1	p-Amino-salicy	8.00	4		4			
Rifampin	1.00	60		60	16		16	p-Amino-salicy	10.00	7		7			
Rifampin	2.00				97	1	98	Amikacin	0.30		1	1			
Rifampin	4.00	1		1				Amikacin	0.60		1	1			
Rifampin	5.00	18		18	3		3	Amikacin	1.20	1		1			
Rifampin	10.00	1		1				Amikacin	2.00	1		1			
Pyrazinamide	25.00	3		3		1	1	Amikacin	2.50	1		1	1		1
Pyrazinamide	50.00	1		1				Amikacin	4.00	3		3	1		1
Pyrazinamide	100.0				61	11	72	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				82	3	85	Amikacin	12.00	2		2			
Ethambutol	4.00	2		2	1		1	Amikacin	18.00	1		1			
Ethambutol	5.00	47	1	48	12		12	Amikacin	20.00	1		1			
Ethambutol	7.50	7		7	32	1	33	Amikacin	30.00	1		1			
Ethambutol	8.00	2		2				Amikacin	48.00	1		1			
Ethambutol	10.00	21		21				Ciprofloxacin	1.00	4		4	3		3
Ethambutol	15.00	1		1				Ciprofloxacin	2.00	13		13	2		2
Ethambutol	25.00	1		1				Ciprofloxacin	2.50				1		1
Streptomycin	1.00	1		1				Ciprofloxacin	4.00	1		1	1		1
Streptomycin	2.00	55		55	87	6	93	Ciprofloxacin	5.00	1		1			
Streptomycin	2.50	1		1				Ofloxacin	1.00	5		5	2		2
Streptomycin	4.00				1		1	Ofloxacin	1.25	1		1			
Streptomycin	5.00	1		1				Ofloxacin	2.00	3		3	5		5
Streptomycin	6.00				35		35	Ofloxacin	4.00	1		1	2		2
Streptomycin	8.00	1		1				Ofloxacin	8.00				2		2
Streptomycin	10.00	39		39	1		1	Rifabutin	0.50	2		2			
Streptomycin	16.00	1		1				Rifabutin	1.00	4		4	2		2
Streptomycin	100.0	1		1				Rifabutin	2.00	8		8			
Ethionamide	1.00		1	1				Clarithromycin	3.00	1		1			
Ethionamide	2.00		1	1				Clofazamine	0.10		1	1			
Ethionamide	2.50				2	1	3	Clofazamine	0.25				1		1
Ethionamide	5.00	16	20	36	4	1	5	Clofazamine	0.50	1		1	1		1
Ethionamide	10.00	4	4	8	1		1	Clofazamine	1.00	3		3			
Ethionamide	15.00	1		1				Sparfloxacin	0.16	1		1			
Kanamycin	5.00	20		20	4		4	Sparfloxacin	0.30	1		1			
Kanamycin	6.00	20		20				Sparfloxacin	0.60	1		1			
Kanamycin	12.00	1		1											
Capreomycin	1.00		1	1											
Capreomycin	2.50				2		2								
Capreomycin	5.00	2		2	4		4								
Capreomycin	10.00	22	1	23	1		1								
Capreomycin	20.00	2		2											
Capreomycin	25.00	1		1											

Table 2. Laboratory results for *M. tuberculosis* antimicrobial susceptibility testing for the June 1995 shipment

Culture W		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	0.10	1		1	100	1	101	Cycloserine	3.00		1	1			
Isoniazid	0.12	1		1				Cycloserine	12.00		1	1			
Isoniazid	0.20	53		53	9	1	10	Cycloserine	20.00		1	1			
Isoniazid	0.25	1		1				Cycloserine	25.00	2		2			
Isoniazid	0.40				20		20	Cycloserine	30.00	16		16			
Isoniazid	0.50	1		1				Cycloserine	50.00	2		2	2		2
Isoniazid	1.00	51		51	9		9	Cycloserine	60.00	1		1			
Isoniazid	2.00	1		1	1		1	p-Amino-salicy	2.00	23		23			
Isoniazid	4.00	1		1				p-Amino-salicy	4.00				2	1	3
Isoniazid	5.00	9		9				p-Amino-salicy	8.00	3		3			
Rifampin	0.50	2		2	1		1	p-Amino-salicy	10.00	7		7			
Rifampin	1.00	60		60	15	1	16	Amikacin	0.30		1	1			
Rifampin	2.00				99		99	Amikacin	0.60		1	1			
Rifampin	4.00	1		1				Amikacin	1.20	1		1			
Rifampin	5.00	18		18	2		2	Amikacin	2.00	1		1			
Rifampin	10.00	1		1				Amikacin	2.50	1		1			
Pyrazinamide	25.00	3		3	1		1	Amikacin	4.00	2		2	1		1
Pyrazinamide	50.00	1		1				Amikacin	5.00	2		2	1		1
Pyrazinamide	100.0				72	1	73	Amikacin	6.00	7		7			
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				85	1	86	Amikacin	20.00	1		1			
Ethambutol	4.00	2		2	1		1	Amikacin	30.00	1		1			
Ethambutol	5.00	48		48	11	1	12	Amikacin	48.00	1		1			
Ethambutol	7.50	6		6	32	1	33	Ciprofloxacin	1.00	4		4	2		2
Ethambutol	8.00	2		2				Ciprofloxacin	2.00	13		13	2		2
Ethambutol	10.00	21		21				Ciprofloxacin	4.00	1		1	1		1
Ethambutol	15.00	1		1				Ciprofloxacin	5.00	1		1			
Ethambutol	25.00	1		1				Ofloxacin	1.00	5		5	1		1
Streptomycin	1.00	1		1				Ofloxacin	1.25	1		1			
Streptomycin	2.00	55		55	90	3	93	Ofloxacin	2.00	3		3	5		5
Streptomycin	2.50	1		1				Ofloxacin	4.00	1		1	2		2
Streptomycin	4.00				1		1	Ofloxacin	8.00				2		2
Streptomycin	5.00	1		1				Rifabutin	0.50	2		2			
Streptomycin	6.00				36		36	Rifabutin	1.00	4		4	1		1
Streptomycin	8.00	1		1				Rifabutin	2.00	8		8			
Streptomycin	10.00	39		39	1		1	Clarithromycin	3.00	1		1			
Streptomycin	16.00	1		1				Clofazamine	0.10		1	1			
Streptomycin	100.0	1		1				Clofazamine	0.25				1		1
Ethionamide	1.00	1		1				Clofazamine	0.50	1		1			
Ethionamide	2.00	1		1				Clofazamine	1.00	3		3			
Ethionamide	2.50				1		1	Sparfloxacin	0.16	1		1			
Ethionamide	5.00	36	2	38	5		5	Sparfloxacin	0.30	1		1			
Ethionamide	10.00	8		8	1		1	Sparfloxacin	0.60	1		1			
Ethionamide	15.00	1		1											
Kanamycin	5.00	20		20	4		4								
Kanamycin	6.00	19		19											
Kanamycin	12.00	1		1											
Capreomycin	1.00		1	1											
Capreomycin	2.50				1		1								
Capreomycin	5.00	2		2	3		3								
Capreomycin	10.00	23		23	1		1								
Capreomycin	20.00	2		2											
Capreomycin	25.00	1		1											