Analyzing academic laboratory accidents to prevent accidents

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UCLA - December 29, 2008



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 safety practices and the culture of safety in ALL academic laboratories

UCLA Response

UCLA initiated a wide array of changes in response to the accident, Cal/OSHA inspections, legal fillings, and the OSHA Lab Standard.

- Chancellor
- Vice Chancellor for Research
- Associate Vice Chancellor for Research Laboratory Safety
- Laboratory Safety Committees
- Environment, Health and Safety
- Departments
- Faculty
- Research Staff
- Graduate Students and Undergraduate Students

Changes top to bottom were required to change the culture of safety

UCLA and University of California Sample Accomplishments

- EH&S approach completely changed to focus on research safety instead of mere compliance
- Dramatic increases in funding for safety by University of California
- UC Center for Laboratory Safety created
- UC promoted development of "Chemical Protection" lab coats
- 100% response rate to lab inspections by faculty
- 100% response rate for safety training by researchers

Key Points:

- Responsibilities and expectations established for both faculty and lab workers
- Culture of safety created by acceptance of safety requirements and faculty engagement

But Before We Congratulate Ourselves Too Much...

There are still too many academic lab accidents!!!

Analysis of Safety Incidents

UCLA Departments vs UC System vs Outside World

- What type of accidents are occurring?
- Where are accidents occurring?
- What are we doing right?
- What are we doing wrong?
- How do we compare against other universities?
- How do we compare against government labs?
- How do we compare against industry?

How can incident data be used to drive safety interventions?

Safety Data and Challenges

What Safety Data Can Be Collected?

- Safety training records
- Lab inspection reports
- Occupational injury reports
- Incidents with material damage, but no injuries
- Near miss data
- Safety Culture

What are the Barriers to Safety Data Collection and Use?

- Lack of infrastructure and culture
- Lack of commitment and resources
- Quality of data
- Institutional reluctance to share or publicize data

Benefits of Analyzing Safety Data

- Reduce risks
- Impact safety culture
- Increase safety awareness
- Share safety information with the community
- Save money and resources
- Conduct safer and better research
- Improve productivity
- Predict (possibly) accidents

Safety Incidents in the UCLA Department of Chemistry and Biochemistry

Injury Year	04	05	06	07	08	09	10	11	12	13	14	15	16	17	Total
Laceration	2	2	2	5	1	1	2		1	1	1	2	1	1*	22
Chemical exposure	3			1	2	1	2	3	2		2	2		1	19
Biological exposure			1												1
Thermal burn				1	2	1				1				1	6
Needle Stick – chemical	1	1							1						3
Needle Stick – biological			1												1
UV radiation to eyes			1												1
Hit by object						1	1	1	1						4
Hit by object in eye	1		1			1						1			4
Animal bite - squirrel				1											1
Carpal tunnel / back pain /	1	1	1	1	4	1	4	2	1						16
Slip fall on level		2					3	5	1		1	1	1	1	15
Slip fall on stairs	1		1							1	1	1		1	6
Strain – lifting	1	1		1	1		1					1			6
Emotional mental stress		1		3		1		1							6
Total Lab Specific Injuries	7	3	6	7	5	5	5	4	5	2	3	5	1	3	61
Total Injuries	10	8	8	13	10	7	13	12	7	3	5	8	2	5	111

Low and decreasing incident rate, but aggregate identifies key injuries

Serious Explosion in September

Hotplate failure overheats oil bath leading to explosion of pressure reactor resulting in serious injury to student.

Third UC injury in recent years where student attempted to fix a runaway experiment. MUST TRAIN FOR EMERGENCIES!



Laboratory Injury Incidents at UCLA

- Laboratory accidents (~110) comprise only 8% of the 1300 accidents reported campus-wide each year
- Since 2011, continuous reduction in number of incidents
- OSHA recordable rate of 0.7/100 researchers
- Low, but can we do better to avoid the catastrophic accident?



- Lacerations
- Needle sticks
- Burns
- Biohazard exposures
- Animal bites/scratches
- Chemical exposures
- Bodily trauma
- Slips and falls
- Ergonomic issues

Types of Laboratory Incidents since 2008



- Punctures and cuts
- Chemical exposure
- Strains acute & chronic (ergon.)
- Animal bites/scratches w/o expos
- Biohaz exposure
- Contusions/acute sprains
- Allergies
- 📔 Burns
- 📔 Unknown cause
- Other exposures
- 🖬 Object in eye

Where Did the Incidents Occur?



Safety Incidents at UCLA

Department of Chemistry & Biochemistry (fourteen years):

Lab-specific accident rate: 0.8% Overall accident rate: 1.6%

UCLA Annual: Lab-specific incident rate: 1.5 % Overall UCLA accident rate: 3.0%

State of California Annual:

All industries including state/local governments accident rate: 4.0%

Colleges, universities, professional schools accident rate: 2.9%. All manufacturing accident rate: 3.2% Chemical manufacturing accident rate: 2.8%

Chemistry & Biochemistry: Effect of Top-down Intervention



600 employees

Intervention began in 2009 Increase in incidents 2010/11 Decrease as of 2012

Top-down Intervention

- Rigorous inspection of all labs, chemical storage rooms, shops and required follow up
- Departmental safety committee
- Mandatory FR lab coats
- Mandatory lab coats in all chemistry teaching labs
- Unannounced PPE inspections
- Mandatory reporting of all laboratory accidents
- PI laboratory safety training
- Extensive student and staff training
- Mandatory fire extinguisher training
- Documentation of training
- SOP for every hazardous chemical

Vivarium: Safety Pioneer Intervention



Two departments report the majority of UCLA lab incidents

Significant reduction of incidents in Vivaria since 2010

Vivarium Incidents 2008-2016 (258 total)

• Lifting/overexertion, Contact with objects and falls, Animal bites account for most



Downward trend since 2008



Vivarium Strategies for Reducing Injuries and Illnesses

- Hands-on animal restraining training
- ⁻ 2 h class with focus on handling and restraining animals in a <u>relaxed environment</u>
- additional class time for uncomfortable students
- additional class time for teaching specific techniques
- Monthly safety meetings
- Financial support through EH&S and IRM







Impact of PI Safety Engagement on the Number of Injuries in the Lab

Injuries witnessed or personally experienced by students and postdocs (n=406)



I. Schröder, D.Y.Q. Huang, O. Ellis, J. H. Gibson, N. L. Wayne; J Chem Health and Safety, 2015

Conclusions: Reducing Accidents

- There is no magic bullet
 A sustained and multipronged set of actions is required
- Rigorous expectations (Top-Down Approach) is effective
 Further reductions in accident rates must still be made
- Changing the routine (Safety Pioneer Approach) is effective

 May or may not be readily transportable or scalable
- Engagement by faculty is the most effective action with a documented impact on safety

 Active participation by direct supervisors reduces injuries and promotes a culture of safety







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