

# Complete Guide *to* Laboratory Safety

SECOND EDITION

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# CHAPTER 1

## *THE LAW AND SCIENCE OF LABORATORY SAFETY*

Jack was the laboratory inspector for the state health department. He loved to cite labs for what he thought were safety violations, such as a chip in a ceramic floor tile, the lack of a temperature-monitor record on a break-room refrigerator, soiled mastic on a baseboard molding, rust inside a metal cabinet, or ceiling tiles that were stained from a previous leak long since dry. Once he even cited a lab because a plant lacked the “requisite” one-quarter inch of pea gravel over the soil. When Bill, the lab manager, pressed him for a reference regarding the safety violations, Jack ignored the request. Bill knew it was prudent not to argue with Jack because that would only intensify Jack’s quest for minutiae. So Bill nodded and moved on, but he did not appreciate an inspector making formal citations without quoting a regulation or statute that could be referenced and then met for its full intent.

What recourse did Bill have in this case? First, he could have looked up the regulation. The Internet allows laboratories to keep abreast of the standards set forth by such public agencies as the Occupational Safety & Health Administration (OSHA), the U.S. Department of Transportation, the Environmental Protection Agency, the International Air Transport Association, and other regulatory bodies.

Second, he could have questioned the interpretation. Regulations may be easy enough to find online, but interpreting them is a different matter. Interpretation can vary from one inspector to another. Let’s take the case of the plant and the pea gravel. If there had been a risk of some kind or a health-related need to cover the plant’s soil with pea gravel, there should be a statute defining in what setting, to what level, and for what reason one would use one-quarter inch and not one-eighth.

Don't be afraid to ask questions of the inspector in a nonthreatening way or to call the OSHA help desk at your local office. You don't have to give your name or where you work, just state the issue and ask whether you can be directed to the location within the standards where the issue can be found. You should be able to access online the interpretation documents given to inspectors. If an inspector does have it in for your lab, send a complaint to his or her supervisor, much as you would file a grievance. Such a grievance would be reviewed by an area director, who in my experience takes these complaints very seriously and acts on them accordingly.

### ISO 15190

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In 2003, the International Organization for Standardization (ISO; [www.iso.org](http://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 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 accident and injury. 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 for 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.

Worldwide, ISO 15189 is used 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. However, ISO 15190 is specifically for safety issues in medical laboratories and is beginning to be used internationally as well as in the United States.

### OSHA

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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 meat-packing industry. The Act created the Occupational Safety & Health Administration (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 Web site, *www.osha.gov*.

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

- OSHA's Form 300 Log, for recording and reporting workplace accidents, injuries, or illnesses (see Chapter 2).
- standards for hazard communication, 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 material safety data sheets (MSDS) for all hazardous chemicals used or stored (see Chapter 7). Each MSDS spells out the properties of the substance, as well as procedures to follow after a worker may have been exposed to it.
- standards for chemical hygiene (see Chapter 8).
- standards for minimizing the risk of exposure to bloodborne pathogens (see Chapter 9).

### **OTHER FEDERAL LAWS**

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

TABLE 1.1

**FEDERAL REGULATIONS AFFECTING LABS**

Regulatory Agency	Web site	Lab activities affected
<p><b>Department of Transportation (DOT)</b></p> <p>Enforces regulations it issues about transporting all types of hazardous materials</p>	<i>www.dot.gov</i>	<ul style="list-style-type: none"> <li>• Transport of lab specimens</li> </ul>
<p><b>Environmental Protection Agency (EPA)</b></p> <p>Enforces regulations under the Clean Air Act, the Resource Conservation and Recovery Act, and other environmental statutes</p>	<i>www.epa.gov</i>	<ul style="list-style-type: none"> <li>• Ventilation</li> <li>• Air contamination</li> <li>• Disposal of hazardous waste</li> </ul>
<p><b>Department of Labor (DOL)</b></p> <p>Enforces regulations under the Americans With Disabilities Act (ADA), Fair Labor Standards Act (FLSA), and other federal labor laws. The Bureau of Labor Statistics is a division of the DOL that compiles and publishes employment data.</p>	<p><i>www.dol.gov</i></p> <p><i>www.ada.gov</i> (for compliance information about the ADA)</p> <p><i>www.bls.gov</i> (for employment and pay data)</p>	<ul style="list-style-type: none"> <li>• Lab design</li> <li>• Ergonomics</li> <li>• Human resources, payroll, and benefits</li> </ul>
<p><b>Food and Drug Administration (FDA)</b></p> <p>Approves new medicines and medical devices for safe use</p>	<i>www.fda.gov</i>	<ul style="list-style-type: none"> <li>• Toxicology</li> <li>• Transfusion Medicine</li> <li>• Apheresis</li> </ul>

TABLE 1.2

**OTHER SOURCES OF LAB SAFETY GUIDELINES**

<b>Organization</b>	<b>Web site</b>	<b>Lab activities affected</b>
<p><b>Centers for Disease Control and Prevention (CDC)</b></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>	<i>www.cdc.gov</i>	<ul style="list-style-type: none"> <li>• Bloodborne pathogens</li> </ul>
<p><b>National Institute for Occupational Safety and Health (NIOSH)</b></p> <p>Division of CDC that focuses on prevention of workplace injuries and illnesses.</p>	<i>www.cdc.gov/niosh/homepage.html</i>	<ul style="list-style-type: none"> <li>• All safety activities</li> </ul>
<p><b>National Committee on Clinical Laboratory Science (NCCLS)</b></p> <p>A global organization of laboratories that develops consensus documents for additional audiences beyond the clinical laboratory community.</p>	<i>www.nccls.org</i>	<ul style="list-style-type: none"> <li>• All</li> </ul>
<p><b>International Air Transportation Association (IATA)</b></p> <p>Membership organizations of airlines and cargo carriers; IATA's standards have the force of law for international shipments.</p>	<i>www.iata.org</i>	<ul style="list-style-type: none"> <li>• Shipping lab tests by air</li> </ul>
<p><b>College of American Pathologists (CAP)</b></p> <p>Membership organization of board-certified pathologists that serves and represents the interest of patients, pathologists, and the public by fostering excellence in the practice of pathology and laboratory medicine.</p>	<i>www.cap.org</i>	<ul style="list-style-type: none"> <li>• All, if the lab is CAP-accredited</li> </ul>
<p><b>Joint Commission</b></p> <p>Membership organization that issues standards and conducts regular surveys and site visits to award accreditation to hospitals and other healthcare providers.</p>	<i>www.jcaho.org</i>	<ul style="list-style-type: none"> <li>• All, if the lab is Joint Commission-accredited</li> </ul>

**STATE AND LOCAL LAWS**

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Table 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 Table 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 Web sites 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.

TABLE 1.3

**OSHA REGIONAL OFFICES****Region 1**

JFK Federal Building, Room E340  
 Boston, MA 02203  
 617/565-9860  
 Fax: 617/565-9827  
 States include Connecticut, Massachusetts, Maine,  
 New Hampshire, Rhode Island, and Vermont.

**Region 2**

201 Varick St., Room 670  
 New York, NY 10014  
 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  
 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 St., SW  
 Atlanta, GA 30303  
 404/562-2300  
 Fax: 404/562-2295  
 States include Alabama, Florida, Georgia, Kentucky,  
 Mississippi, North Carolina, South Carolina, and  
 Tennessee.

**Region 5**

230 South Dearborn St., Room 3244  
 Chicago, IL 60604  
 312/353-2220  
 Fax: 312/353-7774  
 States include Illinois, Indiana, Michigan, Minnesota,  
 Ohio, and Wisconsin.

**Region 6**

525 Griffin St., Room 602  
 Dallas, TX 75202  
 972/850-4145  
 Fax: 972/850-4149  
 States include Arkansas, Louisiana, New Mexico,  
 Oklahoma, and Texas.

**Region 7**

City Center Square  
 1100 Main St., Suite 800  
 Kansas City, MO 64105  
 816/426-5861  
 Fax: 816/426-2750  
 States include Iowa, Kansas, Missouri, and Nebraska.

**Region 8**

1999 Broadway, Suite 1690  
 Denver, CO 80202  
 720/264-6550  
 Fax: 720/264-6585  
 States include Colorado, Montana, North Dakota, South  
 Dakota, Utah, and Wyoming.

**Region 9**

71 Stevenson St., Room 420  
 San Francisco, CA 94105  
 415/975-4310  
 Fax: 415/975-4319  
 States and territories include Arizona, California, Guam,  
 Hawaii, and Nevada.

**Region 10**

1111 Third Ave., Suite 715  
 Seattle, WA 98101-3212  
 206/553-5930  
 Fax: 206/553-6499  
 States include Alaska, Idaho, Oregon, and Washington.

TABLE 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 St., Room 304  
Juneau, AK 99801-1149  
907/465-2700  
Fax: 907/465-2784

### **Industrial Commission of Arizona**

800 W. Washington  
Phoenix, AZ 85007-2922  
602/542-4411  
Fax: 602/542-1614

### **California Department of Industrial Relations**

1515 Clay St.  
Oakland, CA 94612  
415/703-5050  
Fax: 415/703-5058

### **Connecticut Department of Labor**

200 Folly Brook Boulevard  
Wethersfield, CT 06109  
860/566-5123  
Fax: 860/566-1520

### **Hawaii Department of Labor and Industrial Relations**

830 Punchbowl St.  
Honolulu, HI 96813  
808/586-8844  
Fax: 808/586-9099

### **Indiana Department of Labor**

State Office Building  
402 West Washington St., Room W195  
Indianapolis, IN 46204-2751  
317/232-2378  
Fax: 317/233-3790

### **Iowa Workforce Development**

Division of Labor Services  
1000 E. Grand Ave.  
Des Moines, IA 50319-0209  
515/281-8467  
Fax: 515/281-4698

### **Kentucky Department of Labor**

1047 U.S. Highway 127 South, Suite 4  
Frankfort, KY 40601  
502/564-3070  
Fax: 502/564-5387

### **Maryland Department of Labor, Licensing and Regulation**

Division of Labor and Industry  
1100 North Eutaw St., Room 613  
Baltimore, MD 21201-2206  
410/767-2241  
Fax: 410/767-2986

### **Michigan Department of Labor and Economic Growth**

Michigan Occupational Safety and Health Administration  
P.O. Box 30643  
Lansing, MI 48909-8143  
517/322-1814  
Fax: 517/322-1775

### **Minnesota Department of Labor and Industry**

443 Lafayette Road North  
St. Paul, MN 55155-4307  
651/284-5050  
Fax: 651/282-5405

### **Nevada Division of Industrial Relations**

400 West King St., Suite 400  
Carson City, NV 89073  
775/684-7260  
Fax: 775/687-6305

### **New Jersey Department of Labor and Workforce Development**

Office of Public Employees Occupational Safety & Health (PEOSH)  
1 John Fitch Plaza  
P.O. Box 386  
Trenton, NJ 08625-0386  
609/292-2975  
Fax: 609/633-9271

TABLE 1.4

## ***DIRECTORY OF STATES WITH OSHA-APPROVED OCCUPATIONAL SAFETY AND HEALTH PLANS (CONT.)***

**New Mexico Environment Department**

1190 St. Francis Drive, Suite 4050  
P.O. Box 26110  
Santa Fe, NM 87502  
505/827-2850  
Fax: 505/827-2836

**New York Department of Labor**

New York Public Employee Safety and Health Program  
W. Averell Harriman State Office Building 12, Room 500  
Albany, NY 12240  
518/457-2741  
Fax: 518/457-6908

**North Carolina Department of Labor**

4 West Edenton St.  
Raleigh, NC 27601-1092  
919/733-0359  
Fax: 919/733-6197

**Oregon Occupational Safety and Health Division**

Department of Consumer and Business Services  
350 Winter St., NE, Room 430  
Salem, OR 97309-0405  
503/378-3272  
Fax: 503/947-7461

**Puerto Rico Department of Labor**

Prudencio Rivera Martínez Building  
505 Muñoz Rivera Ave.  
Hato Rey, PR 00918  
787/754-2119  
Fax: 787/753-9550

**South Carolina Department of Labor,  
Licensing, and Regulation**

Koger Office Park, Kingstree Building  
110 Centerview Drive  
P.O. Box 11329  
Columbia, SC 29211  
803/896-4300  
Fax: 803/896-4393

**Tennessee Department of Labor and Workforce Development**

710 James Robertson Parkway  
Nashville, TN 37243-0659  
615/741-2582  
Fax: 615/741-5078

**Utah Labor Commission**

160 East 300 South, 3rd Floor  
P.O. Box 146650 • Salt Lake City, UT 84114-6650  
801/530-6848  
Fax: 801/530-7906

**Vermont Department of Labor and Industry**

National Life Building—Drawer 20  
Montpelier, VT 05620-3401  
802/828-2288  
Fax: 802/828-2748

**Virgin Islands Department of Labor**

2203 Church St.  
Christiansted, St. Croix, VI 00820-4660  
340/773-1994  
Fax: 340/773-1858

**Virginia Department of Labor and Industry**

Powers-Taylor Building  
13 South 13th St. • Richmond, VA 23219  
804/786-2377  
Fax: 804/371-6524

**Washington Department of Labor and Industries**

General Administration Building  
P.O. Box 44001 • Olympia, WA 98504-4001  
7273 Linderson Way SW  
Tumwater, WA 98501-5414  
360/902-4200  
Fax: 360/902-4202

**Wyoming Department of Employment**

Workers' Safety and Compensation Division  
1510 East Pershing Boulevard—West Wing  
Cheyenne, WY 82002  
307/777-7700  
Fax: 307/777-5524

### TYPES OF CONTROLS

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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 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

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The nature of lab work and equipment creates risk from fire, explosion, toxic chemicals, and infectious agents. Chapter 11 addresses fire issues, Chapter 8 covers chemicals, and Chapter 9 covers infectious substances. Those chapters further delineate risks to employees in the practice of their professions. 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* is 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 are 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 or not 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 for 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’s precautions 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.

## RESOURCE

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The following is a general reference that you may find helpful for more information:  
ISO 15190:2003(E). “Medical Laboratories—Requirements for Safety” ([www.iso.org](http://www.iso.org)).

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