

Fourth Edition

COMPLETE GUIDE TO
**Laboratory
Safety**

Dan Scungio, MT(ASCP), SLS, CQA (ASQ)

Terry Jo Gile, MT(ASCP), MA Ed

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+HCPro
a division of BLR

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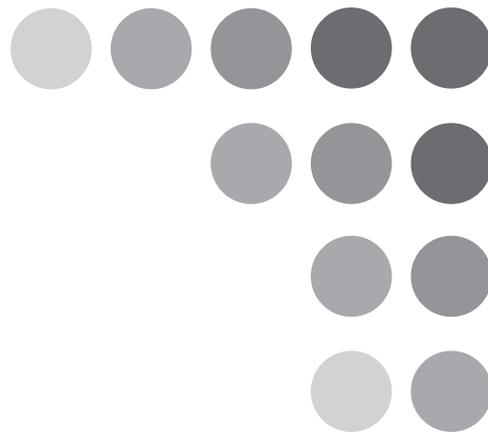
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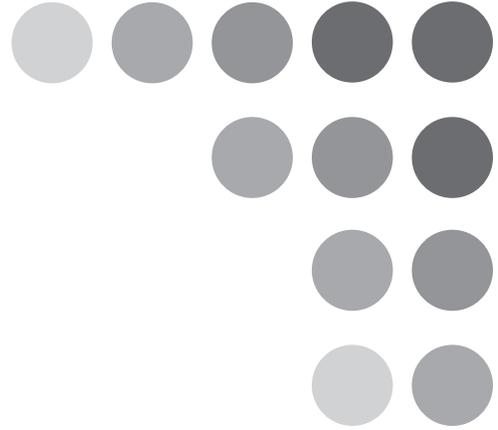
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About the Authors

Dan Scungio, MT(ASCP), SLS, CQA (ASQ)

Dan Scungio, MT (ASCP), SLS, CQA (ASQ), has more than 20 years of experience as a certified medical laboratory scientist, over 10 of which were spent in the management of clinical labs, anatomical pathology labs, and collection sites. For the past seven years he has served as the laboratory safety officer for Sentara Healthcare, a multihospital system in Virginia and North Carolina. As a member of the Laboratory Quality Team, he oversees the safety program for more than 10 laboratories and multiple collection sites. He has a bachelor's degree in medical technology from the State University of New York at Buffalo in Amherst and Buffalo, New York.

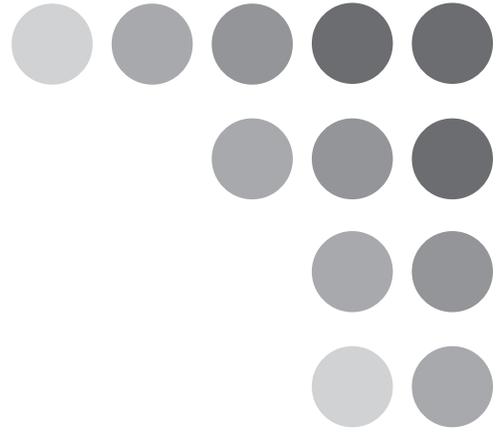
For the past five years, Dan has been mentored under the tutelage of his business partner, Terry Jo Gile, the Safety Lady®. As a laboratory safety consultant, he provides laboratory safety education and safety consulting locally, nationally, and internationally under the title of Dan, the Lab Safety Man™. Dan has authored several laboratory safety articles and supplies new information regularly in his blog on his website (www.dantheLABsafetyman.com).

Terry Jo Gile, MT(ASCP)MA Ed.

Terry Jo Gile, MT(ASCP)MA Ed., has 50 years of experience as a certified clinical laboratory scientist and educator. She has a bachelor's degree in biology from Drake University in Des Moines, Iowa, and a master of arts in education from Central Michigan University in Mount Pleasant. For 20 years, she was a member of the management team at Barnes-Jewish Hospital Department of Laboratories in St. Louis and served as the safety officer as well as a laboratory safety consultant to the BJC Health System.

For 27 years, she was president of her own consulting firm, Safety Lady, LLC. In that capacity, she lectured and consulted worldwide on the proper implementation of safety programs in clinical laboratories. She authored many publications about clinical laboratory safety, including the first three

editions of this book. She officially retired in July 2014 at the conclusion of coauthoring this fourth edition of the *Complete Guide to Laboratory Safety* with her business partner, Dan Scungio. Terry Jo leaves a lasting legacy of helping her colleagues create safety-savvy laboratories.



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Terry Jo Gile

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-
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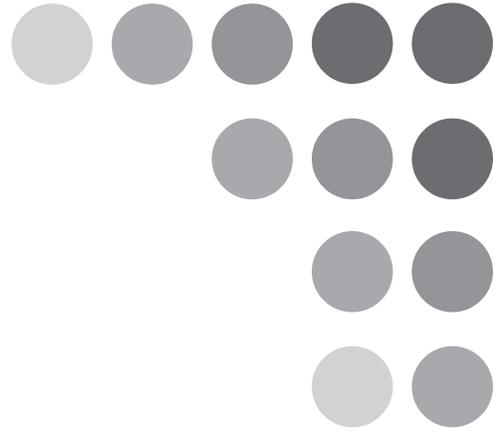
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. . . and to our friends, family, and colleagues along the way for their encouragement and inspiration to continue our crusade to help create safety savvy laboratories everywhere!

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June 2014



Preface

So often people tell us they have not been following the safety rules in the laboratory and they have never been injured or suffered an exposure. The response should always be, “So were you smart, or were you lucky?” If you work in the lab setting, an inherently dangerous place, safety should be at the top of the list every day.

We are honored to provide you with the fourth edition of *The Complete Guide to Laboratory Safety*. It has been four years since the third edition and 12 years since the first edition. Although safety initiatives have remained consistent, it is important to address current best practices. The content for this fourth edition will reflect the same quality and thoroughness you have come to know in the previous editions, with a focus on regulations and compliance. However, the following have been added:

- New case studies and safety-savvy tips in each chapter to bring out the important points
- Safety FAQs that provide real-world questions and answers, and clarifications
- News and trends that pertain to the subject matter
- References and applicable citations and standards from The Joint Commission, the Centers for Disease Control and Prevention, the Occupational Safety and Health Administration, the International Air Transport Administration, and the International Standards Organization
- A new list of the College of American Pathologists’ checklist questions on laboratory safety and where the corresponding information can be found in the book
- A summary that includes instructions on how to use the information from each chapter as training material, including learning objectives, suggestions for interactive presentations, and reinforcement activities
- An updated safety audit checklist
- Lots of tables and figures, and more tools that will make your job easier

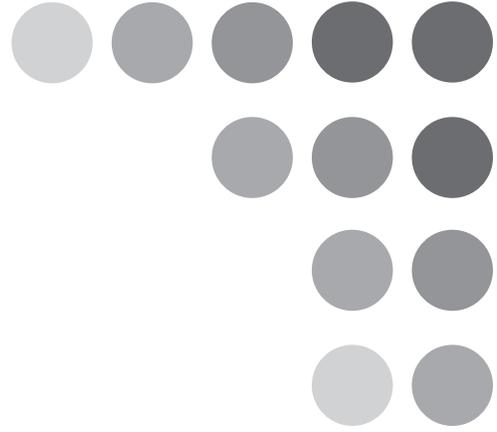
This book is all about results—informing you about the current lab safety issues, demonstrating how the regulations play out in reality, and keeping you in the loop and in compliance. The book summarizes the best practices for your safety program and provides operational details. You will learn

the day-to-day safety routines that must be a part of every employee's work schedule so that they are done properly and completely—and, ideally, without a second thought—every single time.

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June 2014



CHAPTER 1

The Law and Science of Laboratory Safety

Elaine was the new supervisor of the hematology department. She was hired during a severe staffing shortage, so she was allowed to work before all of her training could be completed.

She ordered 1-gallon plastic bottles of methanol, which is used to clean the slide stainers located in the department. She accidentally ordered an entire case of the bottles and realized she had no place to store them. For convenience, she took the extra containers of methanol and placed them on the riser on the counter behind the oldest slide stainer. She did not notice that one of the bottles was leaking from the bottom.

That night Karen was working in the department when the leaking methanol reached the cooling fan on the back of the stainer. The methanol immediately began to burn and the initial flash set Karen's gloves on fire as she was placing slides into the stainer. Karen screamed and her coworker grabbed her to remove her from the room and to smother her hands in a nearby sink. She closed the door to the area as they left the room. Seconds after they left the hematology department, an explosion occurred when the other bottles of methanol stored on the open counter ignited.

The fire department responded quickly, but the hematology department was destroyed.

Karen was treated in the emergency department and was able to return to work after follow-up with the Occupational Health department.

Lessons learned from this experience:

- Always store flammable chemicals inside a flammable storage cabinet
- Never store flammable chemicals near heat sources

- Be sure all laboratory employees have safety training before they are allowed to work in the laboratory

This incident is an Occupational Safety and Health Administration (OSHA) citation just waiting to happen. Although we are used to dealing with the science of laboratory safety, we often overlook the law. In today's world, resources are as easy to access as the Internet. However, the prudent lab safety officer recognizes that resources vary and that it's important to use Internet sources that are accurate and trustworthy. Throughout this book, we will provide you with online sources that are known to be reliable.

ISO 15190

In 2003, the International Standards Organization (ISO) (www.iso.org) published its ISO 15190 standard to help establish policies and processes that make the laboratory a safer place to work. The standard is designed specifically for safety issues in medical laboratories and covers all aspects of laboratory safety, from management requirements and personnel responsibilities to radiation safety and fire precautions. The standard addresses specific requirements for the most common issues that lead to accidents and injuries. ISO 15190 is intended for use in all types of medical laboratories, from major research and teaching institutions to field laboratories with limited resources. Like ISO's well-known standards for manufacturing quality, ISO 15190 focuses on process, setting standards for equipment, and safe work procedures intended to minimize the risk of accidents, spills, and other adverse incidents. The standard does not address the special needs of laboratories that work with exotic infectious agents requiring elevated levels of containment.

ISO will not inspect or cite your facility for violations at this time; however, adhering to this standard will provide a safe work environment for your employees and help you comply with many required OSHA standards. ISO 15190 will be incorporated as part of future Clinical and Laboratory Standards Institute documents. Many labs are more familiar with ISO 15189 (revised in 2007), which deals with the operations of the laboratory. Again, ISO 15190 is not mandated, but it is used worldwide as a parameter of the quality of the laboratory structure and results. This includes how testing is to be provided in a medical emergency and the lab's role in the education and training of healthcare staff.

OSHA

The Occupational Safety and Health Act of 1970—hereafter referred to in this chapter as “the Act”—governs safety in all types of workplaces, including labs. It was enacted in response to the outcry resulting from reports of deplorable conditions in the meatpacking industry. The Act created OSHA to enforce federal rules on workplace safety. The agency has issued specialized standards under 29 CFR 1910, which addresses standards for chemical hygiene and exposure to bloodborne pathogens for healthcare workers. You can find more information, including the full text of all OSHA regulations in a searchable database, on the OSHA website (www.osha.gov).

The OSHA requirements with the greatest day-to-day impact for laboratories are the following:

- OSHA's Form 300 Log, for recording and reporting workplace accidents, injuries, or illnesses (see Chapter 2).
- The Hazard Communication standard (1910.1200), specifying how workers must be made aware of hazardous materials in the workplace. A key hazard communication requirement is that the lab must maintain an up-to-date compilation of safety data sheets (SDS) for all hazardous chemicals used or stored (see Chapter 7). Each SDS spells out the properties of the substance, as well as procedures to follow after a possible worker exposure.
- Standards for chemical hygiene, including occupational exposure to hazardous chemicals in laboratories (1910.1450) (see Chapter 9).
- The Bloodborne Pathogens standard (1910.1030), intended to minimize the risk of exposure to bloodborne pathogens (see Chapter 8).

The Joint Commission

For accredited facilities, The Joint Commission (TJC) has various laboratory-related standards under Environment of Care, Quality Control, and Infection Control.

TJC covers a broad spectrum of requirements, but many include appropriate employee safety considerations, such as tepid water for eyewash stations and appropriate personal protective equipment for lab employees. There are a number of survey preparation tools offered by TJC, including a survey activity guide for laboratory services and FAQs.

Other Federal Laws

A number of other federal regulatory agencies issue and enforce regulations that affect labs, as listed in Figure 1.1. In addition, a number of other government organizations and industry groups publish regulations and guidelines that affect laboratory safety, as listed in Figure 1.2.

Figure 1.1		Federal regulations affecting labs	
Regulatory agency	Website	Lab activities affected	
<p>Department of Transportation (DOT)</p> <p>Enforces regulations it issues about transporting all types of hazardous materials.</p>	www.dot.gov	Transport of lab specimens	
<p>Environmental Protection Agency (EPA)</p> <p>Enforces regulations under the Clean Air Act, the Resource Conservation and Recovery Act, and other environmental statutes.</p>	www.epa.gov	<p>Ventilation</p> <p>Air contamination</p> <p>Disposal of hazardous waste</p>	
<p>Department of Labor (DOL)</p> <p>Enforces regulations under the Americans With Disabilities Act (ADA), Fair Labor Standards Act, and other federal labor laws. The Bureau of Labor Statistics is a division of the DOL that compiles and publishes employment data.</p>	<p>www.dol.gov</p> <p>www.ada.gov (for compliance information about the ADA)</p> <p>www.bls.gov (for employment and pay data)</p>	<p>Lab design</p> <p>Ergonomics</p> <p>Human resources, payroll, and benefits</p>	
<p>Food and Drug Administration (FDA)</p> <p>Approves new medicines and medical devices for safe use.</p>	www.fda.gov	<p>Toxicology</p> <p>Transfusion medicine</p> <p>Apheresis</p>	

Figure 1.2		Other sources of lab safety guidelines	
Organization	Website	Lab activities affected	
<p>Centers for Disease Control and Prevention (CDC)</p> <p>A lead federal agency for protecting the health and safety of people at home and abroad, providing credible information to enhance health decisions; investigates illnesses and potential epidemics; issues rules and standards for practitioners.</p>	www.cdc.gov	Bloodborne pathogens	
<p>National Institute for Occupational Safety and Health (NIOSH)</p> <p>A division of the CDC that focuses on the prevention of workplace injuries and illnesses.</p>	www.cdc.gov/niosh/homepage.html	All safety activities	
<p>Clinical and Laboratory Standards Institute (CLSI)—formerly NCCLS</p> <p>A global organization of laboratories that develops consensus documents for additional audiences beyond the clinical laboratory community.</p>	www.clsi.org	All	
<p>International Air Transportation Association (IATA)</p> <p>Membership organization of airlines and cargo carriers; IATA's standards have the force of law for international shipments.</p>	www.iata.org	Shipping lab tests by air	

<p>College of American Pathologists (CAP)</p> <p>Membership organization of board-certified pathologists that serves and represents the interests of patients, pathologists, and the public by fostering excellence in the practice of pathology and laboratory medicine.</p>	<p>www.cap.org</p>	<p>All, if the lab is CAP-accredited</p>
<p>TJC</p> <p>Membership organization that issues standards and conducts regular surveys and site visits to award accreditation to hospitals and other healthcare providers.</p>	<p>www.jointcommission.org</p>	<p>All, if the lab is Joint Commission–accredited</p>

State and local laws

Figure 1.3 lists the OSHA regional offices. Although every state is covered by one of the 10 regions, section 18 of the Act encourages states to develop and operate their own job safety and health programs. Many states have their own requirements that may affect safety processes in your lab. As with most federal statutes, OSHA preempts state laws that impose less stringent requirements, but states may enact more stringent rules if they wish. A detailed discussion of the 50 states' rules is beyond the scope of this book, but the directory information in Figure 1.4 may be helpful in ensuring that your lab's safety program complies with your state's laws as well as federal rules.

Regional and local laws such as those imposed by city or county fire marshals, water authorities, or waste disposal agencies also may affect laboratory safety. To find online information specific to your state, point your Web browser to *www.[your state's postal initials].gov* to find laws that apply. For example, in Indiana, go to *www.in.gov*; on the left side of the opening screen, click on the button labeled "Law-Justice." In California, go to *www.ca.gov* and click on "Government" on the tab at the top of the page. In Wisconsin, go to *www.wi.gov* and click on "Government" on the left of the page. Because websites are not always complete and up to date, always ask your attorney to review your safety policies for compliance with state, local, and federal laws.

**Figure
1.3**

OSHA regional offices

Region 1

JFK Federal Building, Room E340

Boston, MA 02203

Telephone: 617-565-9860

Fax: 617-565-9827

States include: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

Region 2

201 Varick Street, Room 670

New York, NY 10014

Telephone: 212-337-2378

Fax: 212-337-2371

States and territories include: New Jersey, New York, Puerto Rico, and the Virgin Islands.

Region 3

U.S. Department of Labor/OSHA

The Curtis Center–Suite 740 West

170 S. Independence Mall West

Philadelphia, PA 19106-3309

Telephone: 215-861-4900

Fax: 215-861-4904

States and districts include: Delaware, Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia.

Region 4

61 Forsyth Street, SW Room 6T50

Atlanta, GA 30303

Telephone: 678-237-0400

Fax: 678-237-0447

States include: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

Region 5

230 South Dearborn Street, Room 3244

Chicago, IL 60604

Telephone: 312-353-2220

Fax: 312-353-7774

States include: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

Region 6

525 Griffin Street, Room 602

Dallas, TX 75202

Telephone: 972-850-4145

Fax: 972-850-4149

States include: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.

Region 7

Two Pershing Square Building

2300 Main Street, Suite 1010

Kansas City, MO 64108-2416

Telephone: 816-283-8745

Fax: 816-283-0547

States include: Iowa, Kansas, Missouri, and Nebraska.

Region 8

Cesar Chavez Memorial Building

1244 Speer Blvd., Suite 551

Denver, CO 80204

Telephone: 720-264-6550

Fax: 720-264-6585

States include: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

Region 9

90 7th Street, Suite 18100

San Francisco, CA 94103

Telephone: 415-625-2547

Fax: 415-625-2534

States and territories include: Arizona, California, Guam, Hawaii, and Nevada.

Region 10

300 Fifth Avenue, Suite 1280

Seattle, WA 98104

Telephone: 206-757-6700

Fax: 206-757-6705

States include: Alaska, Idaho, Oregon, and Washington.

**Figure
1.4**

Directory of states with OSHA-approved occupational safety and health plans

Alaska Department of Labor and Workforce Development

P.O. Box 111149

1111 W. 8th Street, Room 304

Juneau, AK 99801-1149

Telephone: 907-465-2700 Fax: 907-465-2784

Industrial Commission of Arizona

800 W. Washington St.

Phoenix, AZ 85007-2922

Telephone: 602-542-5795 Fax: 602-542-1614

California Department of Industrial Relations

1515 Clay Street, 17th Floor

Oakland, CA 94612

Telephone: 510-286-7000 Fax: 510-286-7037

Connecticut Department of Labor Division of Occupational Safety and Health

38 Wolcott Hill Road

Wethersfield, CT 06109

Telephone: 860-263-6900 Fax: 860-263-6940

Hawaii Department of Labor and Industrial Relations

830 Punchbowl Street, Suite 321

Honolulu, HI 96813

Telephone: 808-586-8844 Fax: 808-586-9104

Illinois Department of Labor

900 South Spring Street

Springfield, IL 62702

Telephone: 217-782-6206 Fax: 217-782-0596

Indiana Department of Labor

State Office Building

402 West Washington Street, Room W-195

Indianapolis, IN 46204-2751

Telephone: 317-233-3605 Fax: 317-233-3790

<p><i>Iowa Division of Labor Services</i> 1000 E. Grand Avenue Des Moines, IA 50319-0209 Telephone: 515-281-3469 Fax: 515-281-7995</p>
<p><i>Kentucky Labor Cabinet</i> 1047 U.S. Highway 127 South, Suite 4 Frankfort, KY 40601 Telephone: 502-564-3070 Fax: 502-564-5387</p>
<p><i>Maryland Occupational Safety and Health Administration</i> 10946 Golden West Drive, Suite 160 Hunt Valley, MD 20131 Telephone: 410-527-2062 Fax: 410-527-4482</p>
<p><i>Michigan Occupational Safety and Health Administration</i> 7150 Harris Drive P.O. Box 30643 Lansing, MI 48909-8143 Telephone: 517-322-1817 Fax: 517-322-1775a</p>
<p><i>Minnesota Department of Labor and Industry</i> 443 Lafayette Road North St. Paul, MN 55155-4307 Telephone: 651-284-5050 Fax: 651-284-5741</p>
<p><i>Nevada Occupational Safety and Health Administration</i> 1301 North Green Valley Parkway, Suite 200 Henderson, NV 89074 Telephone: 702-486-9020 Fax: 702-990-0365a</p>
<p><i>New Jersey Department of Labor and Workforce Development</i> Office of Public Employees Occupational Safety and Health (PEOSH) 1 John Fitch Plaza P.O. Box 110 Trenton, NJ 08625-0110 Telephone: 609-633-3896 Fax: 609-292-3749</p>
<p><i>New Mexico Environment Department</i> 1190 St. Francis Drive, Suite N4050 P.O. Box 5469 Santa Fe, NM 87502 Telephone: 505-476-8700 Fax: 505-476-8734</p>

New York Department of Labor New York Public Employee Safety and Health Program
State Office Campus Building 12, Room 158
Albany, NY 12240
Telephone: 518-457-3518 Fax: 518-457-5545

North Carolina Department of Labor Occupational Safety and Health Division
111 Hillsborough Street
Raleigh, NC 27601-1092
Telephone: 919-807-2900 Fax: 919-807-2855a

Oregon Occupational Safety and Health Division
Department of Consumer and Business Services
350 Winter Street, NE, Room 430
Salem, OR 97309-0405
Telephone: 503-378-3272 Fax: 503-947-7461a

Puerto Rico Occupational Safety and Health Administration
Prudencio Rivera Martínez Building, 20th Floor
505 Muñoz Rivera Avenue
Hato Rey, PR 00918
Telephone: 787-754-2172 Fax: 787-767-6051a

South Carolina Department of Labor, Licensing, and Regulation
Synergy Business Park, Kingstree Building
110 Centerview Drive
P.O. Box 11329
Columbia, SC 29211-1329
Telephone: 803-896-7665 Fax: 803-896-7060

Tennessee Department of Labor and Workforce Development
220 French Landing Drive
Nashville, TN 37243-1002
Telephone: 615-741-2793 Fax: 615-741-5078

Utah Labor Commission
160 East 300 South, 3rd Floor
P.O. Box 146650
Salt Lake City, UT 84114-6600
Telephone: 801-530-6901 Fax: 801-530-7606

Vermont Department of Labor and Industry
Occupational Safety and Health Administration
5 Green Mountain Drive
P.O. Box 488
Montpelier, VT 05601-0488
Telephone: 802-828-5084 Fax: 802-828-0408

Virgin Islands Department of Labor
Division of Occupational Safety and Health
3012 Golden Rock
Christiansted, St. Croix, VI 00890
Telephone: 340-772-1315 Fax: 340-772-4323

Virginia Department of Labor and Industry
Main Street Centre
600 East Main Street
Richmond, VA 23219
Telephone: 804-786-0900 Fax: 804-371-6524

Washington Department of Labor and Industries
Division of Occupational Safety and Health
Mailing address:
P.O. Box 44600
Olympia, WA 98504-4600
Location:
7273 Linderson Way SW
Tumwater, WA 98501-5414
Telephone: 360-902-5494 Fax: 360-902-5619

Wyoming Department of Employment
Workers' Safety and Compensation Division
122 West 25th Street, 2nd Floor East
Cheyenne, WY 82002
Telephone: 307-777-7786 Fax: 307-777-3646

Types of controls

All OSHA standards have three types of controls that pertain to that particular standard.

Engineering controls minimize the exposure by either reducing or removing the hazard at the source or isolating employees from the hazard, such as a needle with a safety-engineered device attached.

Administrative controls minimize exposure levels by defining or restricting job functions or scheduling production and tasks. A chemical hygiene plan and a bloodborne pathogen exposure control plan that clearly lay out safety precautions for employees are examples of administrative controls.

Work practice controls alter the manner in which a task is performed. Washing your hands after glove removal is a work practice control.

Fires, Explosions, and Other Risks

The nature of lab work and equipment creates risk from fire, explosion, toxic chemicals, and infectious agents. Chapter 11 addresses fire issues, Chapter 7 covers chemical hygiene, and Chapter 9 covers waste management. Those chapters further delineate risks to employees working in a laboratory. Safety must remain first and foremost in the minds of management to protect staff from unnecessary risk.

Standard precautions and body substance precautions

Universal Precautions are OSHA's required method of control to protect employees from exposure to all human blood and body fluids. The term refers to a concept of bloodborne disease control, which requires that all human blood and body fluids be treated as if they were known to be infectious for HIV, hepatitis B, hepatitis C, or other bloodborne pathogens, regardless of the perceived "low-risk" status of a patient or patient population.

As indicated by the CDC in the 2007 document *Guideline for Isolation Precautions in Hospitals*, "Standard Precautions synthesize the major features of Universal (Blood and Body Fluid) Precautions (designed to reduce the risk of transmission of bloodborne pathogens) and Body Substance Isolation (designed to reduce the risk of transmission of pathogens from moist body substances). Standard Precautions apply to 1) blood; 2) all body fluids, secretions, and excretions, except sweat, regardless of whether they contain visible blood; 3) nonintact skin; and 4) mucous membranes. Standard Precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals."

The OSHA Bloodborne Pathogens standard allows healthcare facilities to use acceptable alternatives to Universal Precautions. These alternative concepts include Body Substance Isolation and Standard

Precautions. These methods incorporate the fluids and materials covered by the standard and expand coverage to include all body fluids and substances. OSHA considers these concepts acceptable alternatives to Universal Precautions, provided that facilities using them adhere to all other provisions of the standard. OSHA offers instructions and clarification to ensure uniform inspection and enforcement of the Bloodborne Pathogens standard.

OSHA's Bloodborne Pathogens standard was written specifically to apply to risks from bloodborne pathogens, but the concept behind it—treating all lab substances as potentially hazardous—should be central to your lab's safety program.



COMPLETE GUIDE TO
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Safety, Fourth Edition**

Dan Scungio, MT(ASCP), SLS, CQA (ASQ)
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