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Heat-Related Mortality — Chicago, July 1995

During July 12–16, 1995, Chicago experienced unusually high maximum daily temperatures, ranging from 93 F to 104 F (33.9 C to 40.0 C). On July 13, the heat index* peaked at 119 F (48.3 C)—a record high for the city. This report describes the heat-related deaths reported by the Cook County Medical Examiner's Office (CCMEO) during this heat wave.

Deaths classified as heat-related by the CCMEO met one of the following three criteria: 1) core body temperature of the decedent ≥105 F (≥40.6 C) at the time of or immediately after death, 2) substantial environmental or circumstantial evidence of heat as a contributor to death (e.g., decedent found in a room without air conditioning, all windows closed, and a high ambient temperature), or 3) decedent in a decomposed condition without evidence of other cause of death and with evidence that the decedent was last seen alive during the heat wave period.

During July 11–27, a total of 465 deaths were certified as heat-related by the CCMEO (Figure 1); during July 4–10, no deaths were certified as heat-related. The highest number of heat-related deaths previously certified by the CCMEO—associated with a heat wave in 1988—was 77. The number of heat-related deaths peaked 2 days after the heat index peaked. Deaths increased from 49 (July 14) to a maximum of 162 (July 15) (Figure 1). Of the 465 decedents, 257 (55%) were male. Based on race-specific data, 229 (49%) decedents were black; 215 (46%), white; and 21 (5%), other racial/ethnic groups.† Within racial categories, 128 (56%) blacks were male, and 114 (53%) whites were male. Of the 437 decedents for whom age could be determined, age ranged from 3 years to 103 years (median: 75 years, mean: 72 years); 222 (51%) were aged ≥75 years.

During July 13–21 (when most heat-related deaths were certified by the CCMEO), a total of 1177 deaths occurred in Chicago—an 85% increase over the same period in 1994 (637 deaths).

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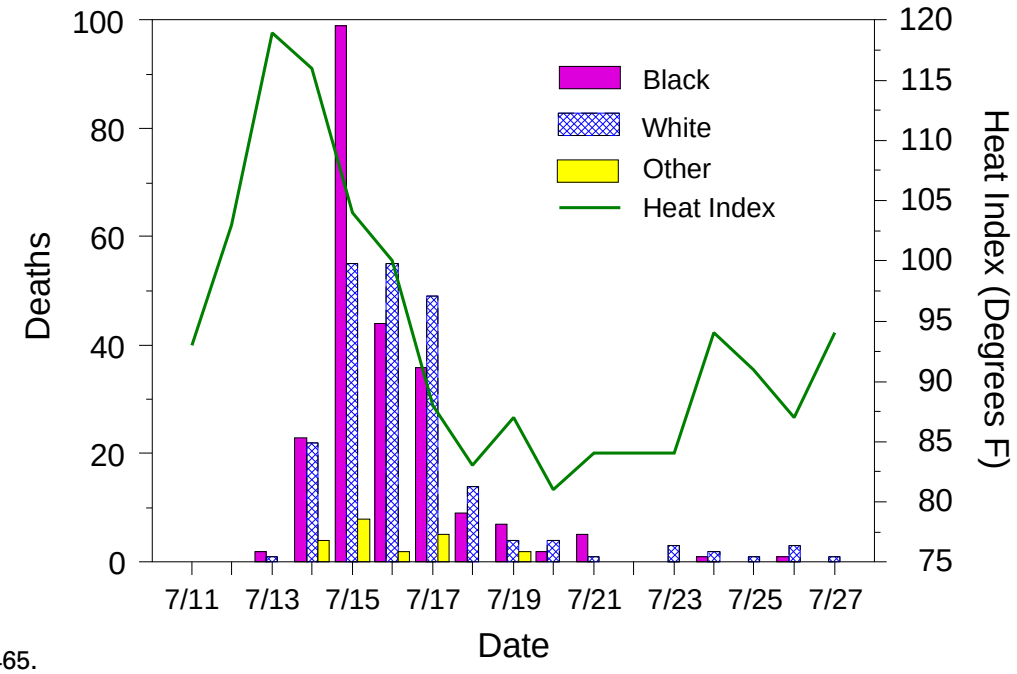
*The heat index (i.e., the apparent temperature) is an estimation of the influence of temperature and humidity on the evaporative and radiative transfer of heat between a typical human and the atmosphere. The values can be derived from a chart available through the National Weather Service (*1*).

†The CCMEO categorizes race of decedents as black, white, or other.

Heat-Related Mortality — Continued

FIGURE 1. Number of heat-related deaths,* by date of occurrence and race† of decedent, and heat index, by date — Chicago, July 11–27, 1995



*n=465.
†The Cook County Medical Examiner's Office categorizes race of decedents as black, white, or other.

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Editorial Note: Excess mortality from hyperthermia and cardiovascular disease during heat waves has been well documented (*2,3*). The findings in Chicago by the CCMEO that blacks, males, and the elderly appear to be particularly susceptible to heat-related death are similar to previous studies of heat waves. During public health crises such as heat waves, state-specific mortality data are often incomplete or unavailable; therefore, data from medical examiners' (MEs') offices may be used to assess mortality during such crises. Although ME-based surveillance for heat-related deaths can prompt timely public health responses during heat waves, use of ME data is limited because of selection bias. Individual MEs and other persons who certify deaths (e.g., coroners and attending physicians) use varying criteria to determine which deaths are heat- related, largely because no standardized definition exists.

In the United States, lack of a uniform definition for heat-related death results in substantial variation in the criteria used to certify such deaths. The most stringent definition of heat-related death is a core body temperature of ≥105 F (≥40.6 C) taken at the time of death, with no other reasonable explanation of death. This definition precludes certifying any death as heat-related if core body temperature is not measured before or near the time of death and may underestimate excess heat-related mortality. A nonspecific definition of heat-related death (which could include all deaths that occur during a heat wave) would overestimate this mortality. The definition used by the CCMEO to classify deaths as heat-related has remained unchanged since 1978 and is based on a reasonable approach (i.e., evidence of exposure to high levels of

Heat-Related Mortality — Continued

environmental heat). These two factors (as well as the finding that the data about heat-related deaths are consistent with preliminary data about total mortality in Chicago during July 1995) suggest that the CCMEO data did not overestimate heat-related mortality during that period.

The differential impact of a heat wave on specific population subgroups cannot be determined based on ME data alone because of incompleteness and potential bias (*3,4*). For example, based on CCMEO data, a disproportionately high number of heat-related deaths occurred among blacks in Chicago on July 15 (Figure 1). Because CCMEO data do not include all deaths nor equally represent all socioeconomic status (SES) categories, it is not yet possible to completely describe mortality, calculate death rates, or determine whether the race- and sex-specific distribution of the heat-related deaths is disproportionate to overall mortality in Chicago. A case-control study is under way in Chicago to examine the influences of SES and specific environmental factors on heat-related mortality.

Despite their limitations, the data in this report confirm that 1) public health information should be directed toward susceptible populations (e.g., the elderly), 2) as in other heat waves (*2,3*), the time between the beginning of a heat wave and the resulting heat-related deaths (e.g., 2 days in Chicago) should be sufficient to disseminate prevention messages to the public, and 3) a standardized definition of heat-related death is needed.

Heat-related mortality is preventable. The most effective measures for preventing heat-related illness and death include reducing physical activity, drinking additional nonalcoholic liquids, and increasing the amount of time spent in air-conditioned environments. In addition, because increased air movement (e.g., fans) has been associated with heat stress when the ambient temperature exceeds approximately 100 F (37.8 C) and because fans are not protective at temperatures >90 F (>32.3 C) with humidity >35% (the exact temperature varies with the humidity), fans should not be used for preventing heat-related illness in areas with high humidity (*3,5*). To further define information that can be used to identify persons at greatest risk during hot weather, CDC is collaborating with Chicago and Illinois health officials to determine risk factors to better target persons at increased risk for heat-related illness or death. A standard definition for heat-related death will be addressed at the February 1996 meeting of the American Academy of Forensic Sciences.

References

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Translocation of Coyote Rabies — Florida, 1994

Translocation of a rabies variant from one area to another has been identified increasingly in the United States. During November and December 1994, rabies was diagnosed in five dogs from two associated kennels in Florida; in addition, two other dogs being kept at one of the kennels died with suspected, but unconfirmed, rabies. Rabies virus recovered from the five dogs was identified as a variant not previously found in Florida but endemic in coyotes (*Canis latrans*) in south Texas. The suspected source of infection was translocation of infected coyotes from Texas to Florida. This report summarizes the findings of an investigation of these cases by the Alachua County Public Health Unit, the Florida Department of Health and Rehabilitative Services, and CDC.

On November 21, 1994, a Walker hound used for fox hunting escaped from one of the fenced kennels; on recapture later that day, the dog was unusually aggressive and bit one of the kennel owners. The dog was euthanized and tested positive for rabies. On November 21, the Alachua County Public Health Unit identified 102 dogs and 10 cats potentially exposed to this dog while it was loose and established a 20-square-mile quarantine area. Measures implemented by public health and animal-control authorities included vaccinating against rabies all unvaccinated dogs and cats within the quarantine area and administering booster vaccine to previously vaccinated animals, prohibiting movement of animals in and out of the quarantine area, systematically mailing rabies update advisories to residents of the quarantine area, and—with the assistance of the news media—increasing rabies surveillance by requesting reports of persons or animals that had been bitten by an animal. As a result of exposure to this dog or other animals in the quarantine area, 26 persons received rabies postexposure treatment, and three persons received preexposure prophylaxis.

Concurrent investigations by the Alachua County Public Health Unit revealed that two other dogs from the same kennel had died on November 10 and November 18. Neither of these dogs were tested for rabies; however, rabies was suspected and confirmed in four additional dogs (three from the same kennel and one from an associated kennel), who died November 28 (one), November 30 (one), and December 1 (two). Rabies in the five dogs tested was confirmed at CDC, and the isolates were identified as the variant associated with coyotes in south Texas (*1*). None of the seven dogs with presumed or confirmed rabies had a history of rabies vaccination. All seven dogs had been kept in Florida for ≥7 months preceding their deaths.

Several times each week during September and October, the kennel owner, family members, and a business associate hunted coyotes that were kept in a 320-acre fenced foxpen 18 miles from the dog kennels. The foxpen had not been rented for use by other hunters. The foxpen had housed 20–25 coyotes, which were reported to have been captured in Florida during February 1994 and placed in the pen during the same month with gray foxes and raccoons. The coyotes were reported to have been fed regularly, and no ill or dead wildlife had been noted in the enclosure within the previous 6 months. Six of the dogs with presumed or confirmed rabies had accompanied the hunters in the foxpen. The one rabid dog that was never taken to the foxpen had shared a kennel with two of the dogs with rabies. Four of the seven rabid dogs also had been to a field trial with approximately 400 other hunting dogs in late October; none of these other dogs are known to have died from rabies.

Rabies — Continued

Depopulation of the free-ranging carnivores within the enclosed foxpen was instituted with the assistance of the Florida Game and Fresh Water Fish Commission because the affected dogs in the foxpen may have been exposed to other rabid animals. The potentially exposed or infected animals included 32 coyotes, five raccoons, two gray foxes, two bobcats and one cat; diagnostic tests of these animals at CDC were negative for rabies. Continuing surveillance in the quarantine area subsequently identified rabies in a puppy that had been bitten by the escaped rabid dog.

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Editorial Note: The episode described in this report resulted in six confirmed and two presumed cases of dog rabies and the need for rabies postexposure treatment of 26 persons. It highlights the increasing problem of animal rabies in the United States, which reached record levels in 1993.

The incubation period for rabies in the cases in this report and the rabies variant with which they were infected suggest that the source of infection was coyotes in the foxpen during October. Although the incubation period for rabies in dogs usually is 3–8 weeks, it can vary from 10 days to 8½ months (*2*). The rabies variant identified is not present in animal populations of the southeastern United States but is found exclusively in 17 counties in southern Texas. Because the dogs had not traveled outside Florida, translocation of infected animals from Texas is suspected. A similar case of dog rabies in Alabama was attributed to coyotes transported for hunting purposes from Texas to Alabama (*3*).

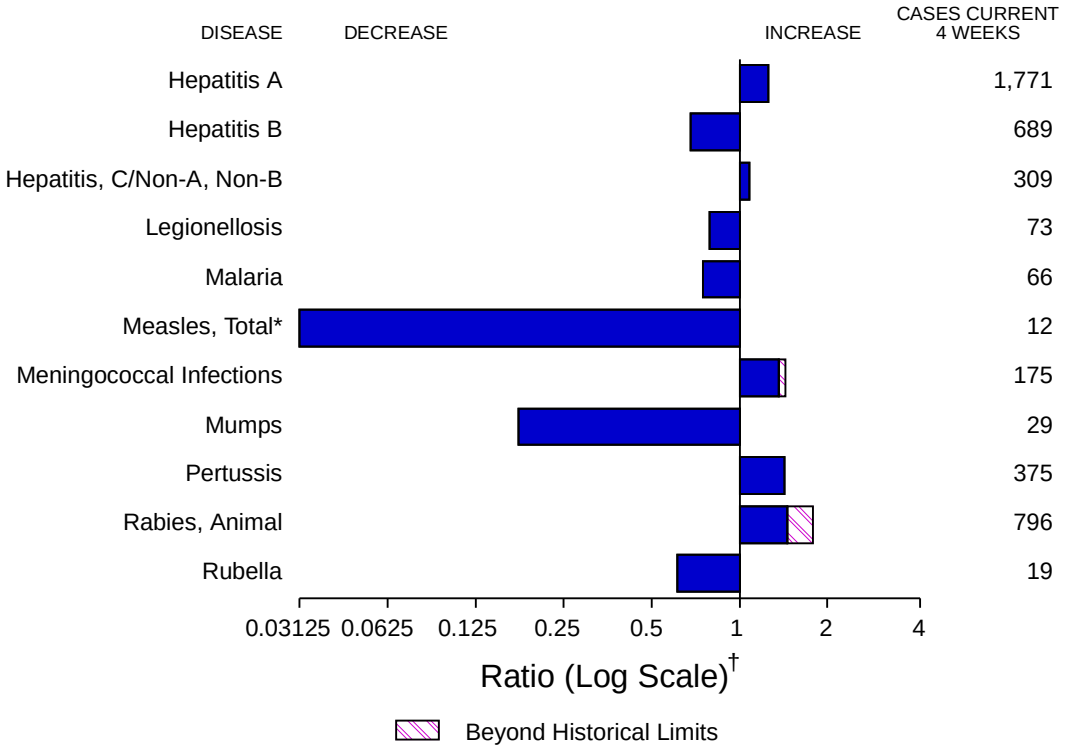
Enzootic dog rabies has been nearly eliminated in the United States as the result of effective mass vaccination programs and programs initiated during the 1950s to control stray animal populations. Dog-to-dog transmission of the magnitude described in this report has not been documented since the early 1970s, except in areas along the U.S.-Mexico border. However, 12 of the 25 human rabies cases diagnosed in the United States since 1980 were associated with exposure to dog rabies viruses outside the United States or near the U.S.-Mexico border. In the cases in this report, rabies transmission to the dogs probably could have been prevented if the dogs had been appropriately vaccinated against rabies.

Since 1988, rabies in coyotes in southern Texas has accounted for most coyote-associated rabies in the United States, including 70 of 75 cases in 1992, and 71 of 74 cases in 1993 (*3*). The coyote rabies epizootic has been a source for infection for unvaccinated domesticated dogs and further expansion of rabies. Since 1991, at least two human deaths have been associated directly with the southern Texas rabies variant (*4,5*), probably associated with interactions between coyotes and dogs. In addition to established measures for preventing rabies, including mandatory vaccination of domesticated dogs (*6*) and prompt postexposure treatment of humans (*7*), the development of safe and effective oral rabies vaccines for coyotes and other wild carnivores would be a potentially important adjunct control strategy.

The interstate transport of wildlife from geographic areas with enzootic hazards to new areas has resulted in disease outbreaks with substantial public health and economic impact. For example, the current raccoon rabies epizootic in the mid-Atlantic and northeastern United States is the direct consequence of translocation and spread

(Continued on page 587)

FIGURE I. Notifiable disease reports, comparison of 4-week totals ending August 5, 1995, with historical data — United States



*The large apparent decrease in the number of reported cases of measles (total) reflects dramatic fluctuations in the historical baseline.
†Ratio of current 4-week total to mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

TABLE I. Summary — cases of specified notifiable diseases, United States, cumulative, week ending August 5, 1995 (31st Week)

	Cum. 1995		Cum. 1995
Anthrax	-	Psittacosis	40
Brucellosis	53	Rabies, human	1
Cholera	8	Rocky Mountain Spotted Fever	251
Congenital rubella syndrome	4	Syphilis, congenital, age < 1 year§	132
Diphtheria*	-	Tetanus	13
Haemophilus influenzae†	745	Toxic shock syndrome	115
Hansen Disease	85	Trichinosis	23
Plague	5	Typhoid fever	177
Poliomyelitis, Paralytic	-		

*The case previously reported in 1995 had onset of illness in October 1994. It will now be included in 1994 data.
†Of 724 cases of known age, 176 (24%) were reported among children less than 5 years of age.
§Updated quarterly from reports to the Division of Sexually Transmitted Diseases and HIV Prevention, National Center for Prevention Services. This total through first quarter 1995.
-: no reported cases

TABLE II. Cases of selected notifiable diseases, United States, weeks ending August 5, 1995, and August 6, 1994 (31st Week)

Reporting Area	AIDS*	Gonorrhea		Hepatitis (Viral), by type						Legionellosis	
				A		B		C/NA,NB			
	Cum. 1995	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
UNITED STATES	42,294	208,913	234,670	15,551	13,675	5,888	6,801	2,558	2,426	736	870
NEW ENGLAND	2,116	2,674	4,720	156	186	120	227	73	91	14	18
Maine	74	44	56	17	17	6	10	-	-	4	2
N.H.	61	71	64	6	13	13	16	10	7	1	-
Vt.	18	34	16	4	5	1	6	1	6	-	-
Mass.	937	1,627	1,778	65	75	46	137	58	62	8	8
R.I.	147	298	283	20	15	8	6	4	16	1	8
Conn.	879	600	2,523	44	61	46	52	-	-	N	N
MID. ATLANTIC	10,897	21,212	26,595	901	1,015	701	902	233	289	108	137
Upstate N.Y.	1,293	3,846	6,196	232	381	222	244	120	133	30	26
N.Y. City	5,641	7,375	9,782	408	348	207	187	1	1	1	-
N.J.	2,567	2,224	3,134	129	194	155	245	86	128	15	26
Pa.	1,396	7,767	7,483	132	92	117	226	26	27	62	85
E.N. CENTRAL	3,311	44,508	46,815	1,792	1,308	594	711	167	213	195	256
Ohio	673	13,636	13,305	1,147	425	73	102	7	14	96	117
Ind.	338	4,730	5,029	97	230	146	129	1	8	46	26
Ill.	1,408	12,064	13,988	217	343	94	189	33	60	13	24
Mich.	675	10,626	10,113	222	165	244	237	126	131	21	51
Wis.	217	3,452	4,380	109	145	37	54	-	-	19	38
W.N. CENTRAL	982	11,236	12,976	1,078	652	386	393	63	54	72	63
Minn.	219	1,668	1,878	113	136	32	41	2	11	-	2
Iowa	54	798	783	44	31	27	18	7	7	14	25
Mo.	427	6,496	7,351	770	297	279	292	40	12	41	20
N. Dak.	5	19	25	18	3	4	-	4	1	4	4
S. Dak.	9	100	113	31	17	2	-	1	-	-	-
Nebr.	75	491	835	31	90	20	21	5	10	8	10
Kans.	193	1,664	1,991	71	78	22	21	4	13	5	2
S. ATLANTIC	10,753	60,857	62,152	732	673	860	1,318	197	298	131	204
Del.	192	1,257	1,114	7	16	2	9	1	1	1	6
Md.	1,429	7,257	11,381	125	100	160	214	2	17	22	52
D.C.	640	2,683	4,370	15	15	13	32	-	-	4	5
Va.	885	6,163	7,823	115	91	65	72	9	18	9	5
W. Va.	47	471	448	12	7	32	24	34	21	3	1
N.C.	586	14,503	15,539	71	70	176	172	36	40	23	13
S.C.	569	7,209	7,642	26	27	33	22	15	6	22	9
Ga.	1,443	9,263	U	54	23	63	496	15	163	23	86
Fla.	4,962	12,051	13,835	307	324	316	277	85	32	24	27
E.S. CENTRAL	1,397	26,169	27,400	953	317	537	658	668	521	25	64
Ky.	178	2,760	2,857	26	102	41	57	13	17	3	8
Tenn.	562	8,141	8,584	828	132	428	553	653	495	16	32
Ala.	378	11,040	9,733	54	51	68	48	2	9	5	9
Miss.	279	4,228	6,226	45	32	-	-	-	-	1	15
W.S. CENTRAL	3,729	21,091	28,062	1,915	1,727	866	671	391	172	8	26
Ark.	166	1,966	4,141	253	48	30	15	3	5	1	5
La.	609	7,205	7,448	53	91	110	107	101	94	2	8
Okla.	174	1,456	2,859	466	157	275	77	259	38	3	9
Tex.	2,780	10,464	13,614	1,143	1,431	451	472	28	35	2	4
MOUNTAIN	1,328	5,213	5,887	2,492	2,664	518	385	275	262	86	62
Mont.	15	40	52	60	15	16	15	10	5	4	14
Idaho	31	70	51	218	197	56	58	33	59	2	1
Wyo.	7	31	48	88	13	17	14	122	80	7	3
Colo.	453	1,754	1,967	320	312	77	63	40	46	36	13
N. Mex.	111	609	599	537	671	187	126	34	37	3	2
Ariz.	351	1,816	1,969	681	1,020	89	35	18	12	7	4
Utah	87	131	176	497	286	55	40	8	11	13	6
Nev.	273	762	1,025	91	150	21	34	10	12	14	19
PACIFIC	7,781	15,953	20,063	5,532	5,133	1,306	1,536	491	526	97	40
Wash.	581	1,432	1,752	459	656	109	139	126	147	14	8
Oreg.	256	212	571	1,114	574	53	87	28	23	-	-
Calif.	6,733	13,499	16,749	3,823	3,731	1,123	1,276	327	352	78	30
Alaska	50	424	542	29	140	9	10	1	-	-	-
Hawaii	161	386	449	107	32	12	24	9	4	5	2
Guam	-	51	75	2	13	1	4	-	-	1	1
P.R.	1,635	316	312	60	36	453	196	217	98	-	-
V.I.	25	6	14	-	2	2	6	-	1	-	-
Amer. Samoa	-	15	18	5	5	-	-	-	-	-	-
C.N.M.I.	-	20	31	15	4	7	1	-	-	-	-

N: Not notifiable U: Unavailable -: no reported cases C.N.M.I.: Commonwealth of Northern Mariana Islands

*Updated monthly to the Division of HIV/AIDS Prevention, National Center for Prevention Services, last update July 27, 1995.

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending August 5, 1995, and August 6, 1994 (31st Week)

Reporting Area	Lyme Disease		Malaria		Measles (Rubeola)						Meningococcal Infections		Mumps	
					Indigenous		Imported*		Total					
	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	1995	Cum. 1995	1995	Cum. 1995	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
UNITED STATES	3,717	5,888	602	577	2	211	-	10	221	827	1,995	1,818	522	852
NEW ENGLAND	1,072	1,430	26	41	-	7	-	-	7	26	94	78	9	15
Maine	11	7	3	2	-	-	-	-	-	5	6	13	4	3
N.H.	15	13	1	3	-	-	-	-	-	1	17	7	1	4
Vt.	6	6	-	1	-	-	-	-	-	3	6	2	-	-
Mass.	98	78	9	20	-	2	-	-	2	7	34	35	2	1
R.I.	174	190	2	5	-	5	-	-	5	7	-	-	-	1
Conn.	768	1,136	11	10	-	-	-	-	-	3	31	21	2	6
MID. ATLANTIC	2,001	3,419	148	103	1	5	-	2	7	209	241	190	69	79
Upstate N.Y.	1,033	2,230	35	31	1	1	-	-	1	15	79	61	19	23
N.Y. City	66	8	68	32	-	2	-	2	4	13	28	24	5	2
N.J.	356	746	32	20	-	2	-	-	2	173	65	41	6	13
Pa.	546	435	13	20	-	-	-	-	-	8	69	64	39	41
E.N. CENTRAL	48	378	70	61	-	7	-	2	9	102	258	264	91	151
Ohio	30	23	5	8	-	1	-	-	1	17	86	74	29	41
Ind.	10	10	12	9	-	-	-	-	-	1	39	37	3	6
Ill.	3	16	32	28	-	-	-	1	1	56	71	91	28	67
Mich.	5	5	13	14	-	4	-	1	5	25	52	34	31	31
Wis.	-	324	8	2	-	2	-	-	2	3	10	28	-	6
W.N. CENTRAL	88	98	15	28	-	2	-	-	2	170	128	120	31	44
Minn.	42	25	3	8	-	-	-	-	-	-	21	11	2	3
Iowa	6	5	1	4	-	-	-	-	-	7	23	14	8	11
Mo.	23	63	5	10	-	1	-	-	1	160	50	59	17	27
N. Dak.	-	-	1	1	-	-	-	-	-	-	1	1	-	2
S. Dak.	-	-	1	-	-	-	-	-	-	-	5	7	-	-
Nebr.	1	2	3	4	-	-	-	-	-	2	11	9	4	1
Kans.	16	3	1	1	-	1	-	-	1	1	17	19	-	-
S. ATLANTIC	359	423	128	104	-	10	-	1	11	52	362	265	81	136
Del.	7	45	1	3	-	-	-	-	-	-	5	4	-	-
Md.	244	138	33	43	-	-	-	1	1	3	28	22	20	38
D.C.	1	3	11	8	-	-	-	-	-	-	3	3	-	-
Va.	30	77	29	12	-	-	-	-	-	2	44	50	16	30
W. Va.	17	12	1	-	-	-	-	-	-	37	7	11	-	3
N.C.	33	49	11	2	-	-	-	-	-	3	56	41	16	33
S.C.	9	7	-	2	-	-	-	-	-	-	47	12	7	6
Ga.	11	85	12	17	-	2	-	-	2	2	74	61	8	8
Fla.	7	7	30	17	-	8	-	-	8	5	98	61	14	18
E.S. CENTRAL	23	25	11	20	-	-	-	-	-	28	122	136	13	15
Ky.	4	15	1	7	-	-	-	-	-	-	40	30	-	-
Tenn.	16	7	4	7	-	-	-	-	-	28	35	25	-	5
Ala.	1	3	5	5	-	-	-	-	-	-	28	52	4	3
Miss.	2	-	1	1	-	-	-	-	-	-	19	29	9	7
W.S. CENTRAL	66	65	17	25	-	19	-	-	19	16	252	218	34	169
Ark.	5	3	3	2	-	2	-	-	2	1	21	36	2	5
La.	1	-	2	5	-	17	-	-	17	1	37	28	8	20
Okla.	25	35	1	2	-	-	-	-	-	-	24	22	-	23
Tex.	35	27	11	16	-	-	-	-	-	14	170	132	24	121
MOUNTAIN	8	4	36	22	-	49	-	1	50	162	143	128	24	35
Mont.	-	-	3	-	-	-	-	-	-	-	2	6	1	-
Idaho	-	2	1	2	-	-	-	-	-	-	6	15	2	7
Wyo.	5	1	-	1	-	-	-	-	-	-	5	5	-	1
Colo.	1	-	16	10	-	8	-	-	8	19	36	24	1	3
N. Mex.	1	-	4	3	-	30	-	1	31	-	30	12	N	N
Ariz.	-	-	6	1	-	10	-	-	10	1	46	43	2	3
Utah	-	1	5	4	-	-	-	-	-	133	11	16	11	12
Nev.	1	-	1	1	-	1	-	-	1	9	7	7	6	9
PACIFIC	52	46	151	173	1	112	-	4	116	62	395	419	170	208
Wash.	4	-	13	16	1	14	-	2	16	3	68	64	10	14
Oreg.	3	5	5	12	-	1	-	-	1	-	62	89	N	N
Calif.	45	41	123	135	-	97	-	1	98	52	254	259	143	182
Alaska	-	-	1	-	-	-	-	-	-	5	7	2	13	2
Hawaii	-	-	9	10	-	-	-	1	1	2	4	5	4	10
Guam	-	-	-	-	U	-	U	-	-	228	3	-	3	4
P.R.	-	-	1	3	U	11	U	-	11	11	13	6	-	2
V.I.	-	-	-	-	U	-	U	-	-	-	-	-	2	3
Amer. Samoa	-	-	-	-	-	-	-	-	-	-	-	-	-	2
C.N.M.I.	-	-	1	1	U	-	U	-	-	29	-	-	-	2

*For imported measles, cases include only those resulting from importation from other countries.
N: Not notifiable U: Unavailable -: no reported cases

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending August 5, 1995, and August 6, 1994 (31st Week)

Reporting Area	Pertussis			Rubella			Syphilis (Primary & Secondary)		Tuberculosis		Rabies, Animal	
	1995	Cum. 1995	Cum. 1994	1995	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
UNITED STATES	91	1,746	2,138	2	94	199	9,107	12,762	10,918	12,680	4,225	4,404
NEW ENGLAND	8	245	223	-	22	126	100	138	272	268	957	1,102
Maine	1	22	2	-	1	-	2	4	12	-	22	-
N.H.	-	21	44	-	1	-	1	3	9	13	106	111
Vt.	1	32	28	-	-	-	-	-	3	4	120	95
Mass.	6	159	125	-	6	123	36	57	141	135	310	417
R.I.	-	1	5	-	-	2	1	11	27	32	178	5
Conn.	-	10	19	-	14	1	60	63	80	84	221	474
MID. ATLANTIC	-	143	329	-	7	6	529	842	2,281	2,488	821	1,101
Upstate N.Y.	-	73	125	-	4	5	43	108	245	324	312	820
N.Y. City	-	23	67	-	3	-	243	371	1,229	1,518	-	-
N.J.	-	5	11	-	-	1	110	135	432	455	234	172
Pa.	-	42	126	-	-	-	133	228	375	191	275	109
E.N. CENTRAL	1	152	343	1	3	9	1,554	1,836	1,068	1,225	35	34
Ohio	-	52	99	-	-	-	536	670	161	188	5	-
Ind.	-	13	40	-	-	-	159	153	42	101	5	9
Ill.	1	39	69	1	1	1	587	634	597	618	3	10
Mich.	-	36	29	-	2	8	173	174	227	281	18	9
Wis.	-	12	106	-	-	-	99	205	41	37	4	6
W.N. CENTRAL	1	96	90	-	-	2	473	744	358	328	201	134
Minn.	-	28	39	-	-	-	28	26	85	71	6	14
Iowa	-	5	6	-	-	-	28	35	44	28	74	54
Mo.	-	23	26	-	-	2	405	636	134	149	19	12
N. Dak.	-	6	4	-	-	-	-	1	2	6	23	7
S. Dak.	1	8	1	-	-	-	-	1	13	16	49	22
Nebr.	-	6	5	-	-	-	3	11	17	16	3	-
Kans.	-	20	9	-	-	-	9	34	63	42	27	25
S. ATLANTIC	16	197	214	1	26	13	2,289	3,306	2,050	2,362	1,286	1,222
Del.	1	9	1	-	-	-	8	18	12	26	33	33
Md.	2	18	57	-	-	-	130	159	236	189	257	345
D.C.	-	4	4	-	-	-	73	149	63	72	10	2
Va.	-	10	17	-	-	-	369	487	136	202	250	228
W. Va.	-	-	3	-	-	-	8	8	49	52	74	48
N.C.	3	76	58	1	1	-	681	1,038	254	269	291	102
S.C.	-	16	11	-	1	-	358	453	193	217	84	114
Ga.	3	16	22	-	1	1	430	505	323	454	167	248
Fla.	7	48	41	-	23	12	232	489	784	881	120	102
E.S. CENTRAL	-	88	106	-	-	-	2,354	2,237	677	861	152	119
Ky.	-	8	55	-	-	-	130	124	53	195	14	11
Tenn.	-	50	18	-	-	-	492	599	262	265	49	34
Ala.	-	30	22	-	-	-	382	405	236	250	85	71
Miss.	-	-	11	N	N	N	1,350	1,109	126	151	4	3
W.S. CENTRAL	23	137	85	-	6	12	1,266	2,855	1,300	1,573	491	432
Ark.	22	22	14	-	-	-	92	301	92	153	21	15
La.	-	10	9	-	-	-	643	1,072	6	7	23	47
Okla.	-	22	21	-	-	4	49	100	124	148	25	24
Tex.	1	83	41	-	6	8	482	1,382	1,078	1,265	422	346
MOUNTAIN	12	318	278	-	4	4	174	186	345	319	89	86
Mont.	-	3	4	-	-	-	4	2	10	9	29	10
Idaho	-	77	24	-	-	-	-	1	9	11	1	2
Wyo.	-	1	-	-	-	-	4	-	1	4	20	14
Colo.	1	24	147	-	-	-	85	93	22	35	-	7
N. Mex.	3	56	17	-	-	-	30	18	50	43	3	2
Ariz.	7	135	70	-	3	-	19	37	168	128	26	41
Utah	1	17	14	-	1	3	4	9	19	29	7	7
Nev.	-	5	2	-	-	1	28	26	66	60	3	3
PACIFIC	30	370	470	-	26	27	368	618	2,567	3,256	193	174
Wash.	15	93	56	-	1	-	9	25	157	167	2	6
Oreg.	4	15	62	-	1	3	6	21	25	90	-	3
Calif.	10	226	340	-	21	21	352	567	2,239	2,806	187	134
Alaska	-	-	-	-	-	-	1	3	47	37	4	31
Hawaii	1	36	12	-	3	3	-	2	99	156	-	-
Guam	U	-	2	U	-	1	3	3	33	45	-	-
P.R.	U	6	2	U	-	-	158	196	89	102	25	55
V.I.	U	-	-	U	-	-	2	22	-	-	-	-
Amer. Samoa	-	-	-	-	-	-	-	1	3	3	-	-
C.N.M.I.	U	-	-	U	-	-	3	1	13	16	-	-

U: Unavailable -: no reported cases

TABLE III. Deaths in 121 U.S. cities,* week ending August 5, 1995 (31st Week)

Reporting Area	All Causes, By Age (Years)						P&I† Total
	All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	621	454	82	58	10	15	36
Boston, Mass.	165	109	30	19	3	4	6
Bridgeport, Conn.	52	37	7	7	1	-	2
Cambridge, Mass.	19	16	1	2	-	-	-
Fall River, Mass.	27	24	2	1	-	-	1
Hartford, Conn.	50	35	8	6	-	1	2
Lowell, Mass.	13	12	-	1	-	-	2
Lynn, Mass.	10	5	3	1	-	-	-
New Bedford, Mass.	32	29	3	-	-	-	3
New Haven, Conn.	45	30	6	5	2	2	4
Providence, R.I.	53	46	6	1	-	-	4
Somerville, Mass.	3	1	1	-	-	-	-
Springfield, Mass.	46	34	6	2	2	2	3
Waterbury, Conn.	48	36	2	7	1	2	5
Worcester, Mass.	58	40	7	6	1	4	4
MID. ATLANTIC	2,250	1,437	453	264	47	46	97
Albany, N.Y.	45	31	10	2	1	1	4
Allentown, Pa.	20	18	2	-	-	-	-
Buffalo, N.Y.	105	72	19	12	1	1	4
Camden, N.J.	29	15	5	7	1	1	2
Elizabeth, N.J.	17	11	2	4	-	-	-
Erie, Pa.§	40	30	7	1	2	-	3
Jersey City, N.J.	51	28	12	8	1	2	2
New York City, N.Y.	1,344	819	285	186	28	26	42
Newark, N.J.	U	U	U	U	U	U	U
Paterson, N.J.	27	11	8	5	-	-	3
Philadelphia, Pa.	200	126	49	18	3	4	12
Pittsburgh, Pa.§	66	45	13	3	3	2	6
Reading, Pa.	21	16	4	1	-	-	-
Rochester, N.Y.	112	84	12	8	5	3	12
Schenectady, N.Y.	20	15	3	2	-	-	-
Scranton, Pa.§	17	15	2	-	-	-	-
Syracuse, N.Y.	96	68	16	6	2	4	5
Trenton, N.J.	22	16	3	1	-	2	2
Utica, N.Y.	18	17	1	-	-	-	-
Yonkers, N.Y.	U	U	U	U	U	U	U
E.N. CENTRAL	2,075	1,320	407	182	68	81	115
Akron, Ohio	58	37	13	5	1	2	-
Canton, Ohio	44	34	6	1	2	1	1
Chicago, Ill.	477	282	103	60	14	18	33
Cincinnati, Ohio	71	33	9	3	3	6	3
Cleveland, Ohio	131	75	28	12	3	13	3
Columbus, Ohio	148	88	31	15	3	11	8
Dayton, Ohio	114	72	23	15	3	1	5
Detroit, Mich.	200	108	45	24	11	12	7
Evansville, Ind.	40	29	7	3	1	-	5
Fort Wayne, Ind.	59	38	10	4	4	3	4
Gary, Ind.	21	9	5	3	4	-	-
Grand Rapids, Mich.	44	27	13	2	1	1	10
Indianapolis, Ind.	178	115	37	13	4	9	11
Madison, Wis.	51	37	6	2	6	-	2
Milwaukee, Wis.	149	113	28	5	1	2	12
Peoria, Ill.	37	30	5	2	-	-	3
Rockford, Ill.	46	35	5	5	1	-	-
South Bend, Ind.	48	37	8	-	3	-	3
Toledo, Ohio	108	76	21	6	3	2	5
Youngstown, Ohio	51	45	4	2	-	-	-
W.N. CENTRAL	582	401	90	41	26	11	24
Des Moines, Iowa	U	U	U	U	U	U	U
Duluth, Minn.	17	11	5	1	-	-	-
Kansas City, Kans.	U	U	U	U	U	U	U
Kansas City, Mo.	112	63	16	8	9	3	3
Lincoln, Nebr.	38	27	9	1	1	-	1
Minneapolis, Minn.	164	115	25	14	6	4	13
Omaha, Nebr.	78	62	10	2	3	1	3
St. Louis, Mo.	115	81	15	11	6	2	1
St. Paul, Minn.	58	42	10	4	1	1	3
Wichita, Kans.	U	U	U	U	U	U	U

Reporting Area	All Causes, By Age (Years)						P&I† Total
	All Ages	≥65	45-64	25-44	1-24	<1	
S. ATLANTIC	1,283	760	276	166	49	30	69
Atlanta, Ga.	161	89	40	23	6	3	5
Baltimore, Md.	270	161	40	50	15	4	25
Charlotte, N.C.	103	58	29	8	4	3	6
Jacksonville, Fla.	100	61	24	7	4	4	6
Miami, Fla.	100	65	21	8	6	-	1
Norfolk, Va.	47	23	11	9	3	-	3
Richmond, Va.	58	38	8	10	1	1	4
Savannah, Ga.	48	33	9	4	1	1	6
St. Petersburg, Fla.	47	36	6	1	1	3	4
Tampa, Fla.	152	80	50	17	4	1	3
Washington, D.C.	187	108	36	29	4	10	6
Wilmington, Del.	10	8	2	-	-	-	-
E.S. CENTRAL	693	441	121	70	28	33	50
Birmingham, Ala.	U	U	U	U	U	U	U
Chattanooga, Tenn.	89	66	15	5	1	2	6
Knoxville, Tenn.	46	32	10	-	2	2	2
Lexington, Ky.	76	56	8	7	4	1	10
Memphis, Tenn.	187	108	28	21	9	21	15
Mobile, Ala.	80	55	8	11	3	3	5
Montgomery, Ala.	71	44	21	3	2	1	5
Nashville, Tenn.	144	80	31	23	7	3	7
W.S. CENTRAL	1,431	885	290	168	58	30	73
Austin, Tex.	82	46	14	14	7	1	4
Baton Rouge, La.	82	49	16	9	6	2	2
Corpus Christi, Tex.	48	33	12	1	2	-	2
Dallas, Tex.	213	134	40	24	8	7	4
El Paso, Tex.	63	35	11	6	4	7	6
Ft. Worth, Tex.	96	55	21	15	3	2	7
Houston, Tex.	357	195	89	56	13	4	25
Little Rock, Ark.	61	45	9	5	1	1	-
New Orleans, La.	64	41	8	12	3	-	-
San Antonio, Tex.	172	120	29	9	8	6	11
Shreveport, La.	81	52	17	10	2	-	4
Tulsa, Okla.	112	80	24	7	1	-	8
MOUNTAIN	834	510	145	114	50	15	45
Albuquerque, N.M.	98	61	17	11	8	1	3
Colo. Springs, Colo.	41	25	8	6	2	-	3
Denver, Colo.	125	81	12	17	7	8	6
Las Vegas, Nev.	132	51	32	34	14	1	4
Ogden, Utah	32	28	3	1	-	-	1
Phoenix, Ariz.	160	92	33	21	11	3	9
Pueblo, Colo.	30	21	6	1	2	-	2
Salt Lake City, Utah	104	71	18	11	2	2	11
Tucson, Ariz.	112	80	16	12	4	-	6
PACIFIC	2,094	1,399	367	210	82	36	86
Berkeley, Calif.	19	10	6	1	1	1	-
Fresno, Calif.	U	U	U	U	U	U	U
Glendale, Calif.	17	14	2	1	-	-	1
Honolulu, Hawaii	68	50	14	4	-	-	7
Long Beach, Calif.	82	52	13	9	4	4	6
Los Angeles, Calif.	979	637	175	105	51	11	-
Pasadena, Calif.	20	11	4	3	-	2	2
Portland, Oreg.	118	84	19	11	1	3	6
Sacramento, Calif.	172	119	28	10	10	5	18
San Diego, Calif.	U	U	U	U	U	U	U
San Francisco, Calif.	152	99	21	28	3	1	18
San Jose, Calif.	169	115	33	17	1	3	19
Santa Cruz, Calif.	21	17	2	1	1	-	1
Seattle, Wash.	135	86	22	17	6	4	2
Spokane, Wash.	48	40	7	-	1	-	3
Tacoma, Wash.	94	65	21	3	3	2	3
TOTAL	11,863¶	7,607	2,231	1,273	418	297	595

*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.
†Pneumonia and influenza.
§Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.
¶Total includes unknown ages.
U: Unavailable -: no reported cases

Rabies — Continued

of infected raccoons from the southeastern United States during the late 1970s; raccoons are now the primary rabies reservoir in the United States (*3*). A recent surge in popularity of coyote hunting in the southeastern United States has resulted in an increase in sales of wild canids for foxpens; although coyotes are indigenous to that region, some of these animals may have been imported illegally. Intensified surveillance for this rabies variant is warranted in those states where residents participate in coyote hunting in enclosures.

In addition to rabies, public health risks associated with wildlife translocation include zoonotic infections such as plague, hantavirus pulmonary syndrome, brucellosis, echinococcosis, Lyme disease, Rocky Mountain spotted fever, ehrlichiosis, and tularemia. However, federal and state regulations have not been applied consistently to the interstate movement of native wildlife. Because of the public health risks and lack of feasible methods to certify animals as free of many of these zoonotic agents, restrictions on the interstate movement of native wildlife may need to be considered.

The Florida Department of Health and Rehabilitative Services and CDC are strain-typing all rabies variants found in wild and domestic canids. No additional isolates of the coyote rabies variant have been identified in Florida.

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Laboratory Practices for Diagnosis of Tuberculosis — United States, 1994

The increase in cases of tuberculosis (TB) during 1985–1992 and the emergence of multidrug-resistant *Mycobacterium tuberculosis* strains led to recommendations for rapid laboratory testing to support control efforts and selection of proper therapy (*1,2*). Many laboratories have adopted the recommendations to use rapid acid-fast bacilli (AFB) smears, growth detection (i.e., primary culture), identification, and drug-susceptibility testing for *M. tuberculosis* (*3*). The regulations implementing the 1988 Clinical Laboratory Improvement Amendments* (CLIA) require all laboratories that perform any mycobacteriology testing to enroll in federally approved proficiency testing (PT) programs. This report summarizes information reported by the laboratories to PT programs in the United States about their practices for *M. tuberculosis*.

*42 CFR 493.825.

Laboratory Practices — Continued

The PT programs submit samples of unknown content to laboratories for testing in the same manner as actual patient specimens; the laboratories subsequently report methods and test results to the program. In 1994, the U.S. Department of Health and Human Services approved six PT programs for mycobacteriology testing: five programs (the College of American Pathologists [CAP]; the states of New Jersey, New York, and Wisconsin; and the Commonwealth of Puerto Rico) provide PT testing for AFB smears, growth detection, organism identification, and drug-susceptibility testing; and one program (the American Association of Bioanalysts) provides testing for AFB smears only.

To determine the number of laboratories that performed various levels of testing for *M. tuberculosis*, laboratories were classified into four categories based on the practices specifically reported for *M. tuberculosis*. These categories were laboratories that perform 1) AFB smears and refer all specimens for primary culture to another laboratory; 2) AFB smears and primary cultures for *M. tuberculosis* but refer all AFB-positive culture isolates for organism identification and drug-susceptibility tests; 3) AFB smears and primary culture with identification of *M. tuberculosis* isolates but refer isolates for drug-susceptibility testing; and 4) AFB smears, primary culture, identification, and drug-susceptibility testing for *M. tuberculosis*. Some laboratories must enroll in more than one PT program to meet the requirements of both state laboratory licensure programs and private laboratory accreditation programs. Therefore, because most laboratories were enrolled in the CAP PT program, the actual number of laboratories in each of the four categories ranges from a minimum that represents the enrollment of CAP only to a maximum that represents the total reported enrollment for all PT programs.

In 1994, a total of 2862 mycobacteriology laboratories were enrolled in PT programs; 2459 (85%) were enrolled in CAP. Category-specific enrollment ranged from 506 (CAP only) to 683 (all PT programs) for laboratories that perform AFB smears only, 1126–1166 for those that perform primary culture without organism identification, 568–699 for those that perform primary culture and identification, and 259–314 for those that perform primary culture, identification, and drug-susceptibility testing (Figure 1).

Of the 2862 mycobacteriology laboratories, 2179 reported performing primary culture for *M. tuberculosis*. Of these, 1166 (54%) referred any AFB-positive isolates to another laboratory for organism identification and drug-susceptibility testing, 699 (32%) performed primary culture with identification, and 314 (14%) performed primary culture, identification, and drug-susceptibility testing. Similarly, of the 1953 laboratories enrolled in CAP only that reported performing primary culture for *M. tuberculosis*, 1126 (58%) referred any AFB-positive isolates to another laboratory for organism identification and drug-susceptibility testing, 568 (29%) performed primary culture with identification, and 259 (13%) performed primary culture, identification, and drug-susceptibility testing.

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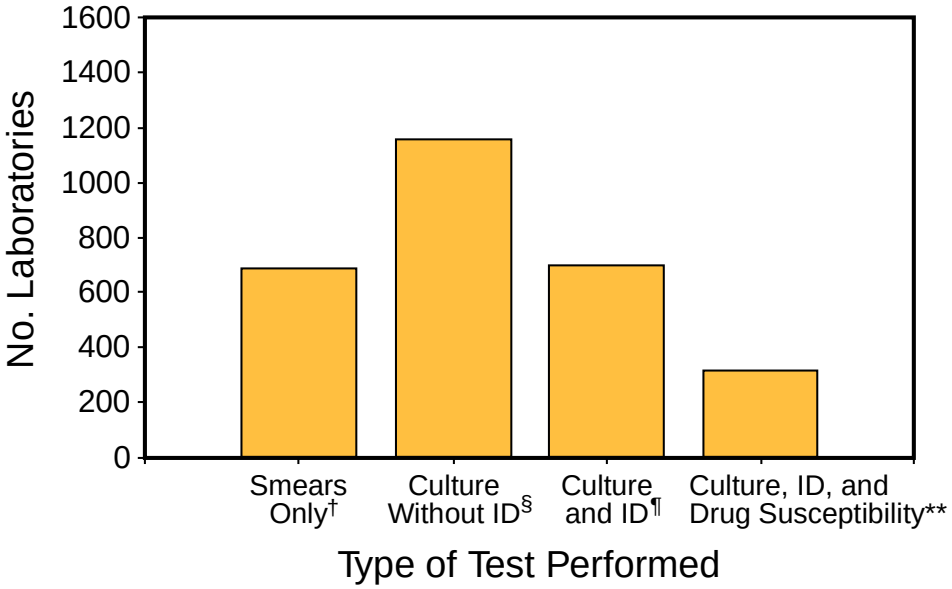
Editorial Note: Rapid laboratory testing to identify and determine the drug susceptibility of *M. tuberculosis* isolates is vital to effective diagnosis, treatment, and control of

Laboratory Practices — Continued

FIGURE 1. Number of laboratories enrolled in proficiency testing (PT) programs for *Mycobacterium tuberculosis*, by type of test performed — United States, 1994*



* n=2862. Data provided by the six PT programs approved by the U.S. Department of Health and Human Services in 1994 to perform mycobacteriology testing. These programs are the College of American Pathologists; the American Association of Bioanalysts; the states of New Jersey, New York, and Wisconsin; and the Commonwealth of Puerto Rico.
† Laboratories that perform acid-fast bacilli (AFB) smears and refer all specimens for primary culture to another laboratory.
§ Laboratories that perform AFB smears and primary culture for *M. tuberculosis* but refer all AFB-positive isolates for organism identification and drug-susceptibility tests.
¶ Laboratories that perform AFB smears, primary culture, and identification of *M. tuberculosis* but refer isolates for drug-susceptibility testing.
** Laboratories that perform AFB smears, primary culture, organism identification, and drug-susceptibility testing for *M. tuberculosis*.

TB in the community. The findings in this report indicate that for a substantial proportion of TB cases, organism identification and drug-susceptibility determinations may be delayed because at least 54% of laboratories performing primary cultures for *M. tuberculosis* must refer AFB culture isolates to another laboratory for complete analysis.

Although both solid and liquid media together are recommended for culturing *M. tuberculosis*, the liquid-culture method is needed to rapidly isolate and detect the organism in primary culture and to test susceptibility to the primary anti-TB drugs (*1*). In addition to decreasing the time required to detect and isolate mycobacteria, liquid-culture methods also increase the sensitivity of culture for *M. tuberculosis* (*1,4*). Although primary culture-isolation methods are not routinely reported to PT programs, a 1992 survey of 749 laboratories that performed primary culture with referral of all isolates to another laboratory indicated that 97 (13%) were using the recommended liquid-culture method (CAP, unpublished data, 1994). In addition, a survey of hospital laboratories in 1992 indicated that only 35 (14%) of 248 laboratories that referred isolates for identification of *M. tuberculosis* used the recommended liquid-culture method compared with 139 (50%) of 280 laboratories that routinely

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identified isolates of *M. tuberculosis* (CDC, unpublished data, 1994). Reasons for the continued use of solid-culture medium alone may reflect minimum test-volume requirements and higher costs associated with the liquid-culture system.

The exclusive use of solid-medium culture methods delays isolation of *M. tuberculosis* by an average of 7–10 days (*4*), thereby delaying organism identification to confirm diagnosis. In addition, the referral of AFB-positive culture growth to another laboratory may result in delays associated with transport. These delays also may prolong determination of whether isolates are resistant to anti-TB drugs: in 1994, based on test results for 28 states, 8% of cases were resistant to isoniazid (INH) and 2% were resistant to both INH and rifampin (*5*). At least one state (i.e., New York) has regulations that prohibit laboratories from performing primary culture if the laboratory does not perform identification of *M. tuberculosis*.

The findings in this report are subject to at least two limitations. First, data were unavailable about the proportion of all *M. tuberculosis* specimens tested by each of the four categories of laboratories enrolled in PT programs. Second, data were unavailable to determine whether laboratories that refer culture isolates for identification have adopted use of liquid-culture methods.

Laboratories should select culture tests that provide rapid identification of *M. tuberculosis* and drug-susceptibility test results to enable early confirmation of the diagnosis and initiation of infection-control measures and case-finding. Laboratories that perform only primary culture for *M. tuberculosis* should determine whether referral of the patient specimen, rather than culture isolates, may decrease the time required for identification and drug-susceptibility testing.

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Notice to Readers

Recommendations for Test Performance and Interpretation from the Second National Conference on Serologic Diagnosis of Lyme Disease

The Association of State and Territorial Public Health Laboratory Directors, CDC, the Food and Drug Administration, the National Institutes of Health, the Council of State and Territorial Epidemiologists, and the National Committee for Clinical Laboratory Standards cosponsored the Second National Conference on Serologic Diagnosis of Lyme Disease held October 27–29, 1994. Conference recommendations were

Notice to Readers — Continued

grouped into four categories: 1) serologic test performance and interpretation, 2) quality-assurance practices, 3) new test evaluation and clearance, and 4) communication of developments in Lyme disease (LD) testing. This report presents recommendations for serologic test performance and interpretation, which included substantial changes in the recommended tests and their interpretation for the serodiagnosis of LD.

A two-test approach for active disease and for previous infection using a sensitive enzyme immunoassay (EIA) or immunofluorescent assay (IFA) followed by a Western immunoblot was the algorithm of choice. All specimens positive or equivocal by a sensitive EIA or IFA should be tested by a standardized Western immunoblot. Specimens negative by a sensitive EIA or IFA need not be tested further. When Western immunoblot is used during the first 4 weeks of disease onset (early LD), both immunoglobulin M (IgM) and immunoglobulin G (IgG) procedures should be performed. A positive IgM test result alone is not recommended for use in determining active disease in persons with illness >1 month's duration because the likelihood of a false-positive test result for a current infection is high for these persons. If a patient with suspected early LD has a negative serology, serologic evidence of infection is best obtained by testing of paired acute- and convalescent-phase serum samples. Serum samples from persons with disseminated or late-stage LD almost always have a strong IgG response to *Borrelia burgdorferi* antigens.

It was recommended that an IgM immunoblot be considered positive if two of the following three bands are present: 24 kDa (OspC)*, 39 kDa (BmpA), and 41 kDa (Fla) (*1*). It was further recommended that an that IgG immunoblot be considered positive if five of the following 10 bands are present: 18 kDa, 21 kDa (OspC)*, 28 kDa, 30 kDa, 39 kDa (BmpA), 41 kDa (Fla), 45 kDa, 58 kDa (not GroEL), 66 kDa, and 93 kDa (*2*).

The details of both plenary sessions and the work group deliberations are included in the publication of the proceedings, which is available from the Association of State and Territorial Public Health Laboratory Directors; telephone (202) 822-5227.

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*The apparent molecular mass of OspC is dependent on the strain of *B. burgdorferi* being tested. The 24 kDa and 21 kDa proteins referred to are the same.

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