History of Laboratory Safety at UCLA

Research Administrators Forum
Office of Research Administration

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UC Center for Laboratory Safety
UCLA Westwood Campus March 18 1929

First class – Chemistry 1A
– held six months before official campus opening

Chemistry Department building is now Haines Hall
California Hall – housed chemistry laboratories
– burned down in January
UCLA Timeline

- **Lab Accident**: 12/29/08
- **Sheri Sanji dies**: 1/16/09
- **Cal/OSHA Investigations, Citations, and fines**: 5/09 – 2/10
- **Los Angeles District Attorney files felony charges against Prof Harran & UC Regents**: 12/27/11
- **Charges against UC Regents dropped and Settlement Agreement signed**: 07/25/12
- **Professor Harran signs a Deferred Prosecution Agreement**: 6/20/2014
- **Changes in safety practices at all campus levels**: 1/2009 - Present
Accident Aftermath

Repercussions across

- UCLA campus
- University of California system
- Chemistry departments and universities nationwide
- Federal agencies
- Professional societies

A very tragic accident that has had true impact improving laboratory safety practices and the safety culture in ALL academic institutions.
Laboratory Safety Triad

Safety Outcomes

What incidents occur?
Where do incidents occur?
When do incidents occur?

Safety Programs
EH&S Actions, Using SOPs, PPE Usage, Safety Training

Safety Culture
Actions by researchers in labs. Safety leadership by everyone.
Key Changes in UCLA Lab Safety

• **EH&S** – Rigorous lab inspections by knowledgeable staff
  – Active in safety training

• **PPE** – Mandatory use in labs (UCLA Policy 905)
  – Major one-time funding by UCOP

• **Safety Committees** – Proactive faculty-led across hazard areas
  – Empowered by Vice Chancellor, Research

• **Individual lab compliance**
  – Required faculty safety training
  – Required researcher safety training
  – Required response to lab inspections
  – Required adherence to lab safety standards
Evolution of Lab Coats – Reducing Chemical Exposures

Performance Requirements for Lab Coats
- Comfortable material to wear
- Breathable
- Non-porous for liquids
- Non-wicking for liquids
- Chemically resistant
- Flame resistant

$35
Cotton or Polyester

$100
Flame Retardant Treated Cotton

$120
Flame Resistant Nomex®

$175
Flame and Chemical Resistant ShieldCXP®
Laboratories can be High-Risk Environments

Chemical Hazards
- Flammables
- Acute toxins
- Carcinogens
- Reproductive toxins
- Corrosives
- Air/water reactives

Biological Hazards
- Infectious material
- Biological toxins
- Public health risks

Radiological Hazards
- Radioisotopes
- Radiation generating equipment (X-rays)
- Lasers

Physical Hazards
- Cryogenics
- High temperatures
- High and low pressures
- Loud equipment
- Cuts and needle sticks

Cannot eliminate all risks, so we use layers of risk management and safety controls, but accidents still occur!
Explosion in Laboratory

UCLA April 2014: Material Science Engineering

- Heating dicyclopentadiene in a pressure reactor in an oven
- Uncontrolled heating causes runaway reaction
- No pressure relief valve on pressure reactor
- Student suffers modest injuries

Oven before incident

Oven after incident
Explosion in Laboratory

UCLA September 2017: Chemistry & Biochemistry

• Pressure bottle for nickel / platinum nanoparticle synthesis
• \( \text{Ni(acac}_2 \) + \( \text{Pt(acac)}_2 \) + \( \text{NaBr} \) + \( \text{DMF} \) \( \text{150} \degree \text{C} \) \( \rightarrow \) \( \text{NiPt} \)
• Hotplate failure causes explosion
• Student sustains major injuries
Safety Outcomes: Analysis of UCLA Safety Incidents

*What incidents are happening in laboratories and how can we use that data to drive improvements in laboratory safety programs?*

- What lab incidents are occurring?
- Where are lab incidents occurring?
- When are lab incidents occurring?
- What lab incidents are decreasing?
- What lab incidents are increasing?

*What impact did implementing a compliance-focused laboratory safety program have on incidents, injuries, and exposures?*
Total Laboratory Incidents at UCLA

Incidents are defined as events causing an injury or illness. Data provided by UCLA Insurance and Risk Management.
61 Departments/Divisions
6 with more than 40 incidents

UCLA Incident Analyses

30%

12%

5%

5%

4%

4%

Hematology Oncology
Chemistry & Biochemistry
Pathology
Microbiology
Neurology

Div Lab Animal Med (Vivarium)
UCLA Incident Analysis

Types of Laboratory Incidents

- Sharps: 32%
- Animal Bites/Scratches: 13%
- Chemical Exposure: 16%
- Biohazard Exposure: 6%
- Other Exposures: 6%
- Fire/Explosion: 1%
- Struck by Object: 8%
- Slips, Trips and Fall: 3%
- Repetitive Movement/Lifting: 15%

1080 incidents over 10 years
38% of sharps incidents cause a biohazard exposure.

Action item: Improve sharps awareness and training.
Details on Laboratory Incidents

- **Biohazard exposure**: 38%
- **Chemical exposure**: 59%
- **Radioactivity exposure**: 2%
- **No exposure**: 1%

**Sharps Incidents**

- **Needles**: 32%
- **Unknown**: 15%
- **Razor blades and scalpels**: 20%
- **Glass**: 11%
- **Other**: 11%
- **Sectioning tools**: 6%
- **Scissors**: 1%
- **Pipette**: 1%
- **Forceps**: 1%
- **Knife**: 2%

**Common Sharp Tools**

- **Needles**: 32%
- **Unknown**: 15%
- **Razor blades and scalpels**: 20%
- **Glass**: 11%
- **Sectioning tools**: 6%
- **Pipette**: 1%
- **Other**: 11%
- **Scissors**: 1%
- **Forceps**: 1%
- **Knife**: 2%

Action item: Loose razor blades should be replaced by razor blade knives
UCLA Incident Analysis

Details on Laboratory Incidents

Total Biohazard Exposures
- Sharps: 61%
- Other biohazard exposures: 33%
- Animal bites/scratches: 6%

Chemical Exposures
- Dermal exposure: 34%
- Inhalation: 28%
- Splash to eye: 29%
- Unknown: 9%

Action item: Address sharps use which causes 61% of all biohazard exposures
Safety Culture Survey

• Determine strengths and weaknesses of safety programs
• Determine the state of laboratory safety culture
• Identify factors that influence the safety culture
• Identify factors that correlate with injuries

GOAL: Use data to drive improvements in laboratory safety practices, culture and outcomes
Safety Culture Survey

• Short: < 10 minutes
• 38 questions; 5-point Likert scale, 1 open-ended question
• Bifurcated survey: Students, postdocs & staff vs PIs
• Areas:
  – Demographics
  – Safety communication
  – Safety attitude
  – Safety behavior
  – Lab incidents and near misses
• 4 Research universities
• > 1000 respondents

<table>
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<tr>
<th>Field</th>
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<tr>
<td>Life Sciences</td>
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<tr>
<td>Engineering</td>
<td>11%</td>
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<tr>
<td>Other</td>
<td>1%</td>
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Trainee/Staff PPE Compliance by Work Area

Safety Culture Survey involving 469 UCLA researchers
Perception Gap when Discussing Safety in Experiments

I discuss with my lab group how to conduct experiments safely.
89% Agree/Strongly Agree

My PI discusses with me how to conduct experiments safely
66% Agree/Strongly Agree

Safety Culture Survey involving 1034 University researchers
Correlating PI Safety Recognition with Student Safety Behavior and Attitudes

PI Action:
- Safety Recognized
- Neutral
- Safety Not Recognized

Student reaction:
- People in my lab incorporate safety measures into their experimental protocols.
- Time devoted to compliance with lab safety regulations is appropriate and valuable.

Safety Culture Survey involving 1034 University researchers
Correlating PI Safety Actions with Student Safety Attitudes and Behavior

**PI Action:**

**Formal Lab Safety Discussions:**
- Weekly / Monthly: 73%
- Quarterly: 56%
- Yearly / Never: 43%

**Student Reaction:**
- A minor injury:
  - Students/staff would report to PI:
  - Weekly / Monthly: 81%
  - Quarterly: 63%
  - Yearly / Never: 49%

Regular and frequent lab safety discussions strongly correlate with higher incident reporting.
Do Faculty and Student Safety Attitudes and Behaviors Impact Safety Outcomes?

How Can Injuries be Prevented?

Correlating behavior with Safety Outcomes:
Near Misses
Minor injuries
Major injuries
Fewer minor injuries are reported when PI includes risk assessment in experimental design

My mentor/professor discusses with me how to conduct experiments safely.
Fewer minor injuries are reported when students/staff perform risk assessments

People in my lab consider safety procedures before they conduct a new or scaled-up experiment.
Key Findings and Recommendations

Safety Programs
• Huge progress in changing safety practices at UCLA
• Funding needed for PPE and other safety issues

Safety Outcomes
• Low incidence of accidents, but still occur
• Need better incident messaging

Safety Culture
• Many measures of safety culture are positive
• PIs must be more engaged in the importance of lab safety
Think Safety

What could go wrong?
How can I prevent it?
How can I prepare for the unexpected

The End – Be Safe!

Thanks to my outstanding colleagues in the UC Center for Laboratory Safety:

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