

National TB Laboratory Services Survey Report: Biosafety

BACKGROUND

APHL and CDC completed the National TB Laboratory Services Survey in 2011. The purpose of the survey was to assess the overall ability of commercial, clinical and public health laboratories in the United States to provide quality tuberculosis (TB) diagnostic services.

This issue brief describes survey results related to safety practices, one of 11 categories covered in the survey. Results were based on answers to seven questions on this topic, including those on appropriate biosafety containment and work practices—critical in any laboratory but especially in those with *Mycobacterium tuberculosis*. Even with precautions, laboratory personnel working with *M. tuberculosis* have a higher incidence of tuberculosis than those not working with this agent.¹

Of the 1,444 laboratories that received the survey, 656 (45%) responded. Of that group, 580 (88%) indicated that they performed some level of in-house TB services. The results reported from those 580 laboratories are the only results included in the analysis discussed in this issue brief. The figures and tables in this document include more information about their safety practices.

EMPLOYEE SCREENING AND MONITORING PRACTICES: RESULTS SUMMARY AND RECOMMENDATIONS

Figure 1: New Employee Screening Practices (n=580) with tuberculin skin test (TST), Mantoux (2-step) TST and/or Interferon Gamma Release Assay (IGRA)

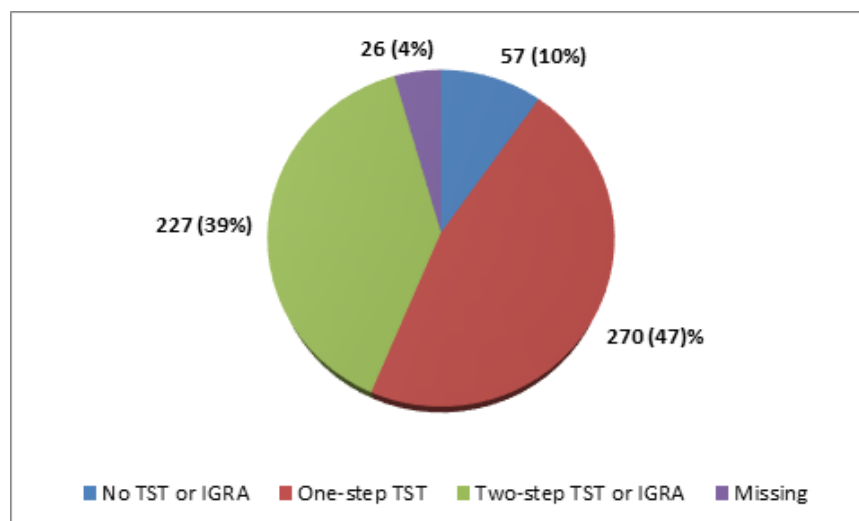


Figure 1: New Employee Screening Practices (n=580) with TST, Mantoux (2-step) TST and/or Interferon Gamma Release Assay (IGRA)

Figure 2: Employee Monitoring Practices (n=580)

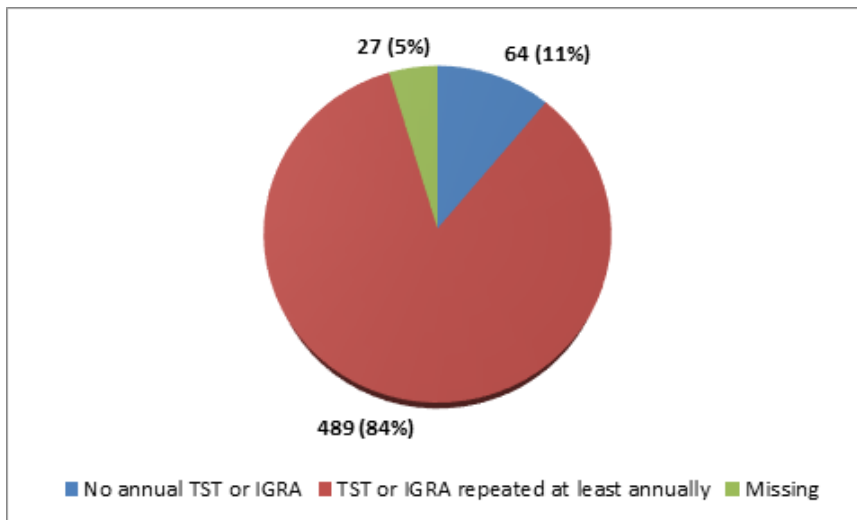


Figure 2: TST or IGRA is repeated at least annually by 84% (489/580) of respondents, while 11% (64/580) reported that annual TST or IGRA testing is not performed.

Figure 3: Practices for Symptom Reviews for Employees with LTBI (n=580)

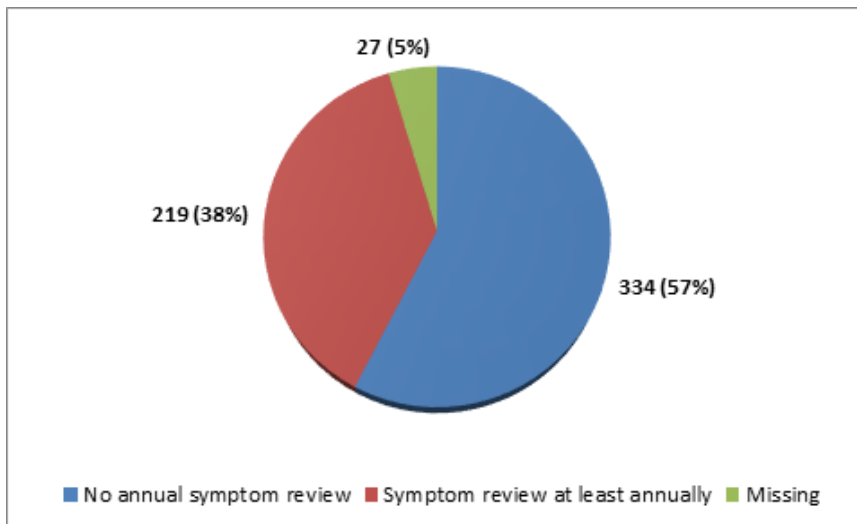


Figure 3: Fifty-seven percent (334/580) of respondents reported that no annual symptom review is performed, while 38% (219/580) said that symptom review occurs at least annually.

It is recommended that all employees be evaluated for latent TB infection (LTBI) to establish a baseline for future TSTs and IGRAs. Baseline results could assist with the identification of laboratory-acquired *M. tuberculosis* infections. If TST is used, the two-step method should be performed to detect any booster effect.^{2,6}

In a laboratory with no documented conversions (i.e., an employee going from a negative to a positive TST or IGRA) within three-five years, employees working with *M. tuberculosis* should be monitored at least annually with a TST or IGRA to detect any potential conversions. If conversions have been documented, testing should be repeated every three months until no additional conversions have been detected for two consecutive three-month intervals.^{2,6} In addition, any

employee with a past positive TST or IGRA result should undergo an annual symptom screen. In the event of a TST or IGRA conversion, supervisors should review laboratory practices, safety of equipment and adequacy of the current safety plan.⁶

If TB disease is excluded following documented conversion, employees should be offered treatment for LTBI in accordance with published guidelines and any educational materials associated with symptoms of TB disease. An annual symptom review should be administered.²⁻⁶

UTILIZATION OF RESPIRATORY PROTECTION: RESULTS SUMMARY AND RECOMMENDATIONS

Figure 4: Annual Respirator Fit Testing Available (n=580)

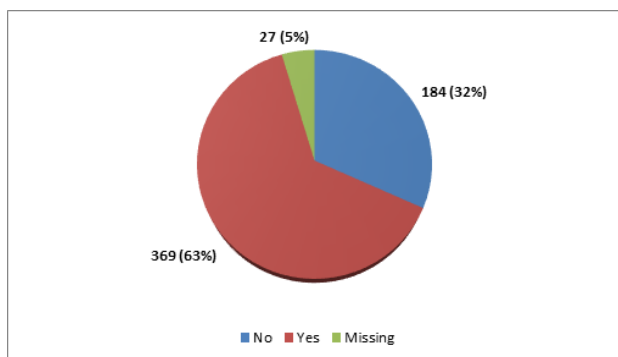


Figure 4: Sixty-three percent (369/580) of respondents reported having annual respirator fit test requirements.

Figure 5: Respiratory Protection Used in Laboratories Performing AFB Smear only (n=106)

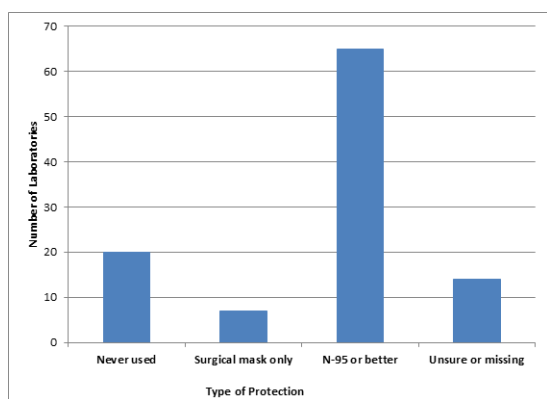
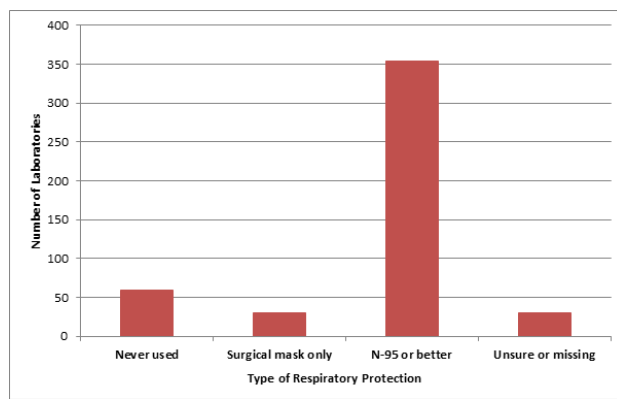


Figure 6: Respiratory Protection Used in Laboratories Performing AFB Smear and Culture (n=474)



Figures 5 and 6: Respirator use (N-95 or better) was reported in 65/106 (61%) of laboratories performing only AFB smear microscopy and in 354/474 (75%) of laboratories performing both AFB smear and culture.

Supervisors and healthcare workers should be trained in the selection, proper use and maintenance of respiratory protection recommended for use against airborne tubercle bacilli. Occupational Safety and Health Administration standards require that employers ensure annual fit testing if N-95 or N-100 respirators are used.^{5,6}

UTILIZATION OF BSL-1, BSL-2 AND BSL-3 FACILITIES: RESULTS SUMMARY AND RECOMMENDATIONS

Table 1: Biosafety Levels (BSL) Used for Mycobacteriology Testing in Laboratories Performing AFB Smear (n=106)			
Number of Laboratories			
BSL	Practices	Primary Barriers (Safety Equipment)	Secondary Barriers (Facilities)
1	11	8	21
2	72	70	56
3	9	14	10
Unknown or missing	14	14	19

Table 2: BSLs Used for Mycobacteriology Testing in Laboratories Performing Both AFB Smear and Culture (n=474)			
Number of Laboratories			
BSL	Practices	Primary Barriers (Safety Equipment)	Secondary Barriers (Facilities)
1	11	6	24
2	286	219	229
3	157	226	184
Unknown or missing	20	23	37

Tables 1 and 2: There were 11 respondents that reported using BSL-1 practices for AFB smear. For laboratories performing smear and culture, 11 respondents reported using BSL-1 practices and 283 reported using BSL-2 practices. The analysis does not rule out an interpretive error of survey question and answers. The results indicate a need for additional education among laboratorians regarding biosafety definitions and recommended facilities and practices.

Figure 7: Comprehensive Safety Risk Assessment Performed (n=553)

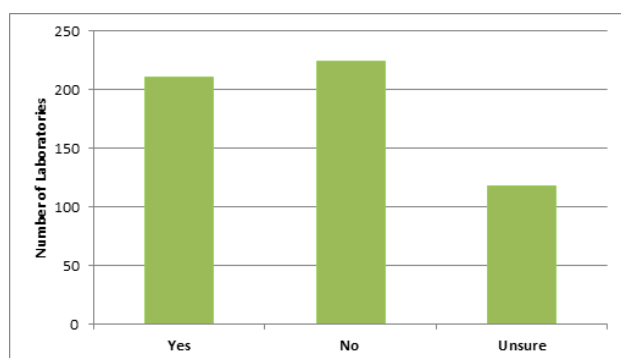


Figure 7: Thirty-eight percent (211/553) of respondents reported that a comprehensive risk assessment had been completed for the mycobacteriology laboratory, 41% said no risk assessment was performed and 21% were unsure.

BSL-2 is required for preparation of AFB smears. BSL-3 practices, safety equipment and facilities are required for laboratory activities associated with the propagation and manipulation of *M. tuberculosis* complex cultures. This includes the use of respiratory protection, safety equipment to prevent and contain aerosols and tuberculocidal disinfectants.¹ All potential aerosol-generating manipulations should be performed in a biological safety cabinet (BSC).

For laboratories performing smear only, all work should be performed in a BSC. An N-95 or better respirator adds an extra layer of protection in BSL-2 work environments. In the laboratory, surgical masks do not contribute to effective protection against *M. tuberculosis* transmission.

Respiratory protection (N-95 or better) is required for BSL-3 laboratory activities associated with the propagation and manipulation of *M. tuberculosis* cultures with the potential to generate aerosols.

Risk assessments are used to determine whether increased or decreased BSL practices or facilities are warranted. A safe work environment should be ensured based on a risk assessment within the work area.

The five general steps for performing a risk assessment are the following:

- 1) Identify the hazards;
- 2) Identify the activities that might lead to exposure;
- 3) Consider laboratory competencies and experience;
- 4) Evaluate and prioritize risks; and
- 5) Develop, implement and evaluate controls to minimize the risk for exposure.⁴

References 2 and 4 have additional information on risk assessment development.

CONCLUSION

This issue brief reflects responses to biosafety questions from the National TB Services Survey Report. At a 45% response rate, a significant number (88%) of respondents indicated that they perform some level of in-house TB services. When asked specific questions about biosafety, however, results showed that more could be done to ensure that the work environment is safe and employees remain healthy. Overall, the results show that there is a need for additional education regarding biosafety definitions and recommended facilities and practices.

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The Association of Public Health Laboratories (APHL) works to strengthen laboratory systems serving the public's health in the US and globally. APHL's member laboratories protect the public's health by monitoring and detecting infectious and foodborne diseases, environmental contaminants, terrorist agents, genetic disorders in newborns and other diverse health threats.

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