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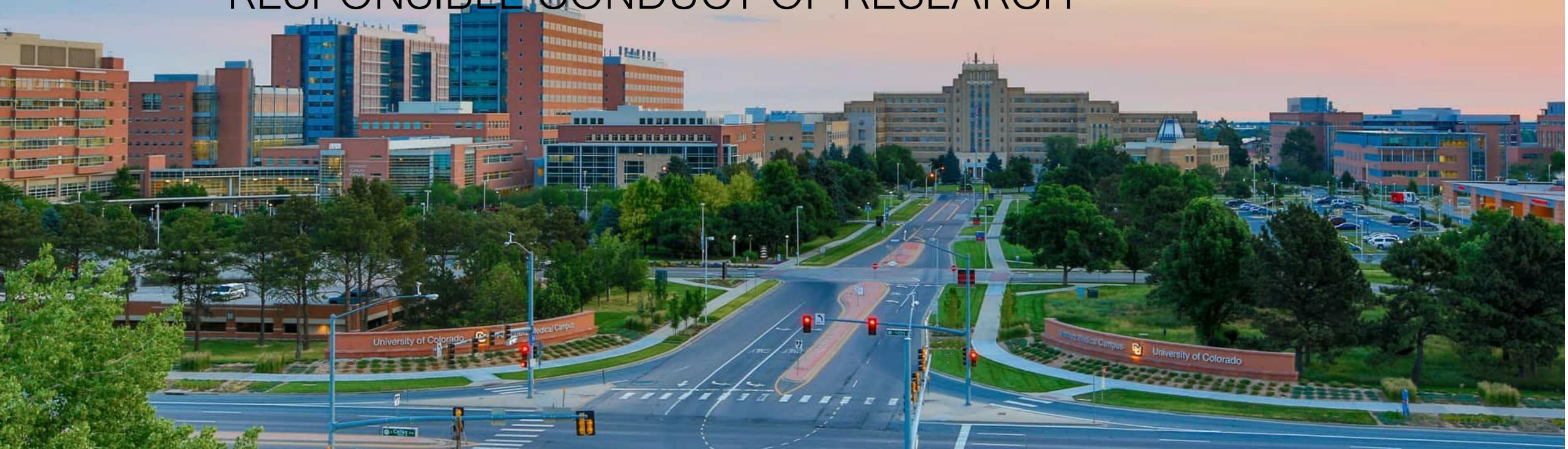
6 April 2023



University of Colorado **Anschutz Medical Campus**

# Ethics of Laboratory Safety

RESPONSIBLE CONDUCT OF RESEARCH



# Housekeeping

## Zoom Etiquette:

- Silence personal devices.
- Stay muted when not talking.
- Set up in a quiet location.
- Remain attentive. Avoid checking email/phone/web.
- Use the Chat function to ask questions or get technical help.
- Use your full name, not an alias.

## Receiving credit for attendance:

- To satisfy the [NIH Requirement for Instruction in the Responsible Conduct of Research](#), the following are required in order to receive credit for attendance:
  - **Attend the full 90 minutes of the training.** Attending any 8 out of the 9 RCR seminars we offer will satisfy the NIH requirement.
  - **Keep your video camera on throughout the session.** NIH requirements for RCR training specify face-to-face discussion.
  - **Participate interactively throughout the session.** Participate in discussions, respond to polls, and sign the attendance sheet (link will be distributed in the Chat).

# Objectives & Agenda

*Laboratory safety is a practical, technical issue employed at the user level, but it is also a leadership responsibility.*

## Agenda

- Definitions
- Framing the problem
- Case studies
- Institutional Resources



**First Polling Question:**  
***Who is in the audience?***

# Are there ethical safety considerations in conducting and overseeing laboratory research?

*“Who is responsible for ensuring safety training is completed AND followed?”*

*“Is adherence to safety protocols and procedures a personal responsibility, PI responsibility, or institutional responsibility?”*

“If you want to become a chemist, you have to ruin your health. Who does not ruin his health by his studies is not a chemist.”  
--August Kekulé - 1858



**2nd Polling Question:**  
***What is your role in the lab?***



In EHS, we much prefer a proactive, preventive approach to laboratory safety.

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**“Let’s review the guidelines for some of the chemicals we handle.”**



# What is Compliance?



*Safety and compliance are not necessarily interchangeable, but they are often linked*

- Acting in accordance with regulations
- *“Responsible Conduct of Research”*
- Good Laboratory Practices
- Standard and Special Microbiological Practices
- Written Standard Operating Procedures
- Research Norms & Values



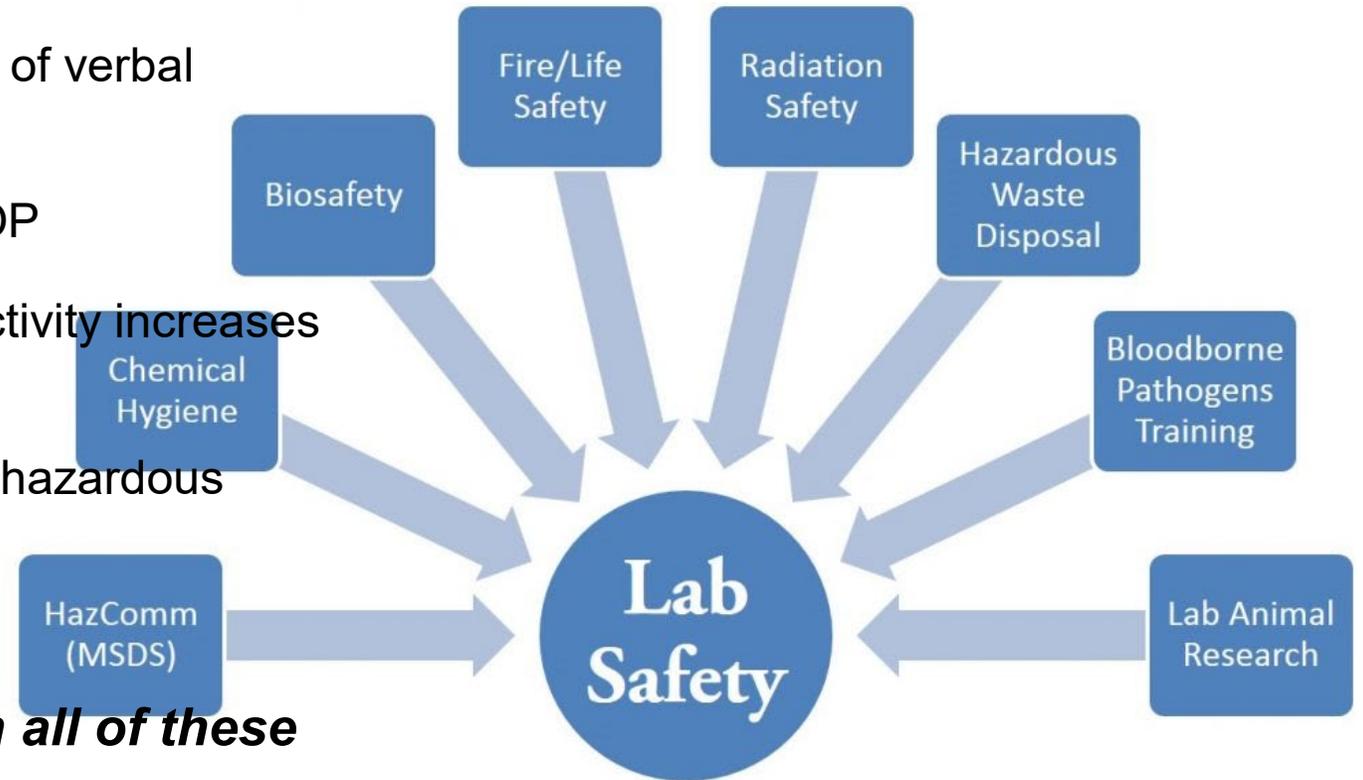


# Safety and Compliance



*Why do non-compliant or unsafe acts occur?*

- Lack of knowledge that regulations exist
- Lack of written SOPs—reliance on memory of verbal instructions
- Missing skill set to follow an established SOP
- Presumption the non-compliant action or activity increases “efficiency”
- Perception that activity is not dangerous or hazardous
- Outright disregard



***Lack of mentoring or coaching underpin all of these***

## ***Incidents and Case Studies***

### **2 Burned in a Chemical Explosion at University of Utah Lab**

**Posted:** March 28, 2018

SALT LAKE CITY - Two people were burned in a chemical explosion that forced the evacuation of a laboratory at the University of Utah.

Salt Lake City firefighters responded to a Hazmat incident at the Emma Eccles Jones Medical Research Building at about 5 p.m. Tuesday.

Fire officials say the two victims suffered minor burn injuries in an explosive chemical reaction that included a nitric acid spill.

School spokeswoman Suzanne Winchester says the two were treated on the scene and a third person received follow up care for a minor injury at the university hospital.

The evacuation order was lifted at about 7:30 p.m. but cleanup operations continued into the night.

## Incidents and Case Studies

### Science Mishap Sends Bronx Students to the Hospital

Posted: November 22, 2017, New York Times

BRONX, NY - A chemistry experiment gone awry sent four tenth graders from a Catholic school in the Bronx to the hospital on Wednesday after they were singed by a flame.

Sister Patricia Wolf, president of the school, St. Catharine Academy, on Williamsbridge Road, said that an experienced chemistry teacher was showing students a procedure that involved alcohol and a metal when the flame got out of control.

“The flame got a little larger than was anticipated, and several students who were near that flame were singed,” Sister Wolf said.

The four injured students were taken to nearby Jacobi Medical Center. The Fire Department classified the injuries as serious in two cases, but Sister Wolf said all the injuries were minor. She said students were singed on their hands, and possibly near the neck as well. Sister Wolf said there were no hazardous materials involved in the experiment and classes were allowed to resume.

One of the injured students, Elizebeth Diaz, 15, said the chemistry teacher was conducting an experiment to demonstrate how an atom goes from ground state to excited state. Her mother said she planned to speak with school’s administration because students were not wearing protective gear.

“They were not properly dressed in the chemistry class,” the mother said. “No lab coat, no gloves, no safety glasses. They should have had that. They’re not being responsible. It’s not acceptable.”

## ***Incidents and Case Studies***

### **Students evaluated after chemical explosion in Boise State lab**

**Posted:** January 18, 2017

BOISE - A hazmat crew responded to a report of a chemical exposure incident in a building at Boise State University Wednesday evening.

A police officer called a chemical spill in at about 5:30 p.m. Boise Fire spokesperson Tammy Barry says nitric acid and isopropyl alcohol mixed and caused a small explosion under the chemical hood (chemical containment area) in a lab at the Science and Education Building on Cesar Chavez Lane.

Three students were placed in showers for decontamination and eight others were being evaluated by paramedics, Barry said.

Boise Fire Battalion Chief Steve Rasulo says there were 11 students and staff in the room at the time of the explosion. By 7:30 p.m., six of them had been treated for nitric acid exposure, cleared by the hazmat team, put in white Tyvek protective suits and taken to the hospital.

## ***Incidents and Case Studies***

### **4 people injured in explosion in Texas Tech Chemistry Building Explosion likely caused by chemical waste product**

**Posted:** February 2, 2015 - 3:54pm | **Updated:** February 3, 2015 - 12:17am

Four people were taken to a hospital with minor injuries Monday after an explosion in the Texas Tech Chemistry Building.

Officials believe the explosion was caused by a chemical waste product, said Chris Cook, university spokesman. Cook could not say what type of chemical caused the accident.

Those injured suffered cuts and abrasions, Cook said. It was unclear if the building sustained any structural damage, but crews were working to clean up inside.

## ***Incidents and Case Studies***

### **Two high school kids burned in lab accident**

**NYC, NC:** January 2, 2014

Two 10th-graders at Manhattan's award-winning Beacon School were injured Thursday morning when a routine lab experiment went horribly awry, leaving one boy with serious burns.

Chemistry teacher Anna Poole had hoped to treat her students to a "fun" demonstration of the rainbow of flames that results from burning four kinds of nitrates in separate crucibles, students and law-enforcement told The Post.

But a volatile buildup of methyl alcohol fumes in the Upper West Side school's third-floor chemistry lab ignited into a fireball that sped across a countertop and engulfed sophomore Alonzo Yanes, 16.

"Help me! Help me!" screamed Yanes, who stood only a couple of feet away from the crucibles, according to witnesses. None of the students were wearing goggles.

Yanes dropped to the floor and tried to roll, but precious seconds ticked by until a fire extinguisher and then a blanket were used to extinguish the flames.

## ***Incidents and Case Studies***

### **Colorado College lab accident hospitalizes 13**

**By: Daniel Chacon** | *The Gazette* Posted: April 11, 2014

COLORADO SPRINGS — A chemical incident in a student lab at Colorado College sent 13 people to the hospital Wednesday, including two who had to be pulled out of the building with significant respiratory issues.

Colorado Springs firefighters and hazmat crews rushed to Olin Hall on North Nevada Avenue after 3 p.m. following reports of a hazardous materials exposure.



## ***Incidents and Case Studies***

### **Explosion on Colorado State University campus causes injuries**

**By: Ryan Parker** | *The Denver Post*   Posted: April 29, 2014

Fort Collins police and medical personnel are responding to an explosion on the Colorado State University campus Tuesday afternoon.

Two students were injured around 3:30 p.m. when a student in a chemistry lab mixed water with an unknown chemical while cleaning a container, police said. An explosion occurred.

The student who caused the explosion was taken to the hospital for injuries, including cuts to his face from glass, police said.



# Case Study in Laboratory Safety



## *The UCLA laboratory fire of December 2008*

<https://www.youtube.com/watch?v=F6NEdcZY2WY>



# The UCLA laboratory fire of December 2008

## Harran Lab

- Patrick Harran joined UCLA in July of 2008 as the inaugural Donald J. and Jane M. Cram Chair in Organic Chemistry
- Dr. Harran was previously at University of Texas Southwestern Medical Center at Dallas
- In temporary labs while permanent labs were being finalized.



## Sheri Sanji

- Spring 2008 B.S. Chemistry grad
- 23 years old
- Working in Harran lab for 2 months
- No prior pyrophoric experience

# The UCLA laboratory fire of December 2008

## Lapses in Training and Orientation

### From EHS

Because Sangji, Chen and Ding had started in mid-October they had missed EHS training for the fall. They were scheduled to be trained in January.

### From Dr. Harran

“We were in temporary laboratory space...we had never gone over where the showers were, how to use them.”

### UCLA had no records that Sangji was trained.

Relied on safety training from past institutions for Sangji, Chen and Ding.



# The UCLA laboratory fire of December 2008

## Legal and Professional Ramifications

- UCLA fined by CalOSHA
- Charges against University of California were dropped in 2012 as a result of a plea deal
- Felony prosecution of Dr. Harran that led to a plea deal in 2015
- Dr. Harran removed as a AAAS fellow



# The UCLA laboratory fire of December 2008

## Laboratory Safety Culture



**3rd Polling Question:  
*Who is responsible for  
safety?***



July 2009

Safety Culture in the Academic  
Institution





# Who sets the standards for safety and compliance?



1. Local, State, or Federal laws and regulations
2. Institutional committees
3. Adopted standards
4. Funding agency's policies



# Federal, State & Local Regulations



## Colorado Dept. of Public Health & Environment

- Biomedical / Regulated Medical Waste Management
- Chemical / Hazardous Materials Management in conjunction with EPA
- Radioactive Materials License —agreement State with NRC

## Metropolitan Waste Water District Commission

- Regulates all discharges to the sanitary sewer systems through the City of Aurora and City of Denver systems.
- Compliance with federal Clean Water Act.





# Institutional Compliance Committees



1. Institutional Animal Care & Use Committee (IACUC)
2. Institutional Biosafety Committee (IBC)
  - Use of recombinant DNA in bench, animal, plant or human subjects research
  - Use of Select Agents pathogens or toxins in research
3. Committee on Ionizing Radiation (CIR)
  - Use of ionizing radioactive materials
4. Radioactive Drug Research Committee (RDRC)
  - Use of radioactive drugs in human subjects research
5. Colorado Multi Institute Review Board (COMIRB)
  - Human subjects research review

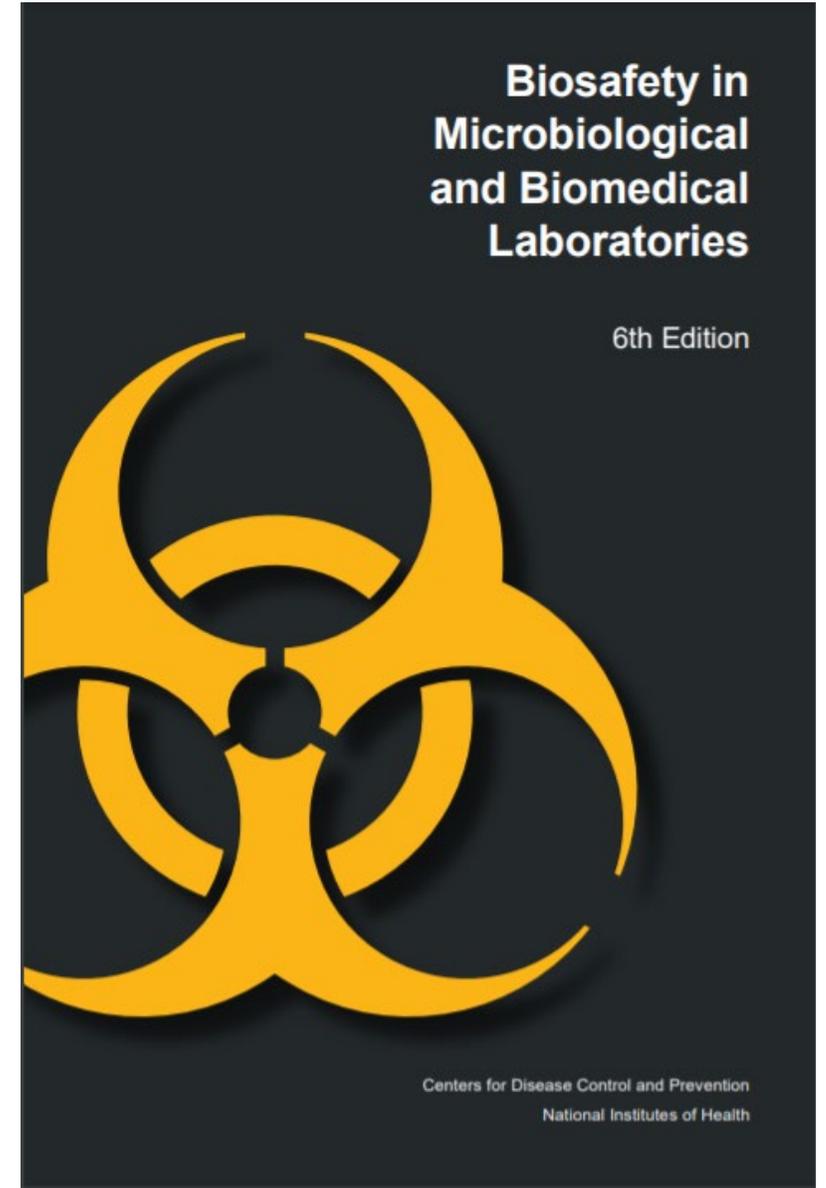




# NIH-CDC BMBL “*Adopted Standard*”

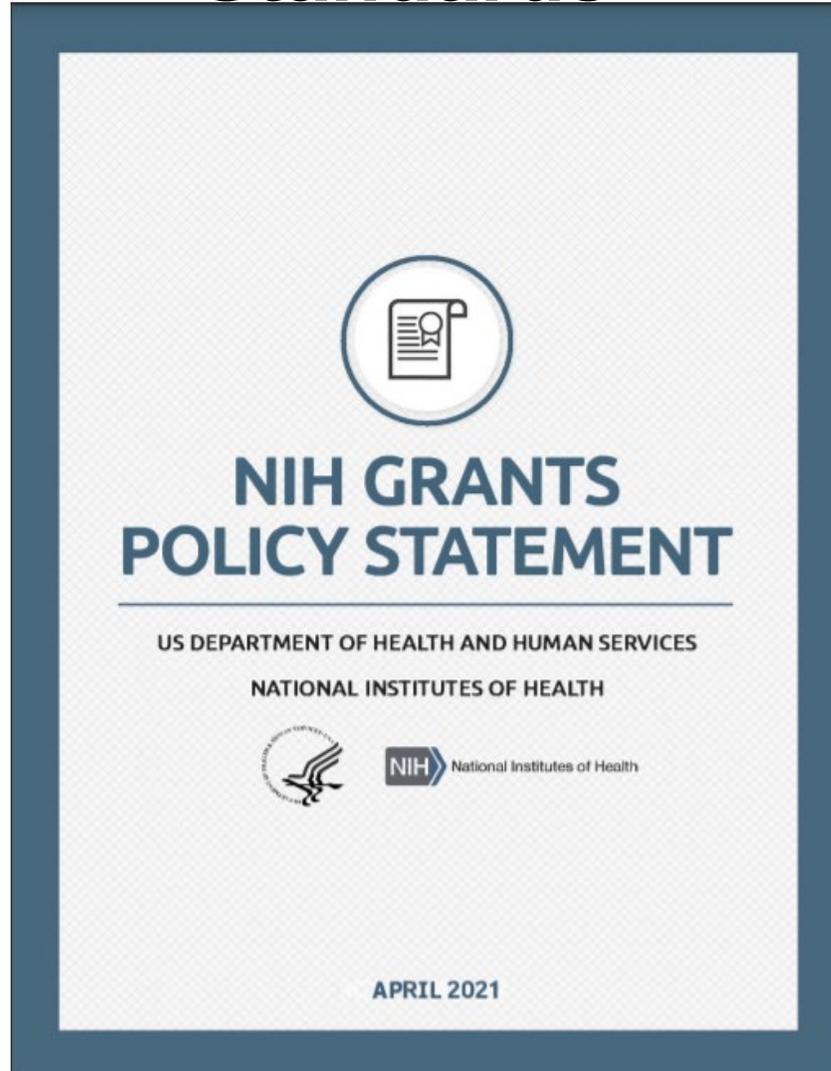


- Biosafety “Bible”
- Guidance on best practices: standard & specialized microbiological practices
- Regulatory in nature for some materials, specifically Select Agents & Toxins, enforcing federal law





# Funding Agency Standards



## 4.1.12 Health and Safety Regulations and Guidelines

29 CFR Part 1910.1030, **Bloodborne Pathogens, Exposure Control & Needlestick Safety**

29 CFR Part 1910.1450, **Occupational Exposure to Hazardous Chemicals in Laboratories**

**Biosafety in Microbiological and Biomedical Laboratories**, CDC and NIH, HHS.

4.1.20 EPA Resource Conservation and Recovery Act (RCRA) and Clean Water Act.

4.1.23 Public Health Security and Bioterrorism Preparedness and Response Act (Select Agents)

42 CFR Part 73 (CDC)

9 CFR 121 & 7 CFR Part 331 (USDA)

4.1.32 USA PATRIOT Act & "Restricted Persons"

4.1.24 NIH *Guidelines for Research Involving Recombinant DNA Molecules*, (including Human Gene Transfer Research)

4.1.24.2 Institutional Biosafety Committee



# Laboratory Safety

We will review some campus-specific resources involved in safety and compliance

**Sign the Attendance Sheet now by  
clicking the link in the Chat.**

# ***Institutional Checks and Balances at CU Anschutz and CU Denver***

- Committees
- Office of Regulatory Compliance
- Office of Grants and Contracts
- Tech Transfer Office (OGC)
- Department of Environmental Health and Safety

## **EHS Divisions**

1. Research Safety and Industrial Hygiene
2. Biological Safety
3. Occupational Health
4. Radiation Safety
5. Hazardous Materials Management



# Occupational Health Program



The OH medical surveillance program serves as the front line in identifying and mitigating occupational exposures to hazardous research activities. All employees working on approved research protocols are required to enroll in occupational health.

Services:

- Medical Surveillance--Occupational Exposures
- Health Risk Assessment--Occupational Exposures
- Immunizations & Testing
- Animal Exposure Surveillance
- Respiratory Protection Risk Assessment

*Research-focused OH program is mandated by the NIH and other agencies and organizations.*

*The OH Clinic is located in the Anschutz Health and Wellness Center.*





# Laboratory Safety Audits



- EHS conducts annual (or more frequent) audits on all labs.
- Your lab can be audited at any given time by any agency providing funding or regulatory oversight to the university.
- It is up to you to ensure you are prepared.



Colorado Department of Public Health and Environment



# General Safety Considerations



- Kids and pets are NOT allowed in the lab areas.
- Food and drinks are NOT allowed in the lab areas.
- Usage of Personal Protective Equipment (PPE) that is appropriate to the task.





# EHS Training Modules



The screenshot shows the University of Colorado skillport website. The page title is 'CU Denver | Anschutz' and the breadcrumb is 'CU Denver | Anschutz > Environmental Health and Safety'. A search bar is visible. A yellow box with black text is overlaid on the page, stating: 'The most important training you can do is Job Specific OJT'. Below the box, two training modules are listed:

- CU: Chemical Waste Management**  
Custom - Course: 45 Minutes
- CU: Lab Safety**  
Custom - Course: 1 Hour

Training	Frequency
LABORATORY SAFETY	Once for all lab personnel
CHEMICAL WASTE MANAGEMENT	Yearly for chemical waste generators
BLOODBORNE PATHOGENS	Yearly for those with potentially exposure
REGULATED MEDICAL WASTE	Every third year for RMW generators
Other available training includes: RADIATION SAFETY, SHIPPING, LASER SAFETY, BIOLOGICAL SAFETY CABINETS, FUME HOODS, RESPIRATOR SAFETY, and more.	



# Hazardous Waste Disposal



## Biological/Regulated Medical Wastes

- 303-724-0235 for regulatory requirements
- 303-724-0111 for waste pickup
- [Biowaste.Disposal@ucdenver.edu](mailto:Biowaste.Disposal@ucdenver.edu)
- [Animal.Hazmat@ucdenver.edu](mailto:Animal.Hazmat@ucdenver.edu)

## Chemical & Hazardous Material Wastes

- 303-724-5661
- [EHS.Hazmat@ucdenver.edu](mailto:EHS.Hazmat@ucdenver.edu)

## Radioactive Wastes

- 303-724-0109
- [Waste.Rad@ucdenver.edu](mailto:Waste.Rad@ucdenver.edu)





# Promoting a Safety Culture



- Advanced training in safety should be mandatory for students engaged in research. This training needs to be hands-on whenever possible
- Research often involves making new materials by new methods, which may pose unknown or unique hazards
- Faculty are expected to provide a safe environment for research via careful oversight of student's work
- Promoting safety extends beyond EHS and senior researchers – it applies to all scientists and students





# Promoting a Safety Culture



- Make a lab safety topic an item at every lab meeting
- Wearing of appropriate PPE should be enforced by everyone
- Periodically review the results of lab inspections with entire lab group
- Encourage students and lab employees to contact EHS if they have questions about safe handling or procedures
- Require that all accidents and incidents (even minor ones) are reported to EHS so the root cause can be identified (“Great save” vs. “Near Miss”)
- Review new procedures with students and discuss all safety concerns
- Make sure all safety rules are followed by everyone
- Recognize and reward students and staff for attention to safety



**4th Polling Question:**  
***What in your lab is done to promote a culture of safety.***

**Taken from “Prudent Practices in the Laboratory”**





# Emotional Safety as part of Lab Safety



- A supportive and inclusive laboratory environment is directly linked to a safe laboratory environment
- Mentors/PIs/Leaders must be committed to setting a positive leadership example, be professional, and promote equity and inclusion for all.
- Inappropriate behavior must be addressed at the work unit level or thru resources provided by the CU Office of Equity

<https://www.ucdenver.edu/offices/equity>

[equity@ucdenver.edu](mailto:equity@ucdenver.edu) 303-315-2567

# 5

## WAYS SUPERVISORS CAN PROMOTE RESEARCH INTEGRITY

Are you a principal investigator, research coordinator, academic advisor, or mentor? Roles such as these place you in a unique position to cultivate exceptional research practices among the next generation of researchers.



### 1 BE AVAILABLE & APPROACHABLE



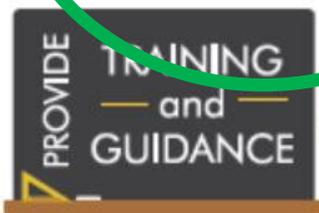
Your team wants to learn from YOU!



2 You are responsible for the integrity of your team's data.

### 3 COMMUNICATE EXPECTATIONS

Prevent misunderstandings by making sure everyone is on the same page.



4

Avoid making assumptions about anyone's skills or knowledge.



5

Be prepared in case you ever suspect research misconduct.



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Find out more:



[ori.hhs.gov](http://ori.hhs.gov)



[@HHS\\_ORI](https://twitter.com/HHS_ORI)



[#ORIedu](https://twitter.com/ORIedu)



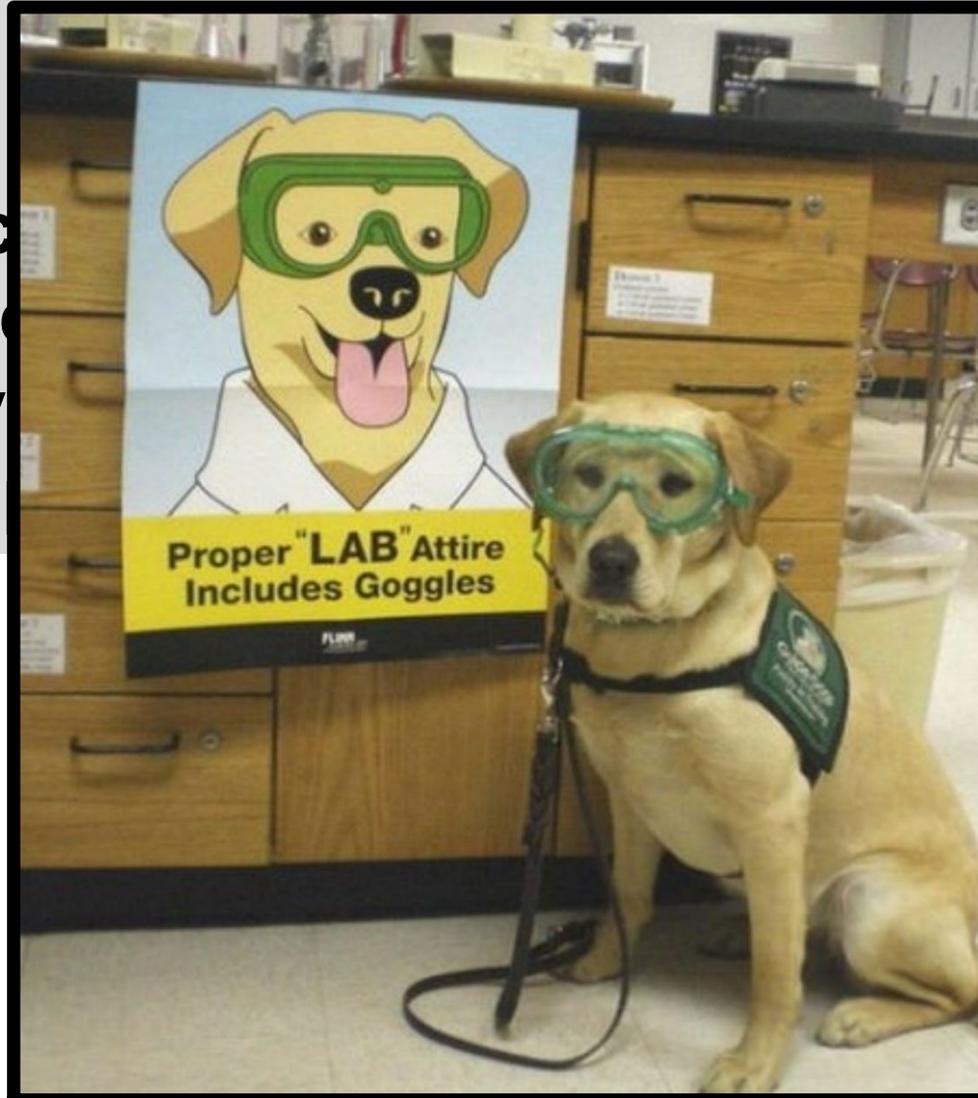
# Proper attire and appropriate PPE is required at all times in lab areas

At a minimum

closed toed shoes

When working

- Lab coat
- Gloves
- Eye protection



***Food and Drink is never allowed in lab areas***





# Contact EHS for Assistance



- Take the required training, complete your OJT, have an active presence in lab meetings & contact EHS if you have questions or concerns.
- Remember, EHS is here to help

## Compliance Specialists

- Austin Astrike- [Austin.Astrike@cuanschutz.edu](mailto:Austin.Astrike@cuanschutz.edu); x4-2271
- Renee Veltri – [Renee.Veltri@cuanschutz.edu](mailto:Renee.Veltri@cuanschutz.edu); x4-2532
- Julie McMillen- [Julie.McMillen@cuanschutz.edu](mailto:Julie.McMillen@cuanschutz.edu); x4-1272
- Main Desk- x4-0345

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