Examining the Human Element in Lab Biosafety

Betiel H. Haile, Public Health Practice, LLC
Mark Wade, San Antonio Metropolitan Health District
Patricia Wade, San Antonio Metropolitan Health District
Andrew Cannons, Bureau of Public Health Laboratories-Tampa
Richard France, Bureau of Public Health Laboratories-Tampa
Lisa D. Ferland, Public Health Practice, LLC
Affan Shaikh, Public Health Practice, LLC
Meeyoung Park, Public Health Practice, LLC
Ngozi Erondu, Public Health Practice, LLC
Sean Kaufman, Emory University

Only first 10 authors above; see publication for full author list.

Journal Title: Online Journal of Public Health Informatics
Volume: Volume 6, Number 1
Publisher: University of Illinois at Chicago Library | 2014-04-29
Type of Work: Article | Final Publisher PDF
Publisher DOI: 10.5210/ojphi.v6i1.5103
Permanent URL: https://pid.emory.edu/ark:/25593/s5kqs

Final published version: http://dx.doi.org/10.5210/ojphi.v6i1.5103

Copyright information:
This is an Open Access work distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License (http://creativecommons.org/licenses/by-nc/3.0/).

Accessed October 14, 2020 5:14 PM EDT
Examining the Human Element in Lab Biosafety

Betiel H. Haile\textsuperscript{1}, Mark Wade\textsuperscript{2}, Patricia Blevins\textsuperscript{2}, Andrew Cannons\textsuperscript{3}, Richard France\textsuperscript{3}, Lisa D. Ferland\textsuperscript{1}, Affan Shaikh\textsuperscript{1}, Meeyoung Park\textsuperscript{*1}, Ngozi Erondu\textsuperscript{1}, Sean G. Kaufman\textsuperscript{4}, Heather Meeks\textsuperscript{5} and Scott J. McNabb\textsuperscript{1, 4}

\textsuperscript{1}Public Health Practice, LLC, Atlanta, GA, USA; \textsuperscript{2}San Antonio Metropolitan Health District, San Antonio, TX, USA; \textsuperscript{3}Bureau of Public Health Laboratories-Tampa, Tampa, FL, USA; \textsuperscript{4}Emory University, Atlanta, GA, USA; \textsuperscript{5}Defense Threat Reduction Agency, Ft. Belvoir, VA, USA

Objective
To understand the potential gaps in laboratory biosafety due to human factors.

Introduction
A laboratory biosafety program (LBP) is essential to ensure the health and safety of laboratory staff and the general public from hazardous materials and infectious agents. In the US, the Occupational Safety and Health Administration (OSHA) sets federal standards governing LBPs that enforce best practices by non-regulatory organizations such as the Centers for Disease Control and Prevention (CDC) and the National Institutes of Health (NIH) [1]. In addition, twenty-five states and two territories established OSHA-approved biosafety standards that may or exceed federal standards [2]. The CDC/NIH’s Biosafety in Microbiological and Biomedical Laboratories (BMBL) are the primary guidelines for LBPs, and many jurisdictions use the manual in a regulatory manner [3]. Ensuring laboratory biosafety requires vigilance; laboratories must maintain equipment and materials, develop and implement security measures, and staff must be annually trained in biosafety procedures. Our evaluation of LBPs underscored the importance of the human element in biosafety compliance.

Methods
We conducted a literature review on LBPs to identify objectives, goals, and best practices. Findings were organized in a logic model to assess performance in biosafety, bioreport, protocols, physical security, information security, and training. Indicators were identified in existing literature (e.g., CDC Inspection Checklist for BSL-2, BMBL v-5) or developed and mapped to the logic model [3, 4].

Field tests of the evaluation tool were conducted at the San Antonio Metropolitan Health District Public Health Laboratory and the Bureau of Public Health Laboratories in Tampa, Florida. Eleven staff, including a lab director, lab coordinator, lab technologists, and lab technicians, was interviewed at the San Antonio site. Twenty-five staff, including supervisors, microbiologists, medical scientists, lab technicians, virologists, serologist, and administrative staff, was interviewed at the Tampa site. We evaluated laboratory area biosafety levels (BSL) 1, 2 and 3 at both sites.

Results
The tool included 130 indicators administered in three formats: pre-visit questionnaire (58), on-site observation checklist (56), and staff interview (16). Pre-visit questions and on-site observations determined that both sites fully implemented a LBP. Staff interviews elicited a range of responses on the efficacy of biosafety training. Using averaged Likert scale ratings, both sites were considered “very capable” at operating safely with biologic materials and “very effective” at reducing or controlling biologic exposures. The BSL-3 staff was rated “very competent” to “extremely competent at donning respirators and Tyvek suits. Reasons stated for lower ratings included unfamiliarity with under-utilized protocols and equipment, lack of more engaging biosafety training, and complacency/human error (at least one person stated that “nobody is perfect”).

Conclusions
In any laboratory, a proper LBP is a critical component of laboratory practice. Nonetheless, specific funding for laboratories to conduct biosafety trainings and engage the workforce on biosafety is often overlooked and, therefore, opportunities to develop or acquire biosafety training materials are extremely limited or non-existent. Staff would benefit from various training formats (e.g., hands-on, small group) to accommodate different learning styles. Additional refresher trainings are recommended for non-routine protocols and non-technical staff passing through biosafety risk areas. Finally, a third-party, or confidential assessment of laboratory staff, is necessary to collect unbiased opinions on a LBP to implement better interventions.

Keywords
biosafety; laboratory; assessment

Acknowledgments
Scott Becker (APHL)  
Chris Mangal (APHL)

References

\textsuperscript{*}Meeyoung Park
E-mail: mpark@publichealthpractice.com