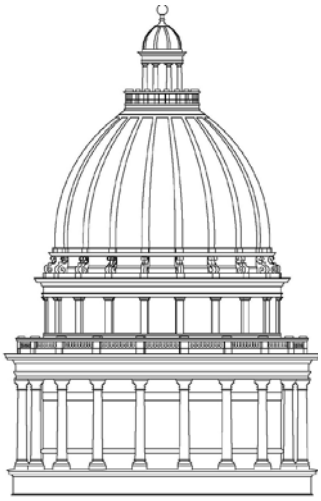
REPORT TO THE

UTAH LEGISLATURE

Number 2019-06



A Performance Audit of the University of Utah's Laboratory Safety Practices

May 2019

Office of the
LEGISLATIVE AUDITOR GENERAL
State of Utah

STATE OF UTAH

Office of the Legislative Auditor General

315 HOUSE BUILDING • PO BOX 145315 • SALT LAKE CITY, UT 84114-5315
(801) 538-1033 • FAX (801) 538-1063

Audit Subcommittee of the Legislative Management Committee
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KADE R. MINCHEY, CIA, CFE
AUDITOR GENERAL

May 14, 2019

TO: THE UTAH STATE LEGISLATURE

Transmitted herewith is our report, **A Performance Audit of the University of Utah's Laboratory Safety Practices** (Report #2019-06). A digest is found on the blue pages located at the front of the report. The objectives and scope of the audit are explained in the Introduction.

We will be happy to meet with appropriate legislative committees, individual legislators, and other state officials to discuss any item contained in the report in order to facilitate the implementation of the recommendations.

Sincerely,

Kade Minchey

Kade R. Minchey, CIA, CFE
Auditor General

Digest of
A Performance Audit of the University of Utah's Laboratory Safety Practices

In recent years, serious accidents, including a preventable fatality, have occurred in other universities' laboratories. These incidents emphasized the importance of compliance with safety programs, policies, and practices in academic labs. Safety deficiencies like those identified at these universities have also been documented at the University of Utah (university), some of them repeatedly over multiple years. Though the university has not had a fatality, it has experienced serious accidents. Safety deficiencies need to be addressed to ensure future accidents are minimized.

Chapter II
The University's Risk Management System for Lab Safety Is Broken

Deficient Lab Safety Practices Have Persisted in Many University Labs. According to the department of Occupational and Environmental Health and Safety's (OEHS) 2016 to 2018 lab safety audits, 49 percent of research groups with one of the three major deficiencies we tracked repeated at least one of these deficiencies in next year's audit. A broader view of all 2017 audits showed that 44 percent of all research groups had one of the three major chemical deficiencies we tracked. Thus, two separate accidents within 13 months for one research group was not surprising based on its history of uncorrected major deficiencies. Other deficient safety practices in academic campus labs include the hepatitis B program, where records show some employees working for multiple years without receiving the vaccine they requested per Occupational Safety and Health Administration (OSHA) regulations. Finally, the university is not following prescribed practices to perform limited health assessments for employees working with laboratory animals. The deficiencies listed in this section show a broken system that places lab personnel at risk.

The University's Lab Safety System Needs Better Oversight. Ineffective coordination between OEHS and university administration is the reason for the major deficiencies previously discussed. OEHS reports inspection counts rather than outcome metrics for its inspections, such as the extent of major deficiencies and their propensity to be repeated. Administrators relied mainly on passive indicators, like number of injuries and fatalities, which meant that necessary improvements to safety programs were at risk of not being implemented until a serious accident that severely injures an employee. The university's lab safety system appears stagnant and focused on performing inspections rather

than addressing problems. Thus, both groups become ineffective in their responsibilities due to poor guidance and information from the other.

The University President Is Assigned Ultimate Responsibility for Lab Safety. Like the university's consultant in October 2017, we stress the importance of the university president invigorating the university's culture of safety. University policies place ultimate responsibility for safety programs on its chief executive, the university president. The university president commissioned a Lab Safety Culture Task Force after a peer review found concerns in 2017. However, no recommendations have been implemented yet. We recommend that the University of Utah president direct administrators to prioritize and enforce the goal of eliminating repeat safety deficiencies from lab safety audits and inspections.

Chapter III
OEHS's Poor Management Practices Leave Safety Issues Unresolved

OEHS Underreported Safety Deficiencies Found in University Labs. According to University Policy 3-300(III)(B)(5)(d), OEHS has responsibility to monitor safety performance. We believe that OEHS reported incorrectly to laboratory college deans that no deficiencies required escalation. In addition, OEHS has not reported on the unacceptable outcomes associated with the hepatitis B vaccine. These outcomes include not offering it to all applicable personnel, and records showing no additional action for 50 percent of those requesting the vaccine. In both cases, OEHS did not track pertinent data. Thus, poor safety program outcomes that require university administration's attention to ensure compliance are not being reported.

OEHS Management Practices Hindered Safety Programs to Mitigate Chemical Hazards. Chemical hazards are the biggest concern among lab personnel, and omitted follow-up activities by OEHS staff has limited the effectiveness of two programs designed to facilitate chemical identification and assessment. First, OEHS failed to follow up and perform hazardous chemical exposure assessments when audits found that required assessments were missing. Second, OEHS staff failed to upload some labs' chemical inventories to the central system after these labs sent inventories to OEHS for that purpose. In both instances, OEHS's lack of follow up reduced the effectiveness of established safety programs that are intended to minimize chemical hazard risks for lab personnel.

OEHS Needs Better Management Practices to Evaluate the Effectiveness of Safety Programs. The undesirable outcomes discussed in this chapter can be attributed to two poor management practices by OEHS. First, the department lacks systematic tracking of pertinent data. Using audit deficiencies as an example, systematic tracking would have

allowed OEHS to avoid underreporting major deficiencies, conduct risk-based selection of audits, and ensure that appropriate corrective actions to address deficiencies are implemented. Second, OEHS needs to focus its time on services that are critical to its success. Expending valuable resources on activities that should be performed by others, such as uploading chemical inventories, diverts necessary resources from critical services. In addition, as OEHS performs an activity that it must audit later creates a conflict of interest.

Chapter IV
University Administrators Need to Take Ownership of Their Lab Safety Responsibilities

Administrators Need to Ensure Implementation of Required Safety Procedures. University administrators are responsible to ensure compliance with lab safety regulations and policies by establishing the necessary procedures to achieve compliance. Some administrators have been aware of consistently poor use of personal protective equipment (PPE) for years yet have not taken appropriate action to address this safety deficiency. This inaction is concerning given that OSHA requires employers to ensure that appropriate PPE is used wherever specific hazards exist. Some administrators have also not ensured compliance with the directive to centralize chemical inventories, nor have they established procedures to comply with OSHA regulations regarding vaccination deliveries.

Administration Needs to Accurately Assess Performance of Safety Programs. University administration has inadequately addressed its responsibility to establish a system to assess safety performance. An incomplete set of metrics led some administrators to incorrectly conclude that their lab safety programs are successful. The lack of adequate safety performance metrics was highlighted in a university consultant's 2017 review. However, university administration has not implemented the corresponding recommendations, as they continue to be studied by the university's Lab Safety Culture Task Force.

Administration Should Lead in Making Safety an Institution-Wide Priority. Administrators are responsible to "…establish priorities and commit resources for the correction of safety deficiencies." However, past funding decisions raise questions about administrators' commitment to strong safety programs. Because administrators have the ultimate responsibility and authority for ensuring safety at the university, their leadership is necessary to make safety a priority across campus. The success of safety and health programs relies on administrators' leadership.

Chapter V
Lab Personnel Need to Take Ownership in Assessing Their Safety Performance

Some Lab Groups Are Unaware of Specific Safety Requirements. A survey found that some lab research group leaders had major concerns about inconsistent safety practices and chemical hazards. Also, during a Lab Safety Culture Task Force meeting, concerns were expressed that lab personnel's safety responsibilities were unclear. Subsequent discussions with a subset of lab personnel found that inconsistent practices indicated inadequate understanding of their lab safety roles and responsibilities. Some of the best practices we observed were found in labs where accidents identified safety practices that needed to improve and were commensurately adjusted. As accidents are the least desirable route to promote safety awareness, the university should consider alternatives to promote lab personnel's awareness of safety responsibilities.

Self-Assessments Make Personnel Aware of Safety Requirements. Part of OEHS's audit procedures prescribe that lab groups perform self-inspections prior to audits. However, this valuable procedure has not been effective, as many deficiencies are not corrected prior to lab visits by OEHS auditors. When self-inspections are performed, there were a lower number of lab safety deficiencies in these spaces. We believe that this practice is valuable because lab personnel learn what safety practices are expected by OEHS auditors. In addition, lab personnel take ownership to ensure that their compliance with those requirements addresses lab-specific hazards.

Peer Reviews Can Use Specialized Knowledge of Hazards to Implement Best Practices. With the varied and complex nature of research conducted in the individual colleges, OEHS staff does not always possess the technical expertise to address all hazards that some labs present. However, labs could benefit from the specialized knowledge of their peers. Regular reviews by peers with technical expertise could provide resources for lab groups and encourage the adoption of the best safety practices for their research procedures. Department-level safety committees are best suited to encourage safety best practices. However, only a few departments at the University of Utah have functioning safety committees. Additionally, peer review has been used at other institutions to ensure appropriate safety practices are implemented. We recommend that laboratory college deans consider adopting safety committees at the college or department level as warranted.

REPORT TO THE
UTAH LEGISLATURE

Report No. 2019-06

A Performance Audit of the University of Utah's Lab Safety Practices

May 2019

Audit Performed By:

Audit Manager	Brian Dean, CIA, CFE
Audit Supervisor	Tim Bereece, CFE
Audit Staff	Matthew Taylor
	Ryan Thelin

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Chapter I
Introduction

In recent years, serious accidents, including a preventable fatality, have occurred in other universities' laboratories. These incidents emphasized the importance of compliance with safety programs, policies, and practices in academic labs. Safety deficiencies like those identified at these universities have also been documented at the University of Utah (university), some of them repeatedly over multiple years. Though the university has not had a fatality, it has experienced serious accidents. Safety deficiencies need to be addressed to ensure future accidents are minimized.

Some lab safety deficiencies at the University of Utah are like those that caused other universities' serious accidents.

The perception among lab personnel is that hazardous chemicals are the most concerning and inadequately controlled. The purpose of Occupational Safety and Health Administration (OSHA) standards, as well as university safety directives, is to provide a safe working environment for university personnel. Thus, the scope of this audit was to evaluate the University of Utah's safety programs.

Multiple levels of personnel, from senior administrators to individual researchers, share responsibility for the administration and oversight of the university's safety programs. This report describes how this collective oversight has been insufficient, given the many safety hazards that remain uncorrected. The university entities that are responsible for the university's safety programs are as follows:

University of Utah personnel, from senior administration to individual researchers, share responsibility for the university's safety programs.

- **University President –** Ultimate responsibility for establishing and maintaining health safety programs at the university. See Chapter II.
- **Occupational and Environmental Health and Safety (OEHS) Department –** Responsible for the monitoring of health and safety programs' effectiveness. See Chapter III.
- **Vice Presidents, Deans, and Department Chairs –** Responsible to ensure that the university complies with all safety regulations and establishes a system for assessing safety performance. See Chapter IV.

- **Researchers –** Responsible for the health and safety compliance of the areas and personnel they oversee. See Chapter V.

During our discussions about preliminary findings with university administrators, they have been quick to begin addressing observed deficiencies. In addition, university administration has stated a commitment to correct the issues raised in this report.

Other Universities' Tragedies Show The Effect of Uncorrected Safety Deficiencies

Over the past decade, other universities' lab incidents involving highly hazardous chemicals led to the death of a researcher and dismemberment of other researchers.

Over the past decade, high profile incidents leading to death and dismemberment of laboratory personnel have raised awareness of chemical hazards in university labs nationwide. Common causal factors in these tragic outcomes were repeat deficiencies. University administration possesses the power and authority to address repeat deficiencies and thereby minimize risk for significant injuries in laboratories.

Safety Deficiencies in Labs at Other Universities Led to Tragedies

Three incidents over the past decade have raised concerns about lab safety within the occupational safety community. All incidents involved highly hazardous chemicals that, upon ignition, either exploded or seriously burned lab personnel. The following are excerpts from the reports that investigators generated after piecing together the facts of each incident.

In 2008, a UCLA researcher died after an air-reactive chemical caused second and third degree burns to 43 percent of her body.

- **University of California Los Angeles (UCLA):** "On December 29, 2008, the Victim was attempting to utilize a 60ml plastic syringe to withdraw approximately 53ml of a highly reactive (pyrophoric) liquid reagent from a glass storage bottle.…The reagent spilled onto the torso and hands of the Victim and immediately caught fire. The fire was eventually extinguished by another researcher working nearby. The Victim sustained second and third degree burns over

approximately 43% of her body. The Victim died eighteen days later on January 16, 2009, as a result of her injuries."[1]

- **Texas Tech University:** "On January 7, 2010, a graduate student within the Chemistry and Biochemistry Department at Texas Tech University (Texas Tech) lost three fingers, his hands and face were burned, and one of his eyes was injured after the chemical he was working with detonated."[2]

- **University of Hawaii:** "The failure to eliminate and or reduce explosion hazards resulted in [the loss of an arm] to a Post Doctorate Researcher … and evacuation of occupants and employees of the [building] on March 16, 2016."[3]

Lab accidents at Texas Tech and the University of Hawaii caused researchers to lose three fingers and an arm respectively.

The tragic loss of a lab researcher and diminished quality of life for affected lab personnel illustrate the risks that lab personnel can frequently work with. The same chemicals and safety lapses that caused these incidents are present in many labs at the University of Utah. Thus, it is critical to ensure that the university has proper safeguards in place to ensure that similar outcomes are prevented.

Repeat Deficiencies at Other Universities Were an Alarming Causal Factor Investigative Reports Cited

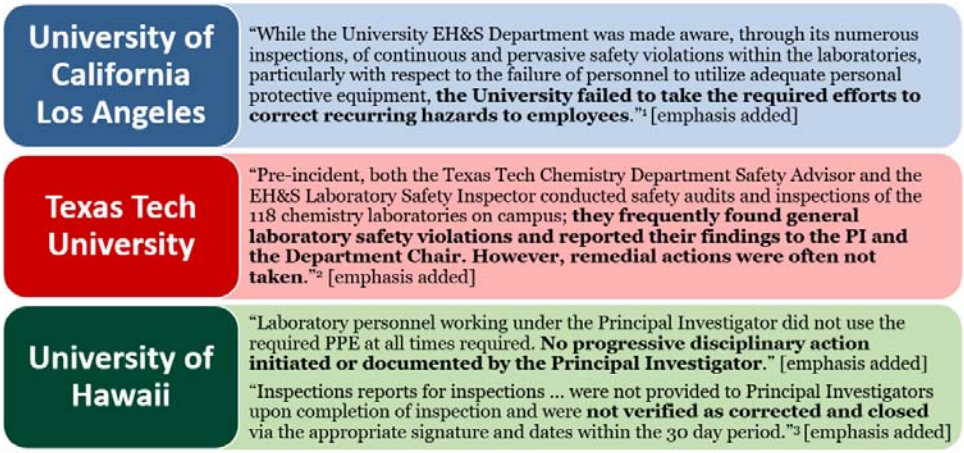
The role of repeat deficiencies is an important takeaway from the other universities' investigative reports. Staff charged with safety oversight knew that safety practices were deficient. However, those unacceptable practices were not resolved. Figure 1.1 includes excerpts from the report issued for each incident.

[1] State of California's Occupational Safety and Health Division: Investigation Report–Case No. S 1110-003-09, page 2.

[2] U.S. Chemical Safety and Hazard Investigation Board–Case Study No. 2010-05-I-TX, page 2.

[3] State of Hawaii's Occupational Safety and Health Division: Citation and Notification of Penalty–Inspection No. 1133727, page 6.

Figure 1.1 Repeat Deficiencies Were Cited in Three Universities' Post-Incident Reviews. At UCLA, Texas Tech University, and the University of Hawaii, the safety deficiencies that contributed to the incidents were known but went unresolved.



Sources: *1) State of California's Occupational Safety and Health Division: Investigation Report–Case No. S 1110-003-09, page 90*
2) U.S. Chemical Safety and Hazard Investigation Board–Case Study No. 2010-05-I-TX, page 14
3) State of Hawaii's Occupational Safety and Health Division: Citation and Notification of Penalty–Inspection No. 1133727, pages 9 & 14

Investigations at the three universities found that uncorrected repeat deficiencies were a causal factor in the incidents.

As these statements indicate, personnel that oversaw safety compliance knew that safety practices were deficient. It is also likely that these deficiencies were even communicated to the primary researcher in charge of each lab group's operations. However, failure to follow up and ensure that those deficiencies were resolved was a critical omission that rendered applicable safety controls ineffective. Thus, it is essential that the university administration takes responsibility to enforce safety programs and hold individuals and groups accountable for compliance with safety controls.

Chemical Hazards Are the Top Safety Concern Among University of Utah Lab Personnel

Like the incident at UCLA, a University of Utah researcher was burned while working with an air-reactive chemical. Fortunately, an appropriate lab coat prevented burns to the torso, but inappropriate gloves resulted in a burned and blistered hand. Chemical hazards are one of the most concerning hazards for lab personnel on campus. Unfortunately, some lab personnel expressed concern that the university's mitigation response to those risks was inadequate.

A University of Utah Incident Demonstrates The Difference a Lab Coat Can Make

In February 2018, an incident in the University of Utah's Chemistry Department led to chemical burns for two lab personnel. This incident involved air-reactive chemicals that combust when exposed to air, which was the hazard that led to the 2008 death of a UCLA researcher. In this incident, the researcher conducting the experiment and their spotter, who had a fire extinguisher, each received burns. Figure 1.2 shows the lab coat and burns resulting from the accident.

In February 2018, a University of Utah researcher's hand was burned by an air-reactive chemical, but a flame-resistant lab coat prevented further injury.

Figure 1.2 A Burn-Scarred Lab Coat Prevented Further Injury to a Chemistry Researcher. A flame-resistant lab coat prevented injury to the researcher's torso during a February 2018 incident involving an air-reactive chemical. However, their gloves did not prevent second-degree burns.

Source: Chemistry Department Safety Officer Meeting

In this case, the researcher was wearing a flame-resistant lab coat or more serious injury could have occurred. Unfortunately, we observed and OEHS has reported repeatedly that lab coats in general are not being worn consistently.

Lab coats are not consistently worn in all research labs at the University of Utah.

Unlike the incident at UCLA, two major differences were observed in the University of Utah's incident report. First, the researcher was wearing the flame-resistant blue lab coat shown in Figure 1.2. As the figure shows, the air-reactive chemical left burn marks in the material. However, an incident report noted that the clothing and skin beneath the coat were unaffected. The second major difference was that a spotter was present to extinguish the chemical. Neither of these safety precautions were present in the UCLA tragedy.

After the Chemistry Department's Safety Committee reviewed the incident, the following improvements to this specific lab group's safety practices were identified.

A University of Utah departmental safety committee suggested fire-resistant gloves to avoid future burns.

- **Use Fire-Resistant Gloves:** While the researcher's nitrile gloves did not melt, second-degree burns were still incurred. Another research group in the Chemistry Department uses fire-resistant pilot gloves, which were recommended for future use when air-reactive chemicals are involved.

- **Build Larger Margins of Safety into Procedures:** The fire resulted when the plunger of the 5 mL syringe came out while drawing 4.6 mL of the chemical. A proposal to fill syringes only to 60 percent of capacity when working with air-reactive chemicals was developed, a level significantly lower than 92 percent of syringe capacity that caused this incident.

As we reviewed this lab group's safety practices in January 2019, its safety practices stood out among its peer groups in the department as practices to emulate.

A University of Utah lab researcher was surprised by how laissez faire lab safety policies are after injuries in other universities' labs.

Based on the observations in the following chapters of this report, the university is fortunate that this incident occurred in the lab it did. One lead researcher's response to a 2016 safety survey sent to the academic community articulated our concerns best.

> I'm surprised how laissez faire lab safety policies are, especially in light of high-profile death and injuries in university labs in recent years. I am more familiar with the Univ. of California lab safety culture, in which labs were inspected at least once a year for basic safety compliance and PIs/managers were reprimanded, if not penalized, if staff and students were put at unnecessary risk. There appear to be no verification and no repercussions here at

> Utah if there is not a culture of safety. I'm not for policing, but I am for making sure that our students, staff, faculty, and infrastructure remain safe.

As will be highlighted in Chapter IV, personal protective equipment (PPE) usage rates, which includes lab coats, gloves, and safety goggles, have been unacceptably low for years. In addition, the buddy system employed by the University of Utah lab where researchers received second-degree burns is not required in another chemistry lab that we visited that works with air-reactive chemicals. Therefore, this example serves as a cautionary tale that promotes significant improvements to the university's lab safety protocols and safety culture.

Chapter IV discusses University of Utah labs' unacceptably low use of lab coats, gloves, and safety goggles.

Chemical Hazards Are Clearly the Most Concerning Hazard in University Labs

In addition to air-reactive chemicals, university labs work with a variety of other hazardous chemicals, including shock-sensitive, water-reactive, cancer-causing, flammable, and corrosive chemicals. According to a 2016 survey of the university's academic community, hazardous chemicals topped the list of concerns for lab personnel, as shown in Figure 1.3.

Among University of Utah lab personnel, chemical hazards were the most frequent concern cited in a 2016 survey.

Figure 1.3 Most Lab Personnel Listed Chemical Hazards as a Top-Five Safety Concern. Among all hazards that exist on campus, lab personnel selected hazardous chemicals most frequently in a 2016 academic survey.

Rank	Concern	Respondents	Percent
Top Three Hazards:			
1	**Chemical Hazards**	**72**	**56%**
2	Walking Surfaces (Ice, Uneven Pavement, Potholes)	56	43%
3	Indoor Air Quality (Mold, Dust, Odors, Temperature)	53	41%
3	Vehicle/Bicycle/Pedestrian Safety	53	41%
Other Lab-Related Hazards:			
5	Needle Sticks and Medical Sharps Injuries	28	22%
10	Infectious Research (Biological, Infectious, or Medical Material)	22	17%
16	Infectious Disease	13	10%
16	Radioactive Materials	13	10%
21	Animal Research - Bites and Scratches	8	6%

Source: OEHS 2016 Customer Survey to Academic Campus Staff

As Figure 1.3 shows, chemical hazards were the most frequently identified concern for lab personnel. These hazards were selected over

10 percent more frequently than those ranked second or third, which were not lab-specific but more aligned with the campus environment in general. Among lab-specific hazards, chemicals were selected twice as frequently as biological and radioactive hazards.

The University of Utah has committees that focus on hazards associated with biological agents, radioactive materials, and animals.

Interestingly, the university has entities charged with oversight for other hazards, but not for chemical hazards. The following groups oversee the protocols and use of specific hazards:

- Biological Agents – The Institutional Biosafety Committee
- Radioactive Materials – The Radiation Safety Office
- Animals – The Institutional Animal Care and Use Committee

The University of Utah does not have a committee designated to assess and mitigate chemical hazards.

A similar committee or office does not exist to manage the chemical hazards on campus. The lack of a hazardous chemical oversight body may explain why chemical hazards are considered the top concern by lab personnel. In its 2017 and 2015 annual reports, OEHS considered evaluating and creating a chemical safety review committee that has not materialized. Thus, responsibility for ensuring chemical safety has fallen to OEHS along with general oversight for all hazards except radiation.

OSHA Standards and Other Safety Requirements Are Intended to Minimize University Accidents

The Occupational Safety and Health Administration (OSHA) developed regulations that address several aspects of lab safety.

To establish a framework for providing employees a safe place to work, the Occupational Safety and Health Administration (OSHA) has developed regulations that address specific hazards. These regulations include information, training, hazard testing, protective equipment, policies, and procedures that must be provided to employees who encounter workplace hazards. These hazards include and are not limited to the following:

- Bloodborne Pathogens (29 CFR 1910.1030)
- Hazard Communication (29 CFR 1910.1200)
- Flammable Liquids (29 CFR 1910.106)
- Respiratory Protection (29 CFR 1910.134)
- Personal Protective Equipment (29 CFR 1910.132)
- Walking and Working Surfaces (29 CFR 1910.22)

Utah operates under an OSHA-approved state plan. Therefore, OSHA's occupational safety standards apply to the University of Utah.

The Utah Occupational Safety and Health (UOSH) Division of the Labor Commission is responsible for enforcement of OSHA regulations in Utah. UOSH has responsibility to apply those regulations to public agencies as well as private companies. UOSH has previously not emphasized public sector entities such as the University of Utah. In the last five years, only one of five inspections at the University of Utah originated from UOSH's initiative (the rest came from complaints or referrals). However, UOSH recently adopted an emphasis program for public sector employers that should increase the frequency of review for entities such as the University of Utah.

The Utah Occupational Safety and Health (UOSH) Division of the Labor Commission is placing greater emphasis on public entity compliance with OSHA regulations.

In addition to OSHA standards, other entities have requirements that may address specific hazards or operations. For example, one campus hazard is isoflurane, which is a general anesthetic. While OSHA does not have a specific standard, it does reference a standard established by the American National Standards Institute (ANSI). In addition, some university lab operations are funded in part by federal grants, which have their own additional set of safety requirements.

Audit Scope and Objectives

The audit request letter that initiated this audit asked us to determine whether the University of Utah followed OSHA and UOSH regulations for worker safety. Specifically, the requestor was interested whether sufficient policies and practices were in place, including an assessment of the monitoring system for assessing their performance.

The audit requestor wanted to know whether the University of Utah has adopted sufficient policies and practices to ensure workplace safety.

Since the University of Utah is one of the state's largest universities, we assessed the worker safety risks of the university's operations. Based on a concurrent UOSH investigation, previous consulting services provided to the university's various operational units, and the risks identified in other universities' academic lab environments, our audit focused on the occupational hazards associated with the University of Utah's academic labs.

The subsequent chapters of this report review the ability of the university to assess the hazards that exist in its labs, resolve known deficiencies, and ensure that mandatory medical services are provided. Based on the issues that we observed, the chapters of this report are as follows:

- Chapter II – The University's Risk Management System for Lab Safety Is Broken
- Chapter III – OEHS's Poor Management Practices Leave Safety Issues Unresolved
- Chapter IV – University Administrators Need to Take Ownership of Their Lab Safety Responsibilities
- Chapter V – Lab Personnel Need to Take Ownership in Assessing Their Safety Performance

Chapter II
The University's Risk Management System for Lab Safety Is Broken

Our review of the University of Utah's lab safety system found repeat deficiencies in many laboratories between 2016 and 2018 that affected essential areas of lab safety. Similar repeat deficiencies in other institutions of higher education led to dismemberment and death. The primary reason for safety deficiencies in many University of Utah labs was inadequate oversight from multiple levels of personnel, including university administration and the Department of Occupational and Environmental Health and Safety (OEHS).

Safety deficiencies in many university labs were primarily the result of inadequate oversight from multiple levels of university personnel.

This chapter presents an overview of the safety deficiencies in many university labs, specifically:

- Propensity for repeated major deficiencies
- Prevalence of three major chemical hazard deficiencies
- Failure to provide requested hepatitis B vaccinations
- Not requiring health risk questionnaires for animal handlers

We found that the university's lab safety system suffers from inadequate oversight. Poor coordination from ineffective communication was occurring between university administration and OEHS. Therefore, each group lacked valuable feedback and guidance from the other, resulting in repeat deficiencies and unresolved safety concerns that affected critical safety issues.

University policy 3-300 sets ultimate responsibility for lab safety with the president. As the president sets top lab safety priorities, improved coordination between OEHS and university administration must occur in order to address those critical safety issues. The university president commissioned a Lab Safety Culture Task Force after a peer review found concerns in 2017. However, no recommendations have been implemented yet. We recommend that the university president direct administrators to prioritize and enforce the goal of eliminating repeat safety deficiencies from lab safety audits and inspections.

Improved coordination between university administration and OEHS must occur in order to address critical safety issues.

Deficient Lab Safety Practices Have Persisted in Many University Labs

According to OEHS's lab safety audits during calendar years 2016 to 2018, major lab safety deficiencies were present in many university labs. When OEHS audits found a major safety deficiency in a research group, a repeat major deficiency in next year's audit was found 49 percent of the time. In addition, half of labs audited in 2017 were cited with at least one major safety deficiency. OSHA considers the extent to which deficiencies are being resolved as a predictive indicator of safety programs. Therefore, a pair of injuries involving hazardous chemicals was not surprising in a lab with a history of uncorrected major deficiencies.

Other deficient safety practices in academic campus labs include the hepatitis B program, where OSHA regulations require offering hepatitis B vaccination to employees who may be exposed to bloodborne pathogens (BBPs). However, records show some employees working for multiple years without receiving the shots or blood work they requested. Finally, the university is not following prescribed practices to perform limited health assessments for employees working with laboratory animals. The deficiencies listed in this section indicate a broken system that places lab personnel at risk.

Research Group Leaders with Major Deficiencies Were Likely to Repeat Them

One research group did not resolve major safety deficiencies until after two OEHS audits and two incidents involving students incurring chemical burns.

In the College of Engineering, one research group did not take corrective action until after two incidents involving students experiencing chemical burns. In addition, this research group underwent two OEHS safety audits, one before each incident, that identified major safety deficiencies. This inaction in correcting safety deficiencies seems reminiscent of the repeat deficiencies at other universities discussed in Chapter I. The following are brief descriptions of the incidents that occurred in this lab group's space.

- **July 2017:** A student was transporting sodium hydroxide (lye) when some of the sample got into an eye. The student washed the eye in an emergency eyewash that was several halls away due to construction. The exposure caused a chemical burn to the student's cornea.

- **August 2018:** A student was working with a 70 percent concentration of nitric acid when the 2.5-liter bottle broke and spilled onto the student's leg and feet. The student was rushed to a nearby emergency shower and then taken to the University of Utah Hospital's emergency room for burns to his leg and feet.

In May 2017, two months before the first incident, the research group was audited by OEHS. The audit identified the following nine major deficiencies:

- No chemical hygiene plan
- No updated chemical hygiene training records
- No safety data sheets (SDS)
- No updated chemical inventory
- Respirator use without appropriate procedures
- Inappropriate container labeling
- Improper compressed gas storage
- Inappropriate chemical storage
- No spill kit

The missing safety data sheets were identified as an issue in the July 2017 incident. Individuals responding to the incident had to obtain that information via their phones rather than it being readily available. In addition, the safety data sheets called for a nearby eyewash station, but the student had to go several halls away (about 30 seconds) to reach an eyewash station due to construction, exceeding the university's 10-second standard.

Despite their significance, the chemical hygiene plan, training records, safety data sheets, and chemical inventory deficiencies had not been resolved before a follow-up audit a month after the July 2017 incident. It was not until after a second incident in August 2018 that these major deficiencies were reported by OEHS staff to be resolved. This report refers to "major deficiencies" as those described by OEHS in its standard operating procedures for safety audits:

> Any condition with the potential to inflict significant damage to life, health or property. Any condition which is immediately dangerous to life or health and/or in violation of code requirements, regulatory requirements, or accrediting agency mandates.

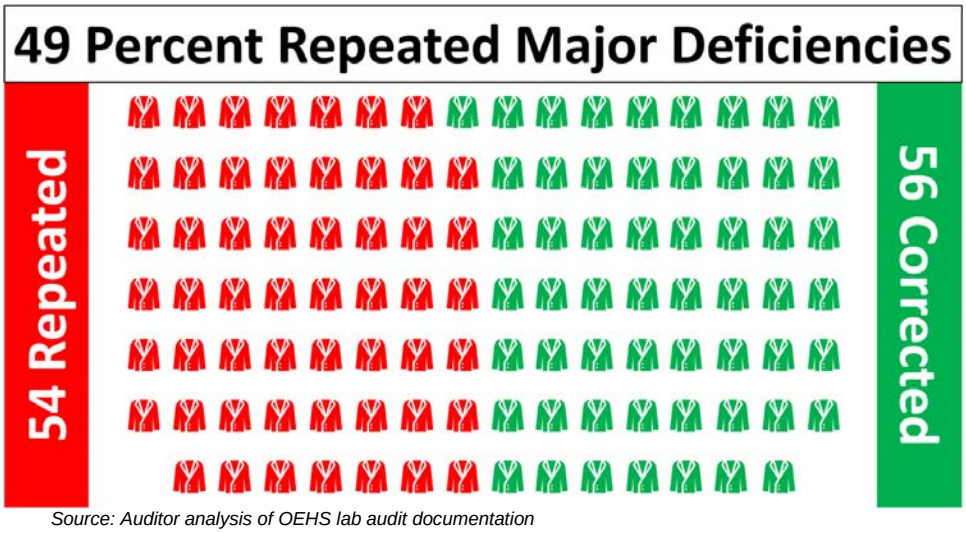
Major deficiencies discussed in this report are any condition violating safety regulations or has potential to inflict significant damage to personnel or property.

This definition of major deficiencies indicates that the nine major safety deficiencies documented in OEHS's audit of the research group was concerning. According to OEHS notes on the August 2018 incident, the research group leader finally "…closed his lab space while he reviewed all [standard operating procedures], chemical hygiene plan, chemical inventory, required [personal protective equipment], etc." An OEHS auditor remarked that these actions should have been taken long ago, after the initial findings of deficiencies.

Nearly half of labs with one of three major deficiencies we tracked repeated the deficiency in their next audit.

The reluctance to address safety deficiencies was not isolated to this one lab group but can be observed across many university labs. Figure 2.1 shows the 110 research groups with an audit in 2016 or 2017 that cited one of three major deficiencies that we tracked. Research groups are color coded to show the disposition of their major deficiencies in a subsequent audit. Specifically, we assessed whether all deficiencies were corrected or if at least one was repeated.

Figure 2.1 Subsequent Audits of Research Groups Are Likely To Find a Major Deficiency Repeated. The 110 lab coats represent a 2016 or 2017 audit of a research group* that was cited for one of three major deficiencies we tracked. In a subsequent audit, those that repeated a deficiency are in red, and those correcting all deficiencies are in green.



Source: Auditor analysis of OEHS lab audit documentation
** Research groups in this analysis were identified as a unique combination of research group leader and building, as three research group leaders had separate OEHS audits that identified major deficiencies in the two buildings that they each operated in.*

In 49 percent of the instances, the lab group did not resolve all major deficiencies we tracked. Thus, the extent of repeat major deficiencies goes beyond the engineering group discussed earlier in

this chapter. The amount of repeat deficiencies is troublesome. OSHA considers the timely correction of identified workplace hazards to be a leading safety indicator, which we will refer to as a predictive safety indicator based on OSHA's leading indicator definition:

> Measures intended to predict the occurrence of events in the future. Leading indicators are proactive, preventative, and predictive measures that provide information about the effective performance of safety and health program activities that can drive the control of workplace hazards.

OSHA's statement was validated when repeat deficiencies were present prior to the other universities' incidents (Chapter I). We are concerned that a similar safety environment exists at the University of Utah like those that led to other universities' tragic outcomes. Therefore, correcting the lab safety system at the university is important to avoid similar negative outcomes.

We are concerned that repeat deficiencies left uncorrected makes the University of Utah susceptible to tragic outcomes like those that happened at other universities.

Another part of our assessment of the university's safety performance focused on the prevalence of these three major deficiencies over a single year. Due to a lack of lab groups receiving subsequent audits in the three-year period we reviewed, the next section provides a snapshot of 2017 safety audit results.

Almost Half of All Audited Research Groups Were Cited for a Major Chemical Deficiency We Tracked

Our review of OEHS's 2017 audit documentation found that 158 of 362 (44 percent) lead researchers' groups were deficient in at least one of three major chemical safety requirements.[4] Figure 2.2 lists the three major chemical deficiencies that we tracked. The totals included in this figure represent the number of lead researcher groups that were not compliant with that specific requirement. In some instances, a research group was noncompliant in all three and would be represented in all three counts.

[4] While OEHS lab safety audits are designed to review over 60 potential lab safety deficiencies, our analysis focused on the deficiencies listed in Figure 2.2 due to their significance in a laboratory's safety environment.

Figure 2.2 Research Groups Were Frequently Found Deficient in Three Safety Controls for Chemical Hazards. We reviewed 2017 audit documentation for 362 research groups and found the following deficiencies.

OEHS Major Deficiency *(Related OSHA Standard)*	Significance Statement**	Research Groups* w/ Deficiency†
Not having or annually updating a **chemical hygiene plan.** *29 CFR § 1910.1450(e)*	"The [chemical hygiene plan] is the **foundation** of the laboratory safety program…"	**103**
Not completing or documenting required annual **safety training** for lab personnel. *29 CFR § 1910.1450(f)‡*	"Safety training should be viewed as a **vital component** of the laboratory safety program."	**141**
Not maintaining accessible **safety reference materials for specific chemical hazards** in lab (such as MSDS sheets). *29 CFR § 1910.1450(h)*	"MSDSs have become the **primary vehicle** through which the potential hazards of materials […] are communicated to trained laboratory personnel."	**56**
158 of **362** research groups* (44 percent) were found to have one or more of the major safety deficiencies above.		

Source: Auditor Generated.
** Research groups in this analysis were defined solely by the research group leader.*
*** These statements were taken from Appendix A of OSHA standard 1910.1450 and its source document, the National Research Council's "Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards."*
† As some research groups were deficient on multiple safety requirements, summing these counts is not appropriate. The count of distinct research groups with one or more of these deficiencies was 158, which is shown in the table's bottom row.
‡ While OSHA requires chemical hygiene plan training at the time of initial assignment, the frequency of refresher information and training is left to the employer. OEHS audits assess lab group compliance according to an annual training standard.

The prevalence of major chemical deficiencies is concerning as 44 percent of audited lab groups in 2017 had one of the three that we tracked.

The three major chemical deficiencies listed in Figure 2.2 are critical in ensuring the safety of lab personnel working with chemicals and an appropriate response if an incident occurs. As Figure 2.2 shows, 141 labs lacked appropriate documented training on chemical hazards. When this sheer volume of deficiencies is combined with the prior discussion about the prevalence of these major chemical deficiencies being repeated, the lack of resolution to these issues is concerning.

Half of Employees Requesting an OSHA-Required Hepatitis B Vaccine Did Not Receive Them

OEHS records show that 38 of 76 (50 percent) employees who requested the hepatitis B vaccine in 2017 had no indication they received it.

As part of its bloodborne pathogen (BBP) regulations, OSHA requires that employees with potential exposure to biological material should have an opportunity to receive the hepatitis B vaccination at no charge. OEHS records for the 2017 calendar year indicate that a majority of employees indicated they already received the vaccine or declined it. While only 76 employees requested the vaccine, records for 38 employees (50 percent) provided no indication they received it. Yet, OSHA regulation 29 CFR 1910.1030(f)(2)(i) states the following regarding employees with potential exposure to BBP:

> Hepatitis B vaccination shall be made available after the employee has received [annual bloodborne pathogen training] and within 10 working days of initial assignment…

The failure to deliver hepatitis B vaccines to those requesting them will be discussed further in Chapters III and IV of this report. Multiple elements of the university's hepatitis B vaccination program were deficient, including the following:

- Not identifying the entire population at risk for BBP exposure.
- Not ensuring that those requesting the vaccine received it.
- Allowing individuals who requested the vaccine to work without receiving it.
- Not identifying who specifically has responsibility for retaining vaccination records.

To have a more successful hepatitis B immunization program, these four elements of the program need to be addressed. Recommendations to OEHS and university administration that address these issues are presented in Chapters III and IV respectively. In this chapter, the fact that employees have requested vaccination and did not receive it illustrates that the risk management system for lab safety appears broken.

To Comply with Federal Requirements, All Animal Handlers Should Have Health Questionnaires Reviewed

The university's health questionnaire that employees complete after an animal-handler safety training has been optional, and officials cite that 68 percent of personnel were opting out. This screening process is intended to protect individuals from potentially devastating working conditions when working around animals. For example, a university veterinarian informed us about Q fever, which is an illness that employees who work with pregnant sheep can contract. If an individual has a heart valve issue, the disease could be fatal. These types of potentially devastating scenarios are what these health questionnaires attempt to mitigate.

The University of Utah should comply with mandates from federal funding agencies that require the collection and evaluation of animal handlers' health histories.

Contrary to the university's practice of optional participation, federal funding for animal-related research mandates the collection and evaluation of animal handlers' health history. We were not able to delineate which federal funding was specific to animal research. For 2018, the University of Utah received nearly $200 million in grants from the National Institutes of Health. Since the University of Utah has made health questionnaires for employees optional, this practice can jeopardize certain research funding and leaves the diverse risks associated with animal research unchecked.

Among the PAC 12 institutions, the University of Utah and one other institution do not require the collection of health questionnaires for at least some personnel involved in animal research. The other 10 institutions require the collection and evaluation of health questionnaires.

Since we brought this issue to the attention of university administrators, they have notified us that resources have been allocated to make health questionnaires and their review mandatory. In Chapter I, we mentioned that university administration has been responsive to issues raised. This instance is a noteworthy response towards implementation for which we commend university administration.

The University's Lab Safety System Needs Better Oversight

Ineffective coordination between OEHS and university administration is the reason for the major deficiencies previously

discussed. To properly assess and address lab safety risks, University Policy 3-300 gives each group specific responsibilities. To be effective, both groups must rely on good information and guidance from the other.

Rather than reporting the outcome metrics for its inspections, such as the extent of major deficiencies and their propensity to become repeat deficiencies, OEHS reports inspection counts. Consequently, university administration has not been alerted to issues that warrant the corrective actions OEHS suggested to university safety policies.

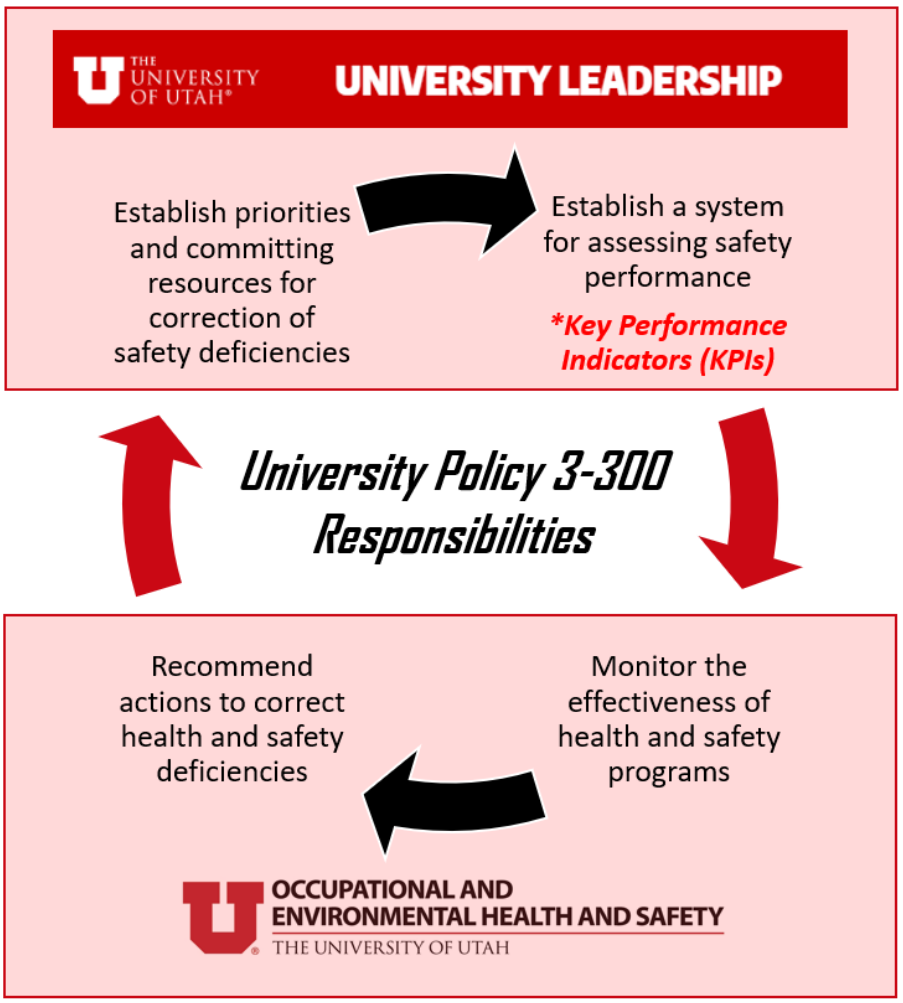
OEHS has not reported outcome-focused metrics for its lab safety audits, and administration has not established clear safety priorities for OEHS to monitor.

Subsequently, university administration perpetuates the weak oversight as safety priorities remain unclear because they continue to be studied for future implementation. The university's lab safety system appears stagnant and focused on performing inspections rather than addressing problems. Thus, both groups become ineffective in their responsibilities due to poor guidance and information from the other.

Poor Guidance between OEHS and University Administration Limited Their Effectiveness

University Policy 3-300 established roles and responsibilities for 14 groups on campus. We believe the roles for OEHS and university administration are particularly important. In addition, a critical function of OEHS, specified in University Policy 3-300(III)(B)(5)(d) and (f), is monitoring health and safety programs and recommending corrective actions. Section (2)(d) and (g) of the policy gives university administration the responsibility to establish priorities for assessing safety performance. The roles of OEHS and university administration are therefore interconnected, as shown in Figure 2.3.

Figure 2.3 The Responsibilities of University Administration and OEHS Rely on Guidance from the Other. Policy 3-300 specifies two key responsibilities for each group that create a feedback loop to address the biggest safety concerns.



Source: University of Utah Policy 3-300
** A University of Utah consultant who performed a peer review in October 2017 recommended that units involved in environmental health and safety efforts develop three or four key performance indicators.*

The feedback loop between OEHS and administrators is critical.

As Figure 2.3 identifies, a critical feedback loop exists between OEHS and university administration. The outputs of one group serve as the other group's basis for decision making and associated tasks. If this feedback loop were working effectively, we anticipate that the following would happen:

- OEHS could monitor lab safety through its audit process, which should be tailored to evaluate the primary concerns communicated by university administration.

- After analyzing the results of its audit work, OEHS would propose corrective actions for identified issues. Then, OEHS would report its findings and recommendations to the applicable vice presidents.

- The vice presidents would then determine what safety deficiencies present the greatest risk and direct additional resources to mitigate their impact.

- Finally, the vice presidents would modify the system for assessing safety performance by adjusting the key performance indicators (KPIs) used to assess safety performance.

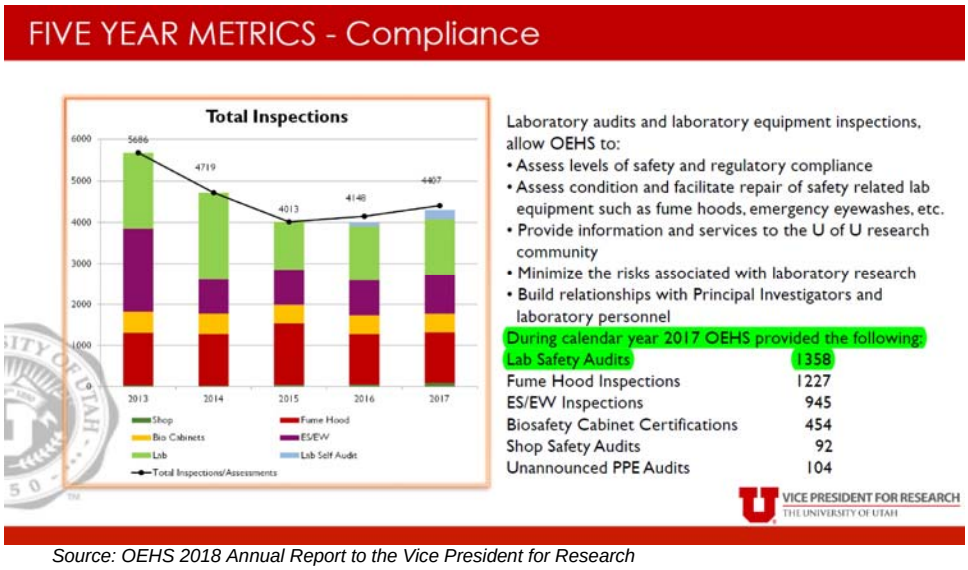
As the following sections show, OEHS has been focused on reporting its activity levels rather than the level of deficiencies observed in its inspections. In turn, university administration has not prioritized what lab safety deficiencies are most risky and need to be addressed first. To begin addressing this gap, university administration needs to establish key performance indicators to be tracked to show the system is progressing. As the next section will show, the outcomes from both groups could be improved, which is needed to fix the current system for assessing lab safety risks.

OEHS has focused on reporting its activity levels rather than the level of deficiencies observed from its inspections.

Ineffective Monitoring of Deficiencies Impairs OEHS's Ability to Make Recommendations

Annually, OEHS has an excellent opportunity to report on the deficiencies it observes in university safety practices when it reports to the Vice President for Research. Instead, OEHS reports on its activity levels as shown in Figure 2.4. Rather than showing its stakeholders the value of the audits in identifying deficiencies, stakeholders are given the number of inspections done but not the findings from the inspections. Figure 2.4 shows the chart that OEHS presented from 2015 to 2018, which emphasized the number of inspections it performed.

Figure 2.4 Inspection Counts Are OEHS's Primary Metric Rather Than Identified Safety Deficiencies. In annual reports from 2015 through 2018, OEHS emphasized the number of inspections it performed rather than the status of lab safety deficiencies.



Source: OEHS 2018 Annual Report to the Vice President for Research

OEHS reports to vice presidents did not detail the extent of safety deficiencies.

Although 1,358 lab and safety audits (green highlight) were reported for 2017, the report does not detail the number of deficiencies identified or corrected to vice presidents. Instead this figure suggests that OEHS has been busy, but the value of that work remains unclear.

In OEHS's 2018 presentation, the topic of top compliance concerns was presented in the form of the following bulleted list:

- Chemical storage and management
- Written chemical hygiene plan compliance
- Participation in the chemical inventory tool
- A drop in personal protective equipment compliance
- Reminder to complete the hepatitis B vaccine series

While these points identify what OEHS's primary concerns are, it does not identify the extent of the issues involved. As has been discussed in this chapter, the following information about deficiencies would be more informative by sharing the extent of known deficiencies. For example:

- 49 percent of lab groups repeated a major chemical safety deficiency

- 103 of 362 lab groups (29 percent) lacked an updated chemical hygiene plan
- 141 of 362 lab groups' (39 percent) basic safety training was undocumented
- 38 of 76 employees who requested a hepatitis B vaccine did not receive one

We believe that this information would be more informative to university administration to begin prioritizing what deficiencies to address. OEHS has not provided justification for the corrective actions it suggested to university administration when it merely reports it conducted 1,358 lab audits without the extent of safety deficiencies.

University Administration Needs to Clearly Define Their Safety Priorities and Corresponding Metrics

While OEHS metrics need improvement, university administration has not yet prioritized which safety concerns should be addressed first. The administration is waiting as its Lab Safety Culture Task Force finishes studying the university's lab safety issues. University Policy 3-300 (III)(B)(2)(g) gives university administration the responsibility to "…establish a system for assessing safety performance." OEHS has not provided useful metrics from its lab safety audits identifying the extent that safety deficiencies are concerning. University administration could have used its own observations and the incidents at other institutions as guidance.

While OEHS's lab safety audit metrics have not been insightful, they have reported low utilization rates of personal protective equipment (PPE) in labs that have persisted for years. Failure to use PPE was one contributing factor in the 2008 death of a UCLA student. Indicators such as low PPE utilization are a predictive indicator that is intended to prevent severe injuries and fatalities. In contrast, the number of injuries and fatalities are considered passive[5] indicators that university administration have historically emphasized.

As administrators relied on passive indicators, the scope of improvements recommended in this report were at risk of not being implemented until a serious accident that severely injures an employee.

As administrators primarily relied on passive indicators in a 2016 response about safety concerns at the university, they had a misguided

[5] While OSHA refers to the number of injuries and fatalities as lagging indicators, we refer to them in this report as passive indicators.

picture of the safety system and considered it more successful than it was. With passive indicators informing administrators of the safety system and culture, the scope of necessary improvements recommended in our report were at risk of not being implemented until a serious accident that severely injures an employee.

Several concerns are discussed in Chapter IV of this report that university administration need to address regarding lab safety. The following are some of the concerns discussed in that chapter:

- Allowing deficiencies that led to other institutions' incidents
- Reliance on passive rather than predictive safety indicators
- Not yet implementing its safety consultant's recommendations

As the final bullet point states, university administration showed concern for safety by hiring a consultant to conduct a safety review. However, the implementation of that October 2017 review's recommendations was postponed as the university president initiated a broader review by a Lab Safety Culture Task Force. The task force's work began September 2018 and will culminate like this audit with a report in May 2019. The implementation of recommendations from this audit, the October 2017 peer review, and the Lab Safety Culture Task Force needs to be swift as 18 months have elapsed since the peer review issued its report.

One recommendation from the university's 2017 consultant was that each unit involved in the health and safety function develop three or four key performance indicators. As the development of those metrics has not yet happened, the potential adverse impacts of repeat deficiencies should be considered. Strong leadership is needed to enforce the goal of no repeat deficiencies, which will mitigate risk. Therefore, as the university president has ultimate responsibility for lab safety, she is the best person to establish and prioritize a directive to eliminate repeat safety deficiencies in university labs.

The University President Is Assigned Ultimate Responsibility for Lab Safety

Like the university's consultant in October 2017, we stress the importance of the university president invigorating the university's culture of safety. University policies place ultimate responsibility for

safety programs on its chief executive, the university president. According to University Policy 3-300 (III)(B)(1):

> The University President has ultimate responsibility for establishing and maintaining environmental health and safety programs and establishing a system for assessing safety performance for the University.

The University of Utah president is the individual empowered to improve the direction of the lab safety program.

This responsibility empowers the university president to improve the direction of the university's safety program.

As was illustrated by the student fatality at UCLA, responsibility for incidents extends beyond lead researchers and rests with university leadership. After the 2008 death at a UCLA laboratory, the university board of regents was included in the lawsuit resulting from the incident. The California's OSHA office's investigative report stated the following:

> UCLA through its failure to maintain an effective Chemical Hygiene Plan and Injury and Illness Prevention Plan, through repeated inability of the Office of Environmental Health & Safety to assure enforcement [of] chemical safety requirements, and through the actions of [the lead researcher], ***wholly neglected its legal obligations to provide a safe working environment for lab personnel.*** [emphasis added]

The lawsuit ended in a settlement agreement that required an overhauled Lab Safety Program at UCLA. However, it reportedly cost UCLA $4.5 million for legal defense for themselves and the lead researcher involved in the lawsuit.

After the incidents at other universities, the Association of Public & Land-Grant Universities' (APLU) created a task force to bring together recommendations from various authorities.[6] The recommendations in the APLU's April 2016 report focused on implementing and sustaining a culture of academic and research safety. The university's Lab Safety Culture Task Force commissioned by the

[6] National Academies of Sciences, Engineering, and Medicine (NASEM); the American Chemical Society (ACS); and the U.S. Chemical Safety and Hazard Investigation Board (CSB)

president has been assessing how university policies and practices can align with the APLU recommendations.

University of Utah leadership needs to prioritize and enforce the goal of eliminating repeat lab safety deficiencies.

One of the critical recommendations the APLU made was for presidents to assume ultimate responsibility for safety. The University of Utah has already adopted the policy that the university president has ultimate responsibility. Therefore, we recommend that the president direct administrators to prioritize and enforce the goal of eliminating repeat deficiencies from lab safety audits and inspections. One organization that we met with during this audit referred to repeat deficiencies as "leadership findings." These situations indicate that leadership needs to provide greater guidance and enforcement on deficiencies. Throughout this report, a variety of deficiencies are described, and there should be no allowance for repeat deficiencies.

Recommendations

1. We recommend that the University of Utah president direct administrators to prioritize and enforce the goal of eliminating repeat safety deficiencies from lab safety audits and inspections.

Chapter III
OEHS's Poor Management Practices Leave Safety Issues Unresolved

The Occupational and Environmental Health and Safety (OEHS) department has not effectively reported the concerning safety conditions in the University of Utah's (university) labs. For example, OEHS has reported to laboratory college deans that no safety deficiencies required escalation, despite many labs with repeated major deficiencies. In addition, the extent that hepatitis B vaccination has been offered and delivered to affected employees is unacceptably low relative to OSHA requirements. Neither of these issues has been effectively communicated to university administration.

OEHS has not effectively reported on lab safety problems, involving repeat major deficiencies, hepatitis B vaccines, and exposure assessments for hazardous chemicals.

University efforts to mitigate chemical hazards have also been hindered by OEHS omissions. During its 2017 audits, missing exposure assessments for hazardous chemicals were identified, but subsequent performance of these required tests has not been performed. In addition, the university's central chemical inventory contains outdated or missing records because OEHS offered to upload labs' chemical inventories but has not done so.

Poor management practices by OEHS allowed these programs and initiatives to fall short of their desired outcomes. Specifically, OEHS has not systematically tracked pertinent data such as audit deficiencies. Thus, essential follow up activities have not occurred. In addition, dedicating staff time to less critical activities contributed to the poor performance of critical ones. OEHS management needs to ensure its staff resources are allocated to the most important services it provides.

Poor management practices like not systematically tracking pertinent data have hinder OEHS's ability to perform its essential duties.

OEHS Underreported Safety Deficiencies Found in University Labs

According to University Policy 3-300(III)(B)(5)(d), OEHS has responsibility to monitor safety performance, which it does through safety audits. We believe that OEHS reported incorrectly to laboratory college deans that no deficiencies required escalation, which would have notified the dean via memo about a lab groups' continued non-compliance. OEHS also has not reported on the unacceptable outcomes associated with the hepatitis B vaccine being offered and

delivered to applicable personnel. OEHS reported the number of vaccinations it offered without providing a context of how many employees should be offered the vaccine. In addition, it did not report whether requests for vaccination were fulfilled. In both cases, OEHS did not track pertinent data. Thus, poor safety program outcomes that require university administration's attention to ensure compliance are not being reported.

OEHS Incorrectly Reported That No Repeat Safety Deficiencies Required Escalation

OEHS reported deficiencies but told deans they did not need escalation.

Based on findings from its 2017 lab safety audits, OEHS for the first time prepared annual reports for the five college deans who oversee faculty with wet-labs. In the colleges of Science, Medicine, Pharmacy, Engineering, and Mines & Earth Sciences, wet-labs have special plumbing to appropriately handle hazardous fumes and liquids. OEHS reported to these deans that "during 2017 no deficiencies required escalation." For all the colleges except Pharmacy, we found that claim to be inaccurate and misleading based on the extent of observed repeat safety deficiencies.

As one example, a lab group in the College of Science repeated four major deficiencies and one minor deficiency.

For example, one research group in the College of Science was cited for the following deficiencies in 2017:

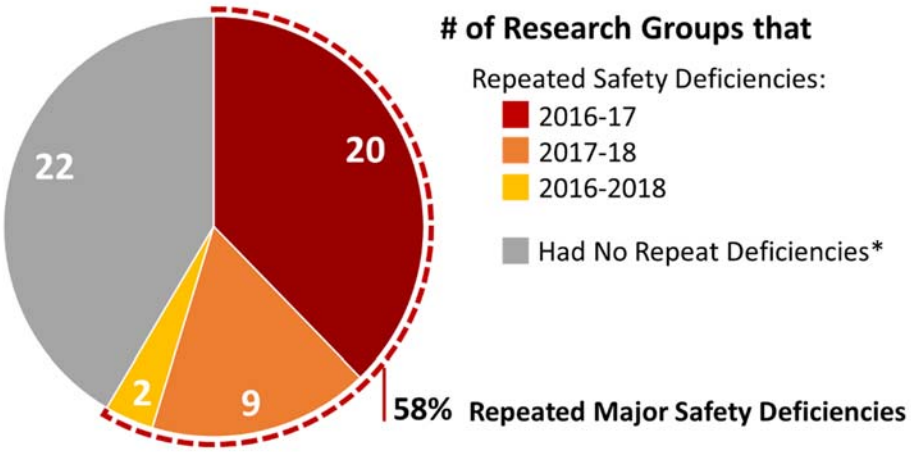
- No chemical hygiene plan (major)
- Applicable training incomplete or undocumented (major)
- Incomplete chemical inventory (major)
- Missing hazard warning sign (minor)
- No hazardous chemical spill cleanup materials (major)

The same deficiencies were identified during the research group's 2018 audit. We believe OEHS's claim that no deficiencies required escalation was incorrect because none of this lab group's deficiencies were corrected. This research group was not the only one that we observed with repeat deficiencies.

Because OEHS did not systematically track deficiencies, we inspected available documentation to determine the extent that repeat deficiencies were taking place. We limited our review to three major deficiencies: missing safety data sheets (SDSs), missing chemical hygiene plans, and incomplete or undocumented required training, such as chemical hygiene training.

In OEHS's 2017 annual reports to college deans, 53 research groups were identified with one of the three deficiencies we tracked. Having also reviewed available documentation for 2016 and 2018 audits, the following observations were made about repeated deficiencies.

Figure 3.1 Research Groups in the 2017 Annual Reports Repeated a Tracked Major Deficiency 58 Percent of the Time. Our review was limited to three major chemical deficiencies. This chart color coded whether the 2017 was a repeat from 2016 (red), repeated in 2018 (orange), or found for all three years (yellow).



Source: OEHS Audit Documentation
**These research groups had no repeat deficiencies out of the three major safety deficiencies that we tracked (SDS sheets, Chemical Hygiene Plan, and Safety Training).*

Our review of OEHS records found that 31 of 53 research groups (58 percent) repeated rather than corrected the three major chemical deficiencies we tracked.

Despite OEHS claims that no lab safety deficiencies required escalation, Figure 3.1 shows that at least one major chemical deficiency was repeated for 58 percent of research groups. Since most research groups are repeating rather than correcting major deficiencies, the current process to correct deficiencies has been ineffective.

When we asked OEHS staff why no deficiencies required escalation, their response was that if a lab had a plan to resolve the deficiency, then no escalation was required. This is understandable if the deficiency was resolved, but when deficiencies were repeated rather than resolved—they should have been escalated by sending a memo to the appropriate college dean. We recommend that OEHS obtain assurance that major deficiencies are corrected. As OEHS's audit procedures stipulate a three-day period to develop a plan that addresses major deficiencies; a second period could be stipulated when that plan would be assessed for implementation.

OEHS's decision to escalate deficiencies was based on research groups developing a corrective action plan rather than addressing the deficiency.

OEHS Has Not Reported the Low Rates of Hepatitis B Vaccination Offers and Delivery

OSHA's bloodborne pathogen (BBP) standard requires that employees with potential exposure be offered hepatitis B vaccination.

As discussed in Chapter II, OSHA regulations[7] require that all employees with potential exposure to bloodborne pathogens (BBPs) be identified, trained, and offered applicable vaccinations with vaccination records maintained. Based on OEHS data, there is no assurance that these steps have been fully taken, as the following service gaps were identified.

- OEHS reportedly offers vaccines to about half the employees in job codes identified as likely to be exposed to BBPs.
- OEHS's records show that half the lab personnel requesting the hepatitis B vaccine or an immunity check in 2017 did not receive them.

Collectively, these two performance measures indicate that some of the services required by OSHA's BBP regulation are not being delivered to the intended populations.

The University of Utah identified 64 job codes where all or most employees have occupational exposure to BBP.

Human Resources (HR) Data Indicates That Only Half the Employees with BBP Exposure in 2018 Were Offered Vaccination. Other higher education institutions as well as the University Hospital and Clinics track hepatitis B vaccination offers and delivery through HR job codes with likely exposure to BBP. In the university's BBP Exposure Control Plan, 64 job classifications are listed where all or most employees have occupational exposure (See Appendix). The following numbers show HR's employee counts for these 64 job codes, which are different from the reported number who attended OEHS's BBP training and were offered the hepatitis B vaccine.

[7] According to OSHA's bloodborne pathogens standard in 29 CFR 1910.1030(f)(2), "Hepatitis B vaccination shall be made available after the employee has received the training required in paragraph (g)(2)(vii)(I) and within 10 working days of initial assignment to all employees who have occupational exposure unless the employee has previously received the complete hepatitis B vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons."

- 2,045 Employees – Human Resources' count of employees in the 64 job codes with occupational exposure to BBP as of December 2018.

- 1,145 Employees – OEHS's reported number of employees who attended its BBP training during calendar year 2018 and were offered a hepatitis B vaccination.

While data from human resources identified 2,045 employees in the 64 affected job codes, OEHS offering the vaccine to 1,145 employees, showing that reconciliation is needed.

Based on the count reported by OEHS, only 56 percent of the likely exposed population attended OEHS's BBP training and received a vaccination offer. Without reconciling offers to population data from human resources, OEHS can give no assurance that the hepatitis B vaccine has been offered to all employees with likely exposure.

It is also worth noting that the exposure control plan contains a second list of an additional 244 job classifications where some employees may have BBP exposure. The second list includes job titles like police officer and custodian. Therefore, the affected population that is receiving vaccine offers could be even lower than 56 percent, which requires a coordinated effort led by university administration that is discussed in Chapter IV.

OEHS records show that 50 percent of employees requesting the hepatitis B vaccine or immunity check in 2017 did not receive them.

Delivery Rates for Lab Personnel Requesting the Hepatitis B Vaccine or Immunization Checks Are Unacceptable. Among lab personnel offered vaccination, less than half request vaccination or having their immunity status checked. Unfortunately, 50 percent of these requests for services went undelivered. OEHS records show the following four outcomes:

1. No action was documented for the employee's request
2. The employee started or completed the requested service
3. Updates to employee vaccination or employment status
4. The employee later declined the requested service

We consider the last three outcomes to be acceptable as lab personnel may change their employment status or find out they had been vaccinated. Figure 3.2 shows the extent to which the four outcomes occurred from 2017 requests for medical services.

Figure 3.2 In 2017, Half of Lab Personnel Requests for Vaccination or Immunity Check Resulted in No Action. Each of these outcomes was after the employee received two email reminders from OEHS.

Status	Immunity Check	Vaccine	Total	Percent
1) No Action	97	38	135	50%
2) Started or Received	68	26	94	35%
3) Updated Employment Status	17	9	26	10%
4) Declined Later	11	3	14	5%
Total	**193**	**76**	**269**	**100%**

Source: OEHS Tracking Sheet for Hepatitis B Vaccination and Immunity Check Requests

As Figure 3.2 shows, 50 percent of requests did not result in delivered services or a change in status. This is more than the 35 percent that were observed at least starting their vaccination series, which consists of three shots. The percent of lab personnel completing the series is lower, which is a concern that should have been communicated to university administration.

Lab personnel who request the hepatitis B vaccine or immunity check for 2, 3, or 4 years show that delivery of requested services is a problem.

One of the undesirable consequences of lab personnel not receiving the services they request is that they then make requests in multiple years for services. During the five years leading up to 2017, the following number of lab personnel requested vaccination or immunization checks for two, three, or four years during the five-year window:

- 4 Years – 6 Employees
- 3 Years – 22 Employees
- 2 Years – 78 Employees

Observing that lab personnel have requested vaccination for multiple years confirms that the process is not working effectively. The current method of tracking BBP offers and delivery of requested services has proven inadequate. Systematic tracking of individual employees' offers and delivery of requested medical services is necessary, which is the practice at the University Hospitals and Clinics. Accountability for each employee requires tracking data at the employee level, which has not been OEHS's practice.

OEHS Management Practices Hindered Safety Programs to Mitigate Chemical Hazards

As chemical hazards were most frequently identified as a top-five safety concern among lab personnel, programs to identify and assess these hazards are critical. Omitted follow-up activities by OEHS staff has limited the effectiveness of two programs designed to facilitate chemical identification and assessment. When audits found that required hazardous chemical exposure assessments were missing, OEHS failed to follow up and perform those assessments. In addition, OEHS staff failed to upload some labs' chemical inventories to the central system after the labs sent inventories to OEHS for that purpose. In both instances, OEHS's lack of follow up reduced the effectiveness of established safety programs that are intended to minimize chemical hazard risks for lab personnel.

Programs to assess lab personnel exposure to hazardous chemicals and the central collection of chemical inventories are not properly managed by OEHS.

OEHS Did Not Satisfy Requirements to Assess Exposure Levels of Hazardous Chemicals

OSHA regulations and other industry-specific requirements have been set in place to ensure that employees are not overexposed to highly hazardous chemicals. One such chemical with specific requirements is formaldehyde, a preservative for biological samples. OEHS's exposure assessment documentation shows that OEHS has not performed the necessary assessments and subsequent follow up when unacceptably high exposures were detected.

OSHA regulations[8] require that exposure assessments be performed when labs use formaldehyde. These regulations include a documentation requirement in 29 CFR 1910.1048(o), which specifies the following:

> (1) *Exposure measurements.* The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to formaldehyde.

OSHA requires that employee exposure to formaldehyde be assessed and documented to show that exposure levels are below specified limits.

[8] According OHSA's formaldehyde standard in 29 CFR 1910.1048(d)(1)(i), "each employer who has a workplace covered by this standard shall monitor employees to determine their exposure to formaldehyde." The subsequent subparagraph provides an exception if the employer "documents, using objective data" that the employee cannot be exposed beyond the short-term exposure limit.

(2) *Exposure determinations*. Where the employer has determined that no monitoring is required under this standard, the employer shall maintain a record of the objective data relied upon to support the determination that no employee is exposed to formaldehyde at or above the action level.

OEHS audits in 2017 identified 47 lab groups that were missing formaldehyde assessments. None of these groups were among the 10 that had assessments in 2017 or 2018.

Based on that standard, we asked OEHS for all documentation (10 records) for formaldehyde assessments that were performed during the 2017 and 2018 calendar years. However, OEHS audits conducted in 2017 identified 44 instances where formaldehyde exposure assessments were needed. None of the documentation OEHS provided matched any of the missing assessments identified in their audits.

While OEHS is the group responsible for performing these assessments, it does not have a systematic process for tracking and following up on labs using formaldehyde. Therefore, OEHS staff rely in part on lab personnel to request an assessment. As will be discussed in Chapter V, the safety-related responsibilities of lab personnel are not well understood. Additionally, during a lab audit that we observed, a lab manager mentioned that they had asked OEHS to conduct formaldehyde exposure tests for years without success.

One 2016 assessment found that exposure to formaldehyde exceeded limits, but the lab group had not been retested within six months as regulations required.

We are concerned about the level of OEHS follow-up on chemical exposure hazards. This concern is exemplified by a formaldehyde exposure assessment in 2016 that found a lab's exposure levels to be above OSHA's regulatory limit. OSHA regulations require another assessment within a year if an overexposure of formaldehyde gas was found. OEHS did not have any documentation of a subsequent retest of exposure levels.

Ensuring proper OEHS follow up when assessments were missing or had identified overexposure is critical. As will be discussed later in this chapter, better tracking and follow up procedures for deficient labs are necessary.

OEHS Failed to Upload Chemical Inventories That Labs Submitted to Resolve Audit Deficiencies

Chemical inventories are an important resource to manage chemical hazards on campus, such as providing the exposure

assessments discussed in the previous section. OEHS's standard wording when a lab had a chemical inventory deficiency describes the importance of this tool:

> University administration has mandated use of the laboratory management system for the maintenance and tracking of chemical inventories on campus. These inventories are used in assessing building code compliance, emergency response needs, and satisfying OSHA requirements.

University of Utah lab groups must upload their chemical inventories into the university's central lab management tool.

This statement describes how chemical inventories are an important tool to manage and respond to risks. OSHA's hazard communication standard 29 CFR 1910.1200(e)(1) supports university administration's mandate by stating:

> Employers shall develop implement and maintain at each workplace, a written hazard communication program … which includes the following: (i) a list of the hazardous chemicals known to be present using a product identifier that is referenced on the appropriate safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas).

In its *2017 Research Safety Report*, an OEHS statement indicates that 27 percent of principal researchers had not uploaded their inventories into the university's central lab management system (LMS). However, we noted that additional research group leaders whose LMS chemical inventories were missing, incomplete, outdated, or lacked pertinent dates had not been marked deficient in OEHS audits.

Twenty-seven percent of research group leaders had not uploaded their chemical inventories.

During our lab visits, research group leaders without chemical inventories in LMS reported sending their inventories to OEHS staff in 2017, but as of October 2018, OEHS had not uploaded them. The following are some excerpts from one research group leader's email exchange with OEHS staff on this issue.

- **October 2016 –** OEHS staff sent an initial email about uploading the lab group's chemical inventory, stating that "it is imperative that this takes place immediately." Due to technical difficulties uploading data into the LMS system, OEHS staff sent a subsequent email stating "if you need help with that

OEHS staff have offered to upload research groups' inventories into the central system.

process please forward the new chemical inventory and we will help as we are able to." Thus, the principal researcher sent them his group's chemical inventory to be uploaded.

- **January 2017 (Three Months Later) –** The researcher's inventory still was not loaded into LMS, so he emailed OEHS staff and received the following response: "As long as you submitted the inventory you will not get a discrepancy in regards to the chemical inventory. Our techs haven't been able to enter all of our chemical inventories into the system because of the [exorbitant] amount that we have received. I will be conducting your safety audit and will make note that you have submitted the chemical inventory at this time."

OEHS staff did not upload chemical inventories as promised, then incorrectly marked the lab compliant for uploading its chemical inventory.

In January 2017, OEHS offered to upload a research group's chemical inventory, but as of October 2018, it is still missing from the central system.

Upon review of the LMS chemical inventory content from October 25, 2018, which was two years after the lead researcher sent his chemical inventory to OEHS, it was not in the central system. In the research group's January 2017 audit referred to above, no deficiency for chemical inventories was indicated. We believe OEHS is missing the point, which is to determine whether the objective of a functional central repository for chemical inventories is being achieved. An effective system would allow safety personnel to know what dangers exist and how to mitigate them if an accident occurs.

Central chemical inventories, which are not available for every laboratory, allow safety personnel to know what hazards are present if an accident occurs.

In OEHS's annual reports, incomplete participation in the central chemical inventory system was identified. However, OEHS did not report that its staff were not uploading some of these inventories, which contributed to the noncompliant research groups. Greater focus needs to be placed on OEHS's role in the lackluster performance. As will be discussed, we are specifically concerned about the conflict of interest that exists when OEHS adopts the role of uploading inventories in addition to auditing whether lab personnel have fulfilled this responsibility. As OEHS plays a critical role in monitoring the performance of safety programs, diluting this effort with data entry of chemical inventories is not a prudent role to adopt.

OEHS Needs Better Management Practices to Evaluate the Effectiveness of Safety Programs

The undesirable outcomes discussed in this chapter can be attributed to two poor management practices by OEHS. First, the department lacks systematic tracking of pertinent data. Using audit

deficiencies as an example, systematic tracking would have allowed OEHS to avoid underreporting major deficiencies, conduct risk-based selection of audits, and ensure that appropriate corrective actions to address deficiencies were implemented.

In addition to improving systematic tracking of pertinent data, OEHS needs to focus its time on services that are critical to its success. Expending valuable resources on activities that should be performed by others, such as uploading chemical inventories, diverts necessary resources from critical services. In addition, as OEHS performs an activity that it must audit later creates a conflict of interest.

To be effective, OEHS must systematically track pertinent data and focus staff efforts on essential safety tasks.

OEHS Has Not Systematically Tracked Pertinent Information

The issues raised earlier in this chapter are, to some extent, the result of OEHS's insufficient data tracking. Using the repeat audit deficiencies as an example, multiple pieces of pertinent information were not tracked. OEHS standard procedures for its audits specify tracking the following information:

- The OEHS specialist shall contact the PI/Supervisor or designee as needed to discuss follow-up and corrective actions. ***Track all follow-up and corrective actions in the audit tracking file*.** [emphasis added]
- Once all noted deficiencies have been corrected, the specialist will send an email to the PI, Supervisor or designee and the Senior IH/OSS using the template found in appendix G. ***Track all follow-up and corrective actions in the audit tracking file***. [emphasis added]

Despite procedures specifying an audit tracking file to be used, the only tracking sheet OEHS auditors provided was one for current audits being performed in 2018. This report's analysis of repeat deficiencies required the creation of our own tracking sheets and subsequent analysis of pertinent data points.

While OEHS standard operating procedures call for an audit tracking file, one has not been used before 2018.

OEHS Underreported Major Deficiencies Because No Systematic Tracking Exists. In annual reports to laboratory college deans and semi-annual reports on labs performing animal testing, not all safety deficiencies found in the audits were mentioned. For example, the 2017 annual report for the College of Engineering

identified 18 research groups with major deficiencies. However, audit checklists that were the basis for those results showed that 27 engineering research groups had one of the three major deficiencies we tracked.

Without Systematic Tracking of Deficiencies, Risk-Based Selection of Audits Is Not Possible. Since an audit tracking sheet for deficiencies does not exist, OEHS is not capable of performing risk-based auditing of labs. When we asked the managing director, associate director, and specialist overseeing audits how audits were assigned, we received three different answers. One response was that all labs are audited on a 12-, 18-, or 24-month rotation and are scheduled based on their assessed risks. However during our analysis, we found that over 100 of the research groups with major deficiencies in 2017 were not audited in 2018, which we believe should have been prioritized.

Systematic tracking of deficiencies is essential to ensure that they are documented and corrected.

Systematic Tracking of Deficiencies Could Ensure Appropriate Corrective Actions Take Place. Moving beyond audit selection, no documentation was available to review regarding corrective actions taken by research group leaders and their lab personnel. Practice and procedures stipulated that this function should occur via email without creating an audit trail showing the resolution of deficiencies. Thus, as we attempted to review the cause for repeat deficiencies, no evidence existed because all prior auditors had left OEHS and their emails were no longer available.

According to University Policy 3-300(III)(B)(5)(d), OEHS has the responsibility to "…monitor the effectiveness of health and safety programs." Without appropriate documentation practices and tracking of pertinent data, this critical function cannot be achieved. Therefore, we recommend that OEHS document the follow-up and corrective actions associated with audit deficiencies. In addition, systematic processes should be developed to track audit deficiencies and all documentation associated with lab safety audits.

Performing Non-Essential Functions Left Critical Follow-Up Activities Incomplete

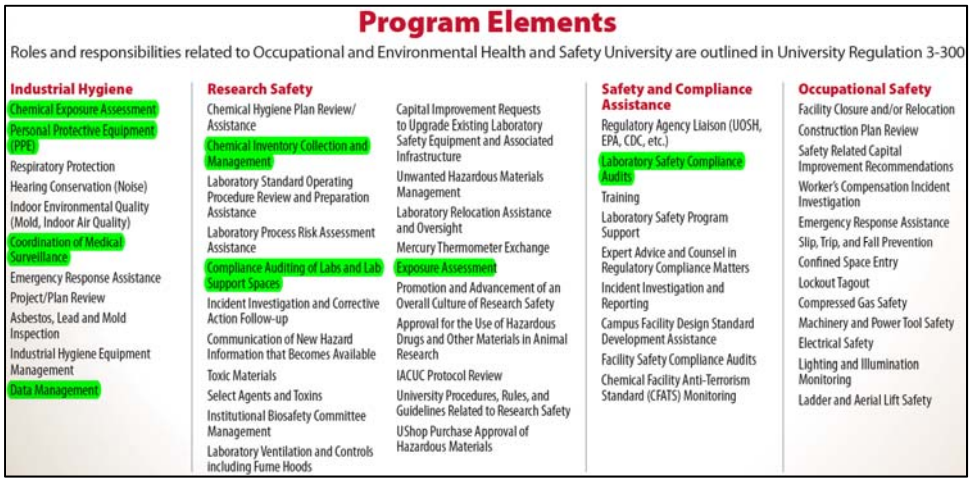
OEHS needs to focus staff efforts on critical follow-up activities that ensure corrective actions are taken to address major deficiencies.

We are concerned that OEHS is not dedicating enough time to the essential services it offers. As discussed earlier in this chapter, critical follow-up activities were not performed by OEHS staff, such as:

- Post-audit lab visits to ensure major deficiencies were resolved
- Conducting missing hazardous chemical exposure assessments
- Retesting labs where acceptable exposure limits were exceeded

Each of these follow-up activities is associated with a critical function that OEHS performs. OEHS publishes a list on its website of program elements that it performs, which are shown in Figure 3.3. In this figure, we highlighted in green the responsibilities where deficiencies were observed and discussed in this report.

Figure 3.3 Inadequate Performance of a Few Responsibilities Are Highlighted among Others OEHS Provides. This figure shows the services that OEHS reports that they provide, and the highlighted services are those with issues discussed in this report.



Source: OEHS Document "OEHS by the Numbers"

The highlighted services in Figure 3.3 are just a portion of the total responsibilities that OEHS has. This report highlights deficiencies in the highlighted areas, raising concern that while OEHS allocates resources to responsibilities not on this list, the results will include unsatisfactory performance of its critical services.

OEHS staff should avoid uploading chemical inventories for lab groups as it presents a conflict of interest.

For example, OEHS should not be uploading and entering labs' chemical inventories into the LMS's central repository. Doing this in addition to auditing creates a conflict of interest that impairs its independent performance of its critical audit function. OEHS should mark labs deficient based on the outcome that no chemical inventory exists in LMS. Instead, labs are sometimes marked compliant even though OEHS staff did not upload the chemical inventory. Thus, a distorted and incorrect assessment is presented to university leadership about the extent of implementation of the central chemical inventory requirement.

Therefore, we recommend that OEHS review the services that it offers to ensure that they are consistent with Policy 3-300 and do not create an independence impairment with its audit services. In Chapter V, we discuss that some lab personnel are uncertain what their responsibilities are. As OEHS reviews the responsibilities related to its role, it should be sure to offload appropriate responsibilities to lab personnel rather than taking those duties upon itself.

Recommendations

1. We recommend that the Department of Occupational and Environmental Health and Safety establish a systematic process to track safety deficiencies observed during its audits.

2. We recommend that the Department of Occupational and Environmental Health and Safety maintain an audit trail of lab personnel responses and corrective actions related to observed safety deficiencies during its audits.

3. We recommend that the Department of Occupational and Environmental Health and Safety report on the percent of university personnel with exposure to bloodborne pathogens who were 1) offered hepatitis B vaccination and 2) received the vaccination or immunity check they requested.

4. We recommend that the Department of Occupational and Environmental Health and Safety systematically track missing required chemical exposure assessments and retest those labs with identified exposures that exceeded acceptable limits.

5. We recommend that the Department of Occupational and Environmental Health and Safety ensure that all deficiencies are reported regardless of their resolution status.

6. We recommend that the Department of Occupational and Environmental Health and Safety review the services it offers to ensure that they are consistent with its policy 3-300 responsibilities and do not create an independence impairment with its audit services.

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Chapter IV
University Administrators Need to Take Ownership of Their Lab Safety Responsibilities

All vice presidents and deans (referred to as administrators) at the University of Utah are charged in policy to oversee the safety of the personnel and facilities under them. Specifically, they are responsible to:

- Ensure areas under their management comply with local, state, and national regulations and university policies
- Establish procedures for the implementation of policies
- Establish a system to assess safety performance
- Establish priorities and commit resources for correction of safety deficiencies

University administrators are responsible to ensure compliance with lab safety regulations and policy, and to establish the necessary procedures to achieve compliance.

We found critical instances in university laboratories where administrators have not fulfilled these responsibilities.

As administrators were made aware of basic lab safety deficiencies, they have not taken corrective actions to ensure compliance with safety regulations and policies. We believe that university administration has not corrected safety deficiencies in part because they have not established a system to accurately assess the performance of their lab safety programs. The administration at the University of Utah must establish a more complete system to accurately monitor lab safety performance. Additionally, they must lead the institution by establishing lab safety as an institution-wide priority and committing the necessary resources to ensure successful lab safety programs.

Administrators Need to Ensure Implementation of Required Safety Procedures

University administrators are responsible to ensure compliance with lab safety regulations and policies by establishing the necessary procedures to achieve compliance. Some administrators have been

There are critical instances where university administrators have not fulfilled their lab safety responsibilities.

aware of consistently poor use of personal protective equipment (PPE) for years yet have not taken appropriate action to address this safety deficiency. This inaction is concerning given that OSHA requires employers to ensure that appropriate PPE is used wherever specific hazards exist. Some administrators have also not ensured compliance with the directive to centralize chemical inventories, nor have they established procedures to comply with OSHA regulations regarding vaccination deliveries.

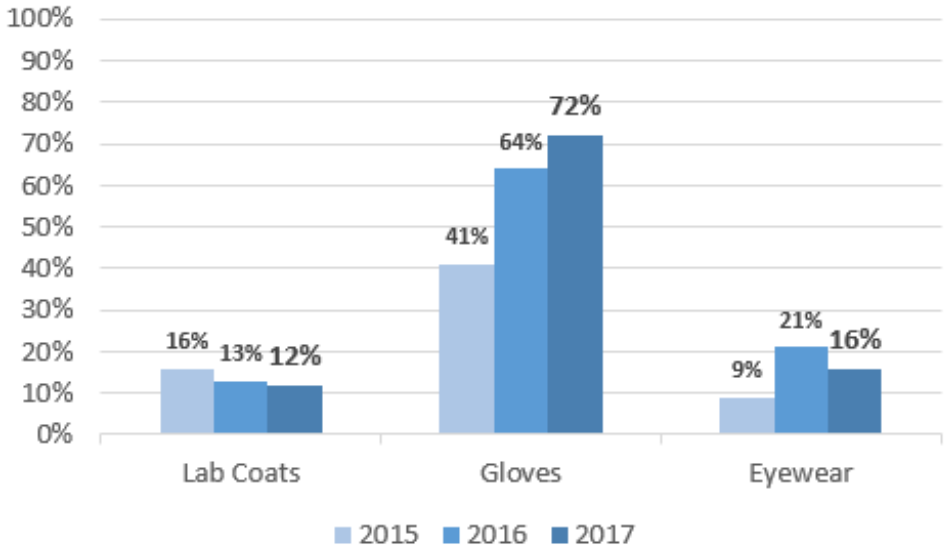
Low Usage of Personal Protective Equipment (PPE) Has Been Allowed for Multiple Years

OSHA requires the use of personal protective equipment (PPE), but University of Utah labs' use of PPE protection has been consistently low.

OSHA regulations require that employers provide personal protective equipment (PPE) and training for potential exposure to hazardous materials. Specifically, the university requires the use of gloves, safety glasses, and lab coats when working with hazardous material. However, the use of these PPE protections has been consistently low for multiple years.

OEHS conducted inspections of the use of laboratory PPE and found poor levels of use over three years, as seen in Figure 4.1.

Figure 4.1 While Use of Safety Gloves Has Improved, Use of Lab Coats and Protective Eyewear Are Low and Not Improving. OEHS checked whether lab coats and eye protection were worn by everyone in a lab and whether gloves were worn by personnel conducting procedures.



Source: OEHS Records and Annual Reports to the Vice President for Research

Even though PPE use showed some improvement from 2015 to 2016, the overall use of PPE is clearly unacceptable. The fact that low PPE use repeats over multiple years, despite being reported to some administration in OEHS' annual reports, is concerning—particularly because these same deficiencies were present at other institutions where tragic incidents occurred. Additionally, we believe the risks to lab personnel who are not wearing PPE are compounded when other safety practices are not being implemented.

Persistently low PPE use over multiple years is concerning, as OEHS has reported this condition to some administrators in its annual reports.

Enforcement of the Directive to Upload Chemical Inventories Has Been Inconsistent

University administration has charged each lab group with uploading their chemical inventories to the Lab Management System (LMS) annually. This directive aligns with OSHA's hazard communication regulation[9] that requires the listing of hazardous chemicals in the workplace as a basis for other safety practices.

However, our analysis of the LMS chemical inventory in October 2018 showed that this directive is not being met. The reasons for poor implementation apply to both lab personnel and OEHS, as discussed throughout this report. University administration should establish clear procedures and follow through to ensure chemical inventory compliance.

Poorly Defined Procedures for Vaccination Delivery And Record-Keeping Hinder Lab Safety Compliance

As discussed in Chapter III, all lab workers potentially exposed to bloodborne pathogens (BBP) are not offered the hepatitis B vaccine or immunity check. An analysis of human resource data for 2018 suggests that a little over half of those with likely exposure to BBP are being offered the hepatitis B vaccine. In addition, OEHS records for half of those requesting vaccines show no action toward receiving the vaccine or a change in status but were still allowed to work in labs.

While half of employees requesting hepatitis B vaccines or immunity checks have not received them, they are still permitted to work in their labs.

Furthermore, vaccination recordkeeping is not compliant with OSHA standards. The OHSA bloodborne pathogen regulation requires the following:

[9] 29 CFR 1910.1200(e)(1)(i)

Recordkeeping for hepatitis B vaccinations is not compliant with OSHA standards.

- Employer shall establish and maintain an accurate record for each employee with occupational exposure.
- Employer shall maintain a copy of the employee's hepatitis B vaccination status for the time of employment plus 30 years.

We observed inconsistent practices and were unable to determine where medical vaccination records were maintained for employee reference. This condition is unacceptable and not in compliance with OSHA.

Other organizations maintain these records for their employees at a central location. For example, the University of Utah Hospital maintains employee vaccination records in a central database for reference. OEHS needs to work with the Human Resources Department and University of Utah Health to more accurately capture the population at risk for BBPs and to ensure delivery of the hepatitis B vaccine. We recommend that university administration develop a plan to coordinate these units in a way to reach all lab personnel impacted by BBP regulations. In addition, we recommend that the university determine where vaccination records should be collected and maintained.

Administration Needs to Accurately Assess Performance of Safety Programs

University administration has inadequately addressed its responsibility to establish a system to assess safety performance. An incomplete set of metrics led some administrators to incorrectly conclude that their lab safety programs are successful. The lack of adequate safety performance metrics was highlighted in a university consultant's 2017 review. However, university administration has not implemented the corresponding recommendations, as they continue to be studied by the university's Lab Safety Culture Task Force.

Passive Indicators Led the Prior Administration To Incorrect Conclusions about Safety Performance

When safety performance and compliance concerns were brought to the prior university administration, they relied heavily on passive metrics to defend their safety performance. In June of 2016, the Rocky Mountain Center for Occupational and Environmental Health (RMCOEH) issued a report to the former University of Utah president that accused the university of "…being noncompliant with many OSHA regulations." The prior university administration responded by defending "…the university's success under the current model." Their position was based largely on the following metrics:

When safety performance and compliance concerns were brought up to the prior administration, they relied heavily on passive metrics to defend their safety performance.

- Low workers' compensation losses compared to other schools
- No job fatalities
- Low number of UOSH violations

Though these metrics of past injuries and illnesses can be insightful, OSHA materials identify them as lagging or passive indicators of safety program performance. By relying primarily on these indicators, a higher level of risk exists that corrections to safety programs would only occur after injuries or illnesses occur.

Administrators relying on passive indicators means a higher level of risk exists that corrections to safety programs would only occur after injuries or illnesses occur.

The measures in the prior administration's response lack predictive indicators—showing the likelihood that an undesirable outcome will occur—and therefore are not enough to effectively assess a safety program's performance. Proactive and predictive metrics would be measures such as the following:

- Current number and severity of safety hazards
- Timeliness in which safety hazards are being resolved
- Number of safety inspections being performed

None of these measures listed above were included in the administration's response, despite the prevalence of safety deficiencies found in lab audit documentation.[10] The fact that in 2016 the university defended its safety programs' success, despite the prevalence

A dangerous disconnect between passive and predictive metrics existed as the prior administration asserted safety program success many labs had major safety deficiencies.

[10] The university's response did cite two other metrics that are more proactive in nature: personnel's engagement in safety activities and university's safety outreach. However, after a review of documentation and given the prevalence of basic safety deficiencies highlighted in Chapter II, we believe that evidence to support these statements is lacking.

of many safety deficiencies on campus, highlights a dangerous detachment between the metrics they use and actual safety program performance. We recommend that the new university administration adopt a more comprehensive set of performance metrics for lab safety as soon as possible.

The Need for Established Metrics Was Highlighted in a 2017 External Review

In October 2017, university administrators commissioned a peer review of its health and safety programs. Of the 13 observations and recommendations to the university regarding these programs, at least two touched on the need for better information to assess safety performance and needs.

Key Performance Indicators (KPIs) to Assess Safety Performance Are Still Lacking. The peer review report recommended that, to improve the ability of the entire health and safety function and to articulate the value the collective effort brings to the campus, "we would suggest each unit be charged with the identification of 3 to 4 key performance indicators (KPIs)." The development of these metrics has not yet occurred.

The Campus Health and Safety Committee has only met twice since the 2017 peer review, which recommended that the committee meet monthly.

The Campus Health and Safety Committee Remains Inactive. The university has not followed the peer review recommendations to re-invigorate the Campus Safety and Health Committee. Specifically, the consultant recommended "…a direct charge from the president to establish a forum that meets on a regular basis (suggest monthly) with a set agenda and expectations for data-driven reports." Since the peer review report in October 2017, the Campus Health and Safety Committee has only met twice as of January 2019 and discussed safety data metrics at one of these meetings.

Additionally, while the minutes indicate that some data was shared in a committee meeting following the peer review, most metrics involved past workers' compensation claims, injuries, and illnesses, which are not the more predictive indicators OSHA materials prescribe (such as the number and severity of current hazards on campus). Unless the Campus Safety and Health Committee meets more often and expands their review of metrics to emphasize predictive indicators, the committee will not be able to effectively assess the performance of lab safety programs.

The Lack of Implemented Recommendations from the Peer Review Is Concerning. The new university administration needs to implement recommendations from the peer review to demonstrate that they are prioritizing a safe and healthy university environment. In the peer review, the consultant made the following statement:

> By sponsoring this peer review, the institution can point to a very tangible example of its commitment to maintaining a safe and healthy working and learning environment for everyone involved in [the university's] education, research, and service missions.

However, for 18 months, the implementation of the 2017 consultant's recommendations has been postponed. In June 2018, the new university president commissioned a Lab Safety Culture Task Force to thoroughly evaluate and make recommendations regarding campus-wide lab safety practices, which should be finished in May 2019.

After a lengthy delay to allow the Lab Safety Culture Task Force to evaluate university labs' safety practices, swift implementation of recommendations from this audit, the 2017 external review, and its task force must happen.

This lengthy delay increases the importance of quick implementation of recommendations from this audit, the 2017 external review, and the task force. The new administration at the University of Utah needs to do so to demonstrate their commitment to lab safety at the university. A complete system must be established by the new administration to accurately and effectively address lab safety needs across campus.

Administration Should Lead in Making Safety an Institution-Wide Priority

Administrators are responsible to "…establish priorities and committing resources for correction of safety deficiencies." However, past funding decisions raise questions about administrators' commitment to strong safety programs. Because administrators have the ultimate responsibility and authority for ensuring safety at the university, their leadership is necessary to make safety a priority across campus. The success of safety and health programs relies on administrators' leadership.

Administrators Should Provide Necessary Resources to Ensure Strong Safety Programs

While OEHS received funding to increase existing operations, funding requests to support better coordination of health services was not approved.

OEHS submitted requests for funding to senior administrators over two years ago that it stated was to comply with occupational health regulations. However, OEHS only received the portion of their request that was focused on increasing existing operations, such as its general operations and hazardous materials shipping. In fiscal years 2018 and 2019, OEHS requested funding for a program to coordinate occupational medical services on campus and to identify potential risks from physical, chemical, and biological hazards. OEHS stated that the funding would help them address occupational health services such as the hepatitis B shot and chemical exposure assessments. Both years, however, this specific request was not approved.

In these funding requests, OEHS specifically mentioned that if this program was not funded, the university would be out of compliance with OSHA regulations.

> [The university] will continue to be out of compliance. OSHA regulations require medical surveillance… Our current experience suggests the instances where this would apply are increasing. Our ability to assure compliance going forward will be impacted without this resource.

Our audit team did not validate the credibility of the funding needs in these requests. Based on the clear warning about compliance and the deficiencies in the delivery of vaccinations and chemical exposure assessments, we are concerned that administration should have supported OEHS at a higher level. The next section discusses how national authorities in research safety emphasize that administrators must be involved to establish successful safety programs and safety cultures.

Administrators' Leadership Is Necessary to Implement Successful Safety Programs and Culture

Although safety deficiencies are identified at the individual lab group level, the likelihood of resolution will be improved with strong engagement from university administration. Prioritizing safety at the upper administrative level can positively influence the safety culture at the university and provide a greater preventative impact. National

experts have emphasized the importance of administrators' involvement in producing safe academic environments:

- **National Research Council –** *Safe Science: Promoting a Culture of Safety in Academic Chemical Research:* "Leadership by those in charge ensures that an effective safety program is embraced by all. Even a well-conceived safety program will be treated casually by researchers and others if it is neglected by top management."

- **American Chemical Society –** *Creating Safety Cultures in Academic Institutions: A Report of the Safety Culture Task Force:* "Leaders are the key to building a strong culture of safety. Leaders inspire others to value safety, seek open and transparent communications to build trust, lead by example, accept responsibility for safety, and hold others accountable for safety. The direction for and strength of the safety culture is determined by its leaders."

- **Association of Public & Land-Grant Universities –** *A Guide to Implementing a Safety Culture:* The first recommendation in this guide is that the president "renews commitment to improve the culture of safety for all academic research, scholarship, and teaching." This includes "…assume ultimate responsibility…" and "…providing adequate resources, and by developing effective policies."

National experts have emphasized that "even a well-conceived safety program will be treated casually by researchers and others if it is neglected by top management."

University administration must take ultimate responsibility over the performance of their safety programs. This includes establishing a system to assess performance, as well as quickly supporting the correction of identified safety deficiencies and hazards. The new administration needs to prioritize and support safety across campus to ensure that lab safety programs are embraced by all.

Recommendations

1. We recommend that administrators at the University of Utah ensure that personnel and facilities under their leadership comply with local, state, and national safety regulations and university safety policies.

2. We recommend that university administration assign responsibilities to ensure compliance with OSHA's hepatitis B vaccination requirement, including identifying affected employees, tracking offers, documenting delivery of requested medical services, and maintaining required documentation.

3. We recommend that senior administrators at the University of Utah implement a system to assess the performance of safety and health programs that relies on key performance indicators identified in 1) this audit report, 2) the October 2017 peer review report, and 3) the university's Lab Safety Culture Task Force's report.

4. We recommend that the senior administration at the University of Utah submit a report on the implementation status of recommendations from 1) this audit, 2) the university's October 2017 peer review, and 3) the Lab Safety Culture Task Force to the Legislature's Higher Education Appropriations Subcommittee for its October 2019 interim meeting.

Chapter V
Lab Personnel Need to Take Ownership in Assessing Their Safety Performance

Researchers and personnel in some lab groups at the University of Utah have expressed concern about inadequate escalation and inconsistent safety practices. While lab accidents increased awareness about deficient practices that eventually led to safety improvements, this is not the most desirable route to drive needed changes.

A lack of awareness about lab safety practices resulted in inconsistent implementation among research groups.

Instead, we recommend that the university mandate the use of self-assessments by lab personnel to identify safety deficiencies. This practice would give lab personnel better understanding of their safety responsibilities and allow for greater ownership of corrective actions. In addition, the use of department safety committees and peer reviews could promote the adoption of safety best practices by lab groups. Peers within the same college or department possess the technical knowledge of hazards present in labs and are best suited to recommend steps to mitigate present risks.

Some Lab Groups Are Unaware of Specific Safety Requirements

A survey found that some lab research group leaders had major concerns about inconsistent safety practices and chemical hazards. Also, during a Lab Safety Culture Task Force meeting, concerns were expressed that lab personnel's safety responsibilities were unclear. Subsequent discussions with a subset of lab personnel found that inconsistent practices indicated inadequate understanding of their lab safety roles and responsibilities.

Members of the university's Lab Safety Culture Task Force expressed concern that some university research personnel do not fully understand their lab safety responsibilities.

Some of the best practices we observed were found in labs where accidents identified safety practices that needed to improve and were commensurately adjusted. As accidents are the least desirable route to promote safety awareness, the university should consider alternatives to promote lab personnel's awareness of safety responsibilities.

Some Research Group Leaders Are Troubled By Inconsistent and Unclear Lab Safety Practices

A 2016 survey given to 87 university research group leaders and supervisors revealed some concerns with lab safety. After asking researchers to list their top five safety concerns at the university (see Figure 1.3 in Chapter I), a follow-up question allowed them to explain the specifics of their concern, which received 23 responses. The following three individual comments were related to lab safety practices.

- With the open environment of many labs on campus, I am concerned that ***just a few that do not follow safety procedures can expose many people to infectious material***. As a lab manager, I find this difficult to control. [emphasis added]

In a 2016 survey, some lab researchers commented on the lack of consistent safety standards or inadequate escalation of problems.

- ***I'm surprised how laissez faire lab safety policies are***, especially in light of high-profile death and injuries in university labs in recent years.... ***There appear to be no verification and no repercussions here at Utah*** if there is not a safety culture. [emphasis added]

- ***Nothing seems to be institution wide and every department has to come up with their own protocols*** for a variety of safety issues, if they have enough concern to make their own. [emphasis added]

The common theme among these comments was that safety practices are inconsistent, and in some instances, those practices conflict with required protocols.

Based on comments made during a university Lab Safety Culture Task Force meeting, inconsistent practices may be a symptom of being unaware of specific safety requirements. Twice during the task force's December 2018 meeting, members commented that it would be good to discuss safety responsibilities with lead researchers. While specific responsibilities were not discussed further in that meeting, we believe that the inconsistent lab safety practices raised concerns about unclear responsibilities.

Inconsistent Practices Show That Lab Personnel's Responsibilities Are Unclear

Inconsistencies in safety-related practices illustrate that safety requirements are not understood.

One audit procedure we performed was observing safety practices among research groups to understand why inconsistency occurred. Specifically, we noticed inconsistencies in the following practices reviewed during OEHS audits:

- Lab coats inconsistently used as personal protective equipment (PPE)
- Chemical hygiene plans not being customized
- Immunization records inadequately maintained
- Chemical inventories inconsistently uploaded to the central system

While these practices are discussed elsewhere in this report, the following discussions focus on different practices that exist. The insight we obtained was that lab personnel in some research groups did not understand what was required, which often led to improper safety practices.

While some chemistry lab groups wear flame-resistant lab coats, others do not wear any coats while working in their lab spaces.

Lab Groups Inconsistently Use PPE. During its audits, OEHS checks whether PPE is used appropriately. PPE practices varied significantly during visits to Chemistry Department research labs. For example, in the lab where a researcher burned their hand (Chapter I), all personnel were observed wearing flame-resistant lab coats. In contrast, not all individuals working in other labs consistently wore lab coats. When we asked one lead researcher if lab coats were required, he said that was a good question, and he did not know. Thus, it appears that lab personnel need clarification regarding specific lab requirements.

While some groups customize their chemical hygiene plan, others merely add their lab group name to the standard template.

While Some Lab Groups Use Unaltered Chemical Hygiene Plan Templates, Others Tailor Them to Their Situations. During our observations in the Chemistry Department, one lab group customized its entire chemical hygiene plan, while another simply added their lab group name to the template. An OEHS auditor told us that they accepted minimally adjusted chemical hygiene plan templates as compliant. These varying practices raise concern whether lab

personnel understand the extent of customization that the chemical hygiene plan template should be receiving.

While some groups maintained employees' vaccination records, others relied on OEHS to provide that service.

Lab Groups Working with Biological Hazards Track Vaccination Records Differently. Another element that is reviewed during OEHS audits is whether required immunizations are current in lab groups working with biological hazards. One lab group's manager began documenting her employees' immunization status after she was exposed to a biological hazard. In contrast, another lab manager told us that they rely on OEHS to maintain those records, which does not happen. Lab personnel are not always clear about who has responsibility to maintain vaccination records.

While some groups upload their chemical inventories to the central repository, others are reluctant to do so.

Some Labs Are Not Annually Uploading Their Chemical Inventories into the University's Central Repository. As discussed previously, OEHS audits whether lab groups upload their inventories to the university's central repository in the laboratory management system. As we discussed this with lab personnel, one lab manager said that the system does not track the level of detail they need, so they were not going to take the time to format their data set for upload. Another lab manager who maintained the inventory in three different formats, said that they will do whatever is needed to be compliant. These different approaches show that the upload requirement is not always being followed.

Lab Accidents Have Effectively Brought Awareness to Deficient Safety Practices

One of the important takeaways from our safety practice observations in the previous section was the impact that accidents had as a catalyst for improving safety practices. The lab requiring lab coats for all personnel and the lab tracking all research group employees' vaccinations experienced a non-fatal burn and an inadvertent biological exposure, respectively. After these accidents, the lead researcher and lab manager recognized the need to improve existing safety practices and made the necessary changes.

Accidents in two labs raised awareness of deficient safety practices that were subsequently addressed.

The Importance of Vaccination Records Was Acknowledged When a Researcher Was Exposed to a Biological Hazard. The lab discussed in the prior section that tracks all researchers' immunization records did not always follow that practice. The lab manager recounted to us that she was involved in an incident where she was exposed to a biological hazard at a time when her lab did not track

immunization records. Because those records were requested by her attending physician and would have been helpful, her lab group has since started tracking and maintaining those records. This practice is a precautionary measure in case another exposure occurs where immunization records could help medical personnel respond appropriately.

The Importance of Appropriate PPE Was Emphasized When A Researcher Was Burned. The other incident was the improved PPE response for the lab (discussed in Chapter I) with the non-fatal burn from an air-reactive chemical. Both of these illustrate the effect that an accident can have on subsequent safe practices. As we discussed in Chapter IV regarding passive indicators, the ideal situation would be for desirable practices to be implemented to prevent accidents from happening as much as possible. Therefore, the remainder of this chapter will discuss the potential positive impact that self-assessments and peer reviews can have on improving safety practices.

Self-Assessments Make Personnel Aware of Safety Requirements

Part of OEHS's audit procedures prescribe that lab groups perform self-inspections prior to audits. However, this valuable procedure has not been effective, as many deficiencies are not corrected prior to lab visits by OEHS auditors. When self-inspections are performed, there were a lower number of lab safety deficiencies in these spaces. We believe that this practice is valuable because lab personnel learn what safety practices are expected by OEHS auditors. In addition, lab personnel take ownership to ensure that their compliance with those requirements addresses lab-specific hazards.

Deficiencies Identified by OEHS Audits Show That Self Assessments Are Underutilized

Some research groups have relied on OEHS audits to identify safety deficiencies. OEHS audit procedures specify that lab personnel should be conducting self-assessments. Yet, as discussed in Chapter II, identified deficiencies are not always corrected for a variety of reasons.

The use of self-inspections assisted one college to identify and correct safety deficiencies rather than rely on OEHS audits.

Labs accepting responsibility to identify and correct these deficiencies provides a good opportunity for them to be addressed appropriately. Therefore, self-assessments have not been as effective as

they could be since many deficiencies still persist. As we discussed earlier in this chapter, members of the Lab Safety Culture Task Force expressed a desire to learn what their responsibilities were. The opportunity for lab personnel to go through the same checklist that OEHS auditors use is a tool to educate them about their safety responsibilities.

The Best Practice of Self-Assessments Is Inconsistently Used at the University

We found some examples of self-assessment use at the University of Utah. During our lab visits, one lead researcher expressed positive feedback about the self-assessment he performed for his most recent audit. He said it provided him an opportunity to take responsibility and ask questions to OEHS auditors regarding safety requirements he did not know about. In addition, another lab group showed us their self-assessment that the dean of the College of Mines and Earth Sciences wants them to perform. This practice has contributed to the reduced number of lab groups identified by OEHS as having safety deficiencies.

In 2017 annual safety reports to college deans, the College of Mines and Earth Sciences had only two lead researchers identified with deficiencies, which oversaw 10 of the college's 63 lab spaces (16 percent). In contrast, the College of Engineering had 16 lead researchers identified with deficiencies, which accounted for 40 of the college's 105 lab spaces (38 percent). When we met with the College of Mines and Earth Sciences dean, he told us that they were aware of the deficiencies in the labs before OEHS annual reports notified him and that the issues were already addressed.

The National Research Council encourages self-inspections to promote the sense of ownership in safety practices.

The National Research Council (NRC) encourages self-inspections as they can be useful by "…raising awareness, promoting the institutional safety culture, and easing the burden on management." Furthermore, the NRC states that research groups can benefit by "…incorporate[ing] explicit analyses of the hazards and risks of planned work into research proposals…." We believe the regular use of self-inspections should be required and used as a tool to educate lab personnel about their responsibilities and ensure greater ownership of implemented safety practices.

Peer Reviews Can Use Specialized Knowledge of Hazards to Implement Best Practices

With the varied and complex nature of research conducted in the individual colleges, OEHS staff does not always possess the technical expertise to address all hazards that some labs present. However, labs could benefit from the specialized knowledge of their peers. Regular reviews by peers with technical expertise could provide resources for lab groups and encourage the adoption of the best safety practices for their research procedures.

When an OEHS staff member does not possess the technical expertise to address a hazard, peer research groups should be sought to identify the best safety practices.

Department-level safety committees are best suited to encourage safety best practices. However, only a few departments at the University of Utah have functioning safety committees. Additionally, peer reviews have been used at other institutions to ensure appropriate safety practices are implemented. We recommend that laboratory college deans consider adopting safety committees at the college or department level as warranted.

Departmental Committees Can Promote Safety Best Practices

While OEHS provides general assurance about lab safety practices, the specific hazards found in some departments are difficult to assess for personnel trained in more general safety practices. Since OEHS staff are not experts in the nuances of a specific group's chemical usage, research, or procedures, lab groups could benefit from periodic peer reviews to develop hazard-specific safeguards. For example, the chemical burn in a chemistry lab that was discussed in Chapter I could have been prevented if researchers were using heat-resistant gloves like some of their peers. This practice was discussed and suggested by the Chemistry Department's Safety Committee.

Within the five laboratory colleges discussed in this report, the College of Mines and Earth Sciences and the Chemistry Department had the only active safety committees we were made aware of. The College of Engineering and the Biology Department are exposed to hazards requiring specialized technical knowledge. However, neither has a safety committee to help researchers adopt appropriate safety practices.

Only a few colleges and departments have active safety committees to promote the practice of peer reviews.

Periodic Peer Reviews Can Ensure Appropriate Application of Safety Practices

The National Research Council calls peer reviews "…one of the most effective safety tools a facility can use…."

In addition to self-assessments, lab groups could benefit from periodic peer reviews to review best practices and overall safety. The National Research Council states that "one of the most effective safety tools a facility can use is periodic peer level inspections." We believe that having a peer review performed by peers with similar backgrounds and experience can be a useful tool for safety.

The University of Washington has created ten health and safety committees to address safety hazards.

The University of Washington, which is a peer institution of the University of Utah, has created ten health and safety committees whose members are employee-elected and management-appointed members. The committees meet monthly to address the safety needs of their departments. The University of Washington's environmental health and safety (EHS) department manages this committee program. These committees are required as part of the state of Washington's OSHA plan. Although this is not a requirement of Utah's state OSHA plan, we believe the use of committees would benefit the safety culture in the various colleges and departments.

Recommendations

1. We recommend that lab research groups conduct self-inspections prior to official OEHS audits.

2. We recommend the use of safety committees made up of faculty for individual departments or colleges to provide peer reviews and technical knowledge.

Appendix

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Appendix:
The University's Exposure Control Plan's Exposure Determination for Bloodborne Pathogens

D. Exposure Determination

University of Utah has performed an exposure determination to identify which employees, students, and visitors may be more likely at risk of exposure to bloodborne pathogens. This determination was made without regard to the use of PPE and regardless of the frequency of exposure. Job classifications in which **all or most university employees** in the specific job classification have occupational exposure pursuant to 29 CFR 1910.1030 include:

Job Description	CODE	Job Description	CODE
Assistant Biosafety Specialist	0604	Dialysis Technician	0068
Assistant Professor (Clinical)	9140	Eye Bank Technical Coordinator	2502
Associate Professor (Clinical)	9126	Eye Bank Technician	0543
Associate Professor, Clinical	0019	Health Care Assistant	0088
Biosafety Specialist	0515	Health Care Asst - CPOE Author	1225
Blood Gas Technician	0196	Histology Technician	2515
Body Donor Program Coord.	0586	Immunogenetics Specialist	0114
Cardiac Device Technician	1239	Licensed Practical Nurse	0123
Cell Therapy Tech I	0023	Medical Assistant	0135
Cell Therapy Tech II	1192	Medical Assistant Advanced	1184
Cell Therapy Tech III	1193	Medical Assistant Certified	1202
Certified Nurse Midwife	2445	Medical Asst Adv Certified	1204
Certified Ophthalmic Assistant	1195	Medical Laboratory Technician	0542
Certified RN Anesthetist	2447	Medical Practice Assistant	0538
Clinical Assistant Professor	9141	Medical Technologist	0139
Clinical Associate Professor	9144	Nurse Manager	2428
Clinical Attending	9198	Nurse Practitioner	0147
Clinical Audiologist	0043	Phlebotomist	0473
Clinical Care Spec	2947	Physician Assistant	0184
Clinical Instructor	9142	Professor (Clinical)	9177
Clinical Nurse	0048	Spv, Cell Therapy Lab	0276
Clinical Nurse Coordinator	0049	Spv, Clinic	2452
Clinical Nurse PRN	0598	Spv, Clinical Laboratory	0288
Clinical Nurse Specialist	0014	Spv, Histopathology Lab	2514
Clinical Professor	9143	Spv, Nursing	0283
Credentialed Med Asst Advanced	1205	Sr Research Nurse	2427
Credentialed Medical Assistan	1203	Staff Physician	3014
Dental Assistant	1180	Surgical First Assistant	0663
Dental Equipment Technician	1235	Surgical Technician	0235
Dental Hygienist	1236	Tissue Allocation Coordinator	0620
Dental Laboratory Specialist	1197	Tissue Processing Technologist	1163
Dentist	0439	Umbilical Cord Blood Phlebotomist	0562

Source: University of Utah Exposure Control Plan (Revision: September 2017)

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Agency Response

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THE UNIVERSITY OF UTAH

Office of the President
201 Presidents Circle, Room 203 • Salt Lake City, Utah 84112-9008 • 801-581-5701 • president@utah.edu

Date: May 3rd, 2019

To: Mr. Kade R. Minchey
Legislative Auditor General
W315 Utah State Capital Complex
Salt Lake City, UT 84114-5315

From: Ruth V. Watkins, President

Subject: Response to Audit 2019-06

Dear Mr. Minchey:

On behalf of the University of Utah, I want to thank you for your review of laboratory safety practices at the University (*A Performance Audit of the University of Utah's Laboratory Safety Practices*, April 17, 2019). First and foremost, I want to assure you that all of us – administrators, faculty and staff – are committed to making the University a safe place for everyone.

The importance of improving laboratory safety at the University was recognized even before this audit was conducted. Between 2016 and 2019, a significant portion of State appropriations, approximately $20 million, was devoted to capital investments directly related to safety improvements, including fume hoods, emergency eye washes and showers, chemical storage solutions, and fire alarm system upgrades. In addition, a University Presidential Task Force on Laboratory Safety Culture was commissioned in June of 2018, with a focus on evaluating University safety culture in light of recommendations published in *"A Guide to Implementing a Safety Culture in Our Universities"* by the Association of Public and Land-Grant Universities (APLU) (April 2016). The recommendations in the current performance audit will be used to amplify and accelerate our efforts to keeping employees, students, and the environment safe and ensuring compliance with applicable State and Federal safety requirements.

The findings of this audit are of such importance that the University administration has already begun implementing changes to most effectively address the challenges and opportunities that were identified. For example, the Occupational and Environmental, Health and Safety Department (OEHS) and the Radiation Safety Office (RSO) are being combined directly under the Vice President for Research. This merger will take advantage of the strengths of both units and is intended to increase efficiencies, improve service, improve inspection enforcement ability, and prioritize a culture of safety across the University. Moreover, specific authority has been delegated to the leader of this combined unit to take all reasonable actions necessary to ensure compliance with University and regulatory health and safety requirements, up to and including shutting down laboratory operations, when justified.

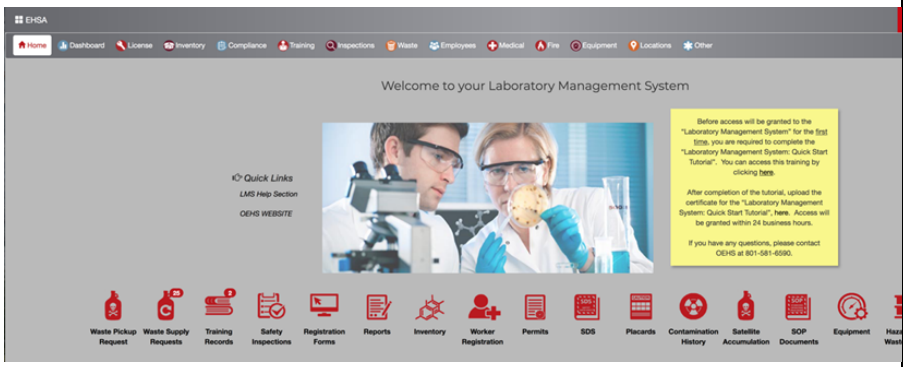
The attached response to the specific audit recommendations include additional actions that the University is committed to implementing to address health and safety short-comings. We recognize that it is imperative that all identified issues are addressed, and that the resulting solutions are timely, comprehensive, effective, and sustained.

Sincerely,

Ruth V. Watkins, PhD
President, University of Utah

University of Utah Response to Recommendations provided in *"A Performance Audit of the University of Utah's Laboratory Safety Practices,"* Utah Legislature (Report No. 2019-06)

RECOMMENDATION	RESPONSE
Chapter II The University's Risk Management System for Lab Safety Is Broken	
II-1 We recommend that the University of Utah president direct administrators to prioritize and enforce the goal of eliminating repeat safety deficiencies from lab safety audits and inspections.	Agreed. Senior leadership at the University of Utah will amplify its commitment to laboratory health and safety with the specific goal of eliminating repeat safety deficiencies in laboratories. Elimination of repeat safety violations will be accomplished through a sustained effort to improve the overall safety culture at the university, supplemented by an enhanced and well-defined corrective action and enforcement framework. Toward this goal, the University is already implementing a revised corrective action process that incorporates increased monitoring of laboratories with identified deficiencies, with defined escalation actions including probation and the shut-down of laboratories with repeat violations. Moreover, changes to the organizational and reporting structure of the university's primary health and safety units are underway to increase efficiencies, improve enforcement ability, and prioritize laboratory safety. As part of this realignment, the Occupational and Environmental, Health and Safety Department (OEHS) and the Radiation Safety Office (RSO) are being combined with the new organization reporting directly to the Vice President for Research. In addition, incentives for safety performance are being incorporated into the annual university process for distributing infrastructure support to colleges, departments, and research laboratories.
Chapter III OEHS's Poor Management Practices Leave Safety Issues Unresolved	

III-1 We recommend that the Department of Occupational and Environmental Health and Safety establish a systemic process to track safety deficiencies observed during its audits.	Agreed. Efforts are currently underway to fully implement an enhanced and comprehensive laboratory management system (LMS) at the university. The *On Site Systems Environmental Health & Safety Assistant* is a powerful LMS that has been partially deployed by both OEHS and the RSO. Among other features, the LMS has the capability to systematically track laboratory inspection results, deficiencies, and corrective actions. Existing barriers preventing the full utilization and implementation of the available LMS functions and tools are currently being evaluated in response to the State audit findings and as part of the OEHS and RSO integration. The goal of the University is to fully implement the LMS as soon as possible, no later than the end of CY2019. 
III-2 We recommend that the Department of Occupational and Environmental Health and Safety maintain an audit trail of lab personnel responses and corrective actions related to observed safety deficiencies during its audits.	Agreed. See response to item III-1 above. Full implementation of the On Site LMS system will result in the ability to systematically track laboratory inspection deficiencies, responses, and corrective actions and create a verifiable audit trail in the process.
III-3 We recommend that the Department of Occupational and Environmental Health and Safety report on the percent of	Agreed.

university personnel with exposure to bloodborne pathogens who were 1) offered hepatitis B vaccination and 2) the delivery rate for those requesting the service.	Senior leadership will ensure Hospital, Human Resources and OEHS clearly define roles and responsibilities regarding exposure to bloodborne pathogens and allocate necessary resources to ensure employees who may be exposed to potentially infectious materials such as hepatitis B are identified and have access to vaccinations. In parallel, we will document the offering and delivery rate of the hepatitis B vaccine.
III-4 We recommend that the Department of Occupational and Environmental Health and Safety systematically track missing required chemical exposure assessments and retest those that identified exposures that exceed acceptable limits.	Agreed. The University will employ a stand-alone Industrial Hygiene tool specifically marketed to manage timely delivery of exposure assessment data and retain records as required by regulation.
III-5 We recommend that the Department of Occupational and Environmental Health and Safety ensure that all deficiencies are reported regardless of their resolution status.	Agreed. All deficiencies and corrective action status will be tracked regardless of resolution status. The On Site LMS has the capability to track laboratory inspection deficiencies and corrective action status. Upon full implementation of the LMS, inspection results and real-time status will be systematically tracked and routinely reported.
III-6 We recommend that the Department of Occupational and Environmental Health and Safety review the services that it offers to ensure that they are consistent with its policy 3-300 responsibilities and do not create an independence impairment with its audit services.	Agreed. The responsibilities delineated in Policy 3-300 are being reviewed to ensure health and safety requirements are being met and inspection independence is not compromised. However, as noted in Policy 3-300, the function of OEHS is not exclusively as a compliance unit – providing assistance in development and implementation of effective safety programs is an important and necessary component for establishing a culture of safety. In addition, a reinvigorated University Health and Safety Committee, with the establishment of a new Laboratory Safety Sub-Committee, will ensure that (1) University priorities are clearly communicated to both OEHS and colleges, departments, and research laboratories, and (2) inspection effectiveness is routinely evaluated.

Chapter IV University Administrators Need to Take Ownership of Their Lab Safety Responsibilities	
IV-1 We recommend that Administrators at the University of Utah ensure that personnel and facilities under their leadership comply with local, state, and national safety regulations and University safety policies.	Agreed. The importance of compliance with health and safety requirements will be clearly communicated from senior University leadership from Vice Presidents to college deans, department heads, and research laboratories with the expectation that departments will prioritize support for required changes. Restructuring the primary university health and safety units directly under the Vice President for Research, together with a reinvigorated Health and Safety Committee and new sub-committee structure, will enhance the ability of University senior leadership to enact sustainable improvements and ensure compliance with all applicable requirements. In addition, the revised corrective action process includes escalated consequences for non-compliance with applicable requirements.
IV-2 We recommend that university administration assign responsibilities to ensure compliance with OSHA's hepatitis B vaccination requirement, including identifying affected employees, tracking offers, documenting delivery of requested medical services, and maintaining required documentation.	Agreed. As described in response to III-3, responsibilities will be clarified/assigned to ensure compliance with OSHA's hepatitis B vaccination requirement, and essential information will be tracked and documented.
IV-3 We recommend that senior administrators at the University of Utah implement a system to assess the performance of safety and health programs that relies on key performance indicators identified in 1) this audit report, 2) the October 2017 peer review report, and 3) the university's Lab Safety Culture Task Force's report.	Agreed. Key Performance Indicators will be defined and tracked, routinely reported to senior administrators, and acted upon, when necessary. The reinvigorated Health and Safety Committee and the to-be-formed Laboratory Safety Sub-Committees will provide routine oversight and periodic assessment of program performance. The State audit report, the October 2017 peer review report, and the report from the University's Lab Safety Culture Task Force reports will be used in the process of defining meaningful key performance indicators.

	In addition, as noted in Response II-1, safety performance, as measured by key performance indicators, is being incorporated into the annual university process for distributing infrastructure support to colleges, departments, and research laboratories. Lastly, the University is committed to instituting a rigorous self-audit system whereby University health and safety functional areas will be subject to periodic evaluation by independent internal and/or external reviewers, with recommendations implemented, as appropriate.
We recommend that the senior administration at the University of Utah submit a report on the implementation status of recommendations from 1) this audit, 2) the university's October 2017 peer review, and 3) the Lab Safety Culture Task Force to the Legislature's Higher Education Appropriations Subcommittee for its October 2019 interim meeting.	Agreed. The University of Utah is committed to submitting a report on the implementation status of recommendations from 1) the State audit, 2) the university's October 2017 peer review, and 3) the Lab Safety Culture Task Force to the Legislature's Higher Education Appropriations Subcommittee for its October 2019 interim meeting.
Chapter V Lab Personnel Need To Take Ownership in Assessing Their Safety Performance	
V-1 We recommend that lab research groups utilize self-inspections prior to official OEHS audits.	Agreed. Laboratory self-inspections are currently being conducted in some colleges, departments, and research laboratories. The self-inspection process will be fully implemented across all colleges, departments, and laboratories as soon as possible and no later than the end of CY2019. When fully implemented, the On Site LMS system will provide the ability to let principal investigators conduct self-inspections and upload the results for tracking and further action.
V-2 We recommend that use of safety committees made up of faculty for individual department or colleges to provide peer-reviews and technical knowledge.	Agreed.

	The University is committed to establishing a system of safety committees within all colleges and departments, as appropriate. These committees will be made up of technical peers and experts, with assistance from OEHS safety professionals. The to-be-established Laboratory Safety Sub-Committee of the Health and Safety Committee will include representatives from the college and department safety committees.