Laboratory Safety at UC: Past, Present, and Future

2013 UC Compliance and Audit Symposium

Erike Young – UCOP, EH&S Director
Ken Smith - UCOP, Laboratory Safety Manager

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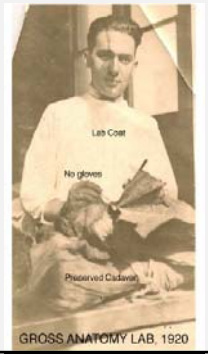
Early Chemistry Laboratories

Early Chemistry Laboratory

Improved Laboratory Conditions

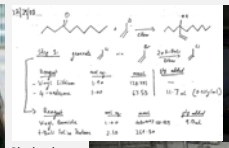
1920 Anatomy Laboratory Conditions



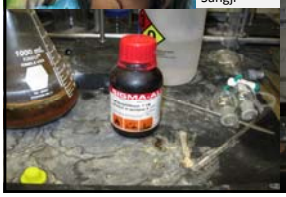
Modern Laboratory Conditions

University of Kansas Center of Excellence
in Chemical Methodologies & Library Development

December 29, 2008



Sheharbano Sangji



Factors Possibly Contributing to the Accident

- Experiment Design
- Experimental Techniques
- Synthetic Clothing
- Training
- **PPE**

Center for Investigative Reporting

Video: The People v. Professor Harran

http://californiawatch.org/higher-ed/video-people-v-professor-harran-17275

UC Regents Charged Under California Labor Code 6425(a)

- Any employer and any employee having direction, management, control, or custody of any other employee, who willfully violates any occupational safety or health standard or code, and that violation caused death to any employee, or caused permanent or prolonged impairment of the body of any employee, is guilty of a public offense punishable by imprisonment in a county jail for up to one year or by a fine of up to $100,000, or by both, or in the state prison for up to three years, or by a fine of not more than $250,000, or by both;
- The LADA alleged that the UC Regents did not:
  1. Provide adequate **training**
  2. Require appropriate **Personal Protective Equipment ("PPE")**
  3. Establish **Standard Operating Procedures ("SOPs")**

Statement of Facts

- For purposes of the Agreement, Regents do not dispute the following:
  - Regents had not adequately trained Ms. Sangji,
  - Regents did not require appropriate PPE,
  - Regents did not establish SOPs for transferring pyrophoric agents,
  - Regents have implemented a comprehensive training and safety program at UCLA,
  - Regents have made a substantial and good faith effort to bring lab safety practices into compliance with Title 8.

Common Questions

- Why did the Regents agree to a settlement?
- Who was involved in the negotiations?
- The accident occurred at UCLA, so why are all campuses required to comply with the settlement requirements?
- How does the settlement requirements compare to what Cal/OSHA currently requires?

Why did the Regents agree to a settlement?

- "The effect of a criminal conviction would negatively impact the University of California as a whole…., and many thousands of students, employees, and indirectly, the public, including potentially debarment, loss of funding, loss of licenses and exclusion from areas of research vital to public health, public safety, and national security." (Executed agreement page 2, line 24)

Who was involved in the negotiations?

- Legal Team
  - Charlie Robinson – UCOP, Vice President and General Counsel for Legal Affairs
  - Karen Petrulakis – UCOP, Deputy General Counsel Litigation, Labor Employment , and Governance
  - Kevin Reed - UCLA, Vice Chancellor, Legal Affairs
  - Norm Hamill – UCOP, Senior Counsel
  - Craig Moyer - Manatt, Phelps & Phillips LLP
  - Nancy Whang - Manatt, Phelps & Phillips LLP
  - Truc Do - Munger, Tolles & Olson LLP
- Advisory Workgroup
  - Nancy Wayne – UCLA, Associate Vice Chancellor for Research, Laboratory Safety
  - James Gibson – UCLA, EHS Director
  - Patrick Schlesinger – UCB, AVC Research Administration and Compliance
  - Fiona M. Doyle – UCB, Professor of Mineral Engineering and Past Chair of UCB Academic Senate
  - James Nowick – UCI, Professor of Chemistry
  - Petros Yiannikouros – UCLA, Chemical Hygiene Officer
  - Erike Young – UCOP, EHS Director
  - Dallas Rubenstein – UCR, Professor of Chemistry, Provost and Executive Vice Chancellor
  - Michael Pirrung – UCR, Distinguished Professor of Chemistry
  - David Vandenberg – UCSB, Laboratory Safety Program Manager
  - Marianne Generales – UCSD, AVC Research
  - Ken Smith – UCSD, Research Safety Division Manager
  - David Gardner – UCSF, Professor, School of Medicine
  - Bob Eaton – UCSF, EHS Director

The accident occurred at UCLA, so why are all campuses required to comply with the settlement requirements?

- The criminal charges were filed against the UC Regents as the employer.
- "The effect of a criminal conviction would negatively impact the University of California as a whole…., and many thousands of students, employees, and indirectly, the public, including potentially debarment, loss of funding, loss of licenses and exclusion from areas of research vital to public health, public safety, and national security." (Executed agreement page 2, line 24)

How does the settlement requirements compare to what Cal/OSHA currently requires?

- Title 8 of the California Code of Regulations ("8 CCR") applies systemwide to all Laboratory operations.
- The Agreement adds enhanced requirements for:
  - SOP approval and documentation
  - Serious injury reporting

Leadership Commitment to Safety

- July 27, 2012 Settlement Agreement reached between the People of the State of California and the Regents of the University of California.
- August 3, 2012 UC-wide letter from Provost Aimee Dorr.
- August 28, 2012 letter from Vice President Steve Beckwith.
- Working collaboratively with Academic Senate.


UNIVERSITY OF CALIFORNIA

Roles and Responsibilities

- EHS Directors
  - Providing information, resources, and tools to assist affected departments and researchers
  - Working directly with Department Chairs
  - Consulting with Academic Senate and VCRs
  - Certify that departments are in "substantial compliance" with agreement.
- Department Chairs
  - Helping ensure researchers meet agreement requirements
  - Liaison between EH&S and researchers
- Researchers and Lab Personnel
  - Implement agreement requirements
  - Provide assurance that obligations are being met

Ken Smith

A PRIMER ON CALIFORNIA CODE OF REGULATIONS (CCR) TITLE 8

Meeting Settlement Agreement Requirements

Department Chairs, faculty and lab personnel are vital to successfully implement the settlement agreement requirements. The most significant of these are:

1. The completion of lab safety **training** that meets the settlement requirements,
2. Approval and training on **SOPs** specific to chemicals noted in the agreement, and
3. Review of hazards and, selection of appropriate **PPE**.

Important Sections of Title 8 Pertaining to Chemistry

Section	General Industry Safety Order - Title
3203	Injury and Illness Prevention Program
3380 et. al.	Personal Protective Equipment
5162	Emergency Eyewash and Shower Equipment
5191	**Occupational Exposure in Hazardous Chemical Laboratories (*Laboratory Standard)***
5155	Airborne Contaminants
Article 110	Regulated Carcinogens
5209	Select Carcinogens
339	Hazardous Substance List
3368	Consumption of Food and Beverages
Group 20	Flammable Liquids, Gasses and Vapors
Group 27	Fire Protection
5193	Blood Borne Pathogens
5199	Aerosol Transmissible Disease
5199.1	ATD -Zoonotic

Corporate Criminal Liability Act
"Be a Manager, Go to Jail"
California Penal Code, Section 387

- Enacted in 1990 by the California legislature. This law is designed to protect workers as well as the public.
- California law holds organizations and their supervisors including Principal Investigators responsible for the safety of their workers.
- Makes organizations and their managers criminally liable when they fail to warn their employees and report to Cal-OSHA the existence of "serious concealed dangers of which the corporation and its managers have actual knowledge…"
- Investigations can be long and involved.
- Convictions can involve fines and/or imprisonment.

Corporate Criminal Liability Act cont.
Definition of a manager…

- A person having both:
  - Management authority and
  - Significant responsibility for any aspect of a business including safety of a product/business practice (Employers, directors, management officials, supervisory personnel)

Note: the words "manager" or "supervisor" do not have to be part of a job title to be within the definition of "manager".

Corporate Criminal Liability Act cont.
Definition of a Serious Concealed Danger…

- A danger related to a product or business practice, that creates a substantial probability of death, great bodily harm, or serious exposure to an individual.

OSHA General Duty Clause (29 USC 654): Provides broad enforcement powers

(a) **Each employer** shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees shall comply with occupational safety and health standards promulgated under this act.

(b) **Each employee** shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct."

Cal/OSHA's version of General Duty Clause

- California law holds manager/supervisors (Principal Investigators) responsible for the safety of their workers.
- 8 CCR 3203

Injury and Illness Prevention Program (8 CCR 3203)

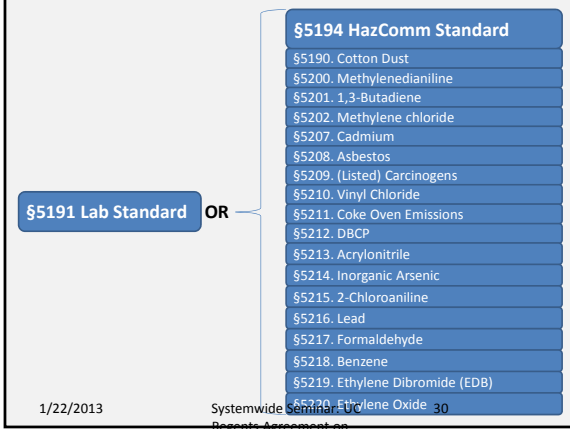
- The key to a safe and healthful work environment is a comprehensive Injury and Illness Prevention Program ("IIPP").
- IIPP are universal interventions that can substantially reduce the number and severity of workplace injuries and alleviate the associated financial burdens on U.S. workplaces.
- Most successful IIPP are based on a common set of key elements including:
  - management leadership,
  - worker participation,
  - hazard identification,
  - hazard prevention and control,
  - education and training, and
  - Program evaluation and improvement.

Laboratory Standard 8 CCR 5191

- In 1990, OSHA issued the *Occupational Exposure to Hazardous Chemicals in Laboratories* standard (29 CFR 1910.1450).
- Cal/OSHA as a State-plan State followed suit in 1991 (8 CCR 5191).
- Commonly known as the ***Laboratory Standard***.
- It was developed to address workplaces where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory Standard 8 CCR 5191

- Supersedes another more onerous standard know as the *Hazard Communication Standard*.
  - The goal of the *Hazard Communication Standard* is to communicate to employees the hazards of chemicals in the workplace.
- The *Laboratory Standard*, on the other hand, is designed to provide a comprehensive approach for the protection of laboratory workers which protect workers through the development and implementation of work practices and control measures expressly tailored to the Individual laboratory work place.



Laboratory Standard 8 CCR 5191

- The purpose of the Laboratory Standard is to ensure that workers in laboratories are informed about the hazards of chemicals in their workplace and are protected from chemical exposures exceeding allowable levels.
  - This standard was designed expressly for laboratories to address the unique exposure conditions under which work is performed and to protect employees from adverse health effects that may result from their work in laboratories regardless of what toxic and hazardous substances are used.
- The Laboratory Standard achieves this protection by establishing safe work practices in laboratories through adoption of a Chemical Hygiene Plan ("CHP").

Laboratory Standard

- The Laboratory Standard consists of five major elements:
  - Hazard identification,
  - Chemical Hygiene Plan,
    - SOPs
  - Information and training,
  - Exposure determination, and
  - Medical consultation and examinations.

Hazard Identification

- Each laboratory must identify which hazardous chemicals will be encountered by its workers.
- All containers for chemicals must be clearly labeled.
- Safety Data Sheets (SDSs) for chemicals received by the laboratory must be maintained and readily accessible to laboratory workers.

Potential Hazards

- Impact
- Penetration
- Compression
- Electrical
- Radiation
- Optical
- Thermal
- Biological
- Noise
- Chemical
- Animal

Chemical Hygiene Plan (CHP)

- Provides guidelines for prudent practices and procedures for the use of chemicals in the laboratory.
  - *SOPs,*
  - *Criteria for Exposure Control Measures,*
  - *Adequacy and Proper Functioning of Fume Hoods and other Protective Equipment,*
  - *Information and Training,*
  - *Requirement of Prior Approval of Laboratory Procedures,*
  - *Medical Consultations and Examinations,*
  - *Chemical Hygiene Officer Designation, and*
  - *Particularly Hazardous Substances.*

Key Points Under the Laboratory Standard:

- **SOPs:**
  - Prudent laboratory practices which must be followed when working with chemicals in a laboratory. These include general and laboratory-specific procedures for work with hazardous chemicals.
- **Particularly Hazardous Substances:**
  - Outlines additional worker protections for work with particularly hazardous substances which includes **select carcinogens**, **reproductive toxins**, and substances which have a high degree of **acute toxicity**.
- **Information and Training:**
  - The PI is required to provide information and training to ensure that workers are apprised of the hazards of chemicals in their work areas and related information.

Information and Training

- Laboratory workers must be provided with information and training relevant to the hazards of the chemicals present in their laboratory.
- The training must be provided at the time of initial assignment to a laboratory and prior to assignments involving new exposure situations.

Hazardous Materials & Operations

- Ensure that staff:
  - Wear appropriate PPE
  - Are trained & competent
  - Follow SOPs
- Fix hazards immediately
  - Contact EH&S if you need assistance.

What's wrong with this picture?

PPE 8 CCR 3380-3387

- Requires that UC (typically PIs) provide PPE ***and*** ensure that it is used wherever "hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants [are] encountered."
- Cal/OSHA regulations are specific to body parts:
  - §3381. Head Protection.
  - §3382. Eye and Face Protection.
  - §3383. Body Protection.
  - §3384. Hand Protection.
  - §3385. Foot Protection.

PPE

- PPE is used to protect employees when a known hazard or exposure exists.
- PIs are responsible for providing and ensuring the use of common PPE such as protective eyewear, lab coats, and gloves.
- A selection tool is available from EHS.
- PI or department is responsible for purchasing all PPE.

Documentation

- Cal/OSHA and/or UC Record retention policies require documentation of training and other records.
- Store minimum 5 years:
  - Date & Time,
  - Topics,
  - Presenter(s),
  - Minutes,
  - Action Items,
  - Attendees names & signatures.

PI Responsibilities

- Responsible for the safety of everyone who works in or visits their laboratory including:
  - Ensuring lab personnel obtain required documented safety training before beginning work.
  - All requirements outlined in the Lab Safety Manual, Chemical Hygiene Plan, and applicable research authorizations are being followed.
  - Ensuring laboratory personnel have access to and are familiar with the appropriate Laboratory Safety Manual(s).
  - Recognizing and evaluating hazardous conditions and operations which your employees may be exposed to and implement safe procedures and controls.

PI Responsibilities continued

- Establishing and communicating SOPs (general and protocol specific).
- Ensuring that laboratory personnel have been trained on appropriate PPE, that it is available and used properly.
- **Prompt reporting** of laboratory accidents and injuries to Risk Management and EH&S.
  - Serious injuries **MUST** be immediately reported to EH&S.
- Correcting all findings noted during EH&S lab inspections.
- Informing facilities maintenance personnel, other non-laboratory personnel and any outside contractors of potential lab-related hazards. Identified potential hazards should be minimized to provide a safe environment for repairs and renovations.

Erike Young
Ken Smith

UC OBLIGATIONS UNDER THE AGREEMENT

UC Regents Settlement

- Applies to all laboratory facilities within any Department of Chemistry and/or Biochemistry
- Enforcement terms and conditions shall be effective for a four year period.
- Cooperation and Compliance: The Regents agree to continue to cooperate fully and actively with the LADA and Cal/OSHA regarding any alleged violation of Title 8, workplace health and safety rules. The Regents shall:
  a) Comply with the terms of Appendix A in cooperation with Cal/OSHA;
  b) In response to any inquiry by Cal/OSHA, truthfully disclose and provide all information, documents, records and other evidence within the Regents' possession, custody, or control relating to any Title 8 violations; and
  c) Exercise due diligence to prevent and detect violations of the Labor Code involving employee laboratory safety.

Breach of the Agreement

- Regents knowingly engage in conduct that constitutes a material failure to substantially comply with any promises and obligations in this agreement will be considered a breach of the agreement.
  - Conduct by an employee shall not be considered a breach of the agreement, unless Vice Chancellor of Research learns of conduct and fails to initiate curative action within 30 days of learning of it.
- Any breach in which the LADA elects to pursue will be heard by a Special Master
  - Penalty of up to $500,000

Appendix A
I. Administrative Enforcement

- Only applies to laboratory facilities within any Department of Chemistry, and/or Biochemistry.
- Title 8 still applies to all laboratories including those within the Department of Chemistry and Biochemistry.
- Cal/OSHA may still assess any fines or penalties.
- Regents and UCLA shall commit no violations of Labor Code Sections 6425 and no knowing, non-negligent violations of Labor Code Section 6423.

- **Labor Code Section 6423**
  - Except where another penalty is specifically provided, every employer and every officer, management official, or supervisor having direction, management, control, or custody of any employment, place of employment, or of any other employee, who does any of the following is guilty of a misdemeanor…
- **Labor Code 6425**
  - Any employer and any employee having direction, management, control, or custody of any employment, place of employment, or of any other employee, who willfully violates any occupational safety or health standard, order, or special order, or Section 25910 of the Health and Safety Code, and that violation caused death to any employee, or caused permanent or prolonged impairment of the body of any employee, is guilty of a public offense punishable by imprisonment….

Appendix A Commitments

Obligation	Description
A1	Identification of Chemistry/Biochemistry PI's & Laboratory Facilities
A2	Written Chemical Hygiene Plan & Lab Safety Manual
A3 A4 A5	Training: • Existing PI's • New PI's – Prior to starting a lab • All Lab Personnel
A6	Standard Operating Procedures (SOP)
A7	SOP Availability
A8	Pyrophoric Safety
A9	Personal Protective Equipment (PPE)
A10	Laboratory Inspections
AIII	Increased report to CAL/OSHA injuries in Chemistry & Bio Chem

	Settlement	Current Cal/OSHA or UC Policy
Facilities	List of laboratory facilities limited to chemistry, biochemistry, and organic chemistry. * UCLA to provide interim list within 90 days and final list within 180 days of agreement. * All other campuses to provide interim list within 180 days and final list within 365 days	Settlement requirement needs to comply with regulations under title 8 of the California Code of Regulations, including, *e.g.*, inspections, PPE and training, machinery and equipment.
Written Lab Safety Manual and Chemical Hygiene Plan	Each campus must maintain a formal written: * Laboratory Safety Manual ("Manual"); and * Chemical Hygiene Plan. Manuals must be provided and maintained in each lab within 60 days of agreement. Electronic copies are acceptable.	Settlement requirement is consistent with title 8 of the California Code of Regulations sec. 5191 (CHP), 3203 (Manual).
PI/Researcher Training	All existing PIs required to complete training which covers University's Lab Safety Manual and University policy concerning the PI's responsibility for lab safety, including Title 8 regulations, including but not limited to sections 5164, 5191, 5194, 3203, 3380-3387.	Settlement requirement is consistent with title 8 of the CCR 3203. Section 3203 requires employees to be trained on hazards, including supervisors. Draft UC Policy on Lab Safety Training clarifies requirement that all lab research personnel to be trained on specific elements.

	Settlement	Current Cal/OSHA or UC Policy
	New or visiting PI prohibited from operating, or directing/supervising any employee in training requirements if the above completed. UC must maintain records of training completion for the last five years. Removed reference to number of training hours required.	
Lab Personnel Training	Same as PI Requirement. Removed reference to number of training hours required	Settlement requirement is consistent with title 8 of the CCR 3203. Section 3203 requires employees to be trained on hazards.
Refresher Training	No refresher training requirement	Draft Lab Safety Training Policy requires training every 3 years.
Standard Operating Procedures (SOP) Development and Approval Process	SOP only required for 10 categories of chemicals totaling 500 substances (Exhibit 1); down from 10,000+ chemicals originally requested. SOP must be reviewed by qualified personnel but reviewer not specified; original proposal required Department Safety Committee review and approval as well as EH&S review and approval of (1) reactive/hazardous chemicals or (2) particularly hazardous substances. SOP amendment subject to PI approval; original proposal required Department	Settlement requirement is consistent with Title 8 Section 5191 (Lab Standard). Section 5191 requires Chemical Hygiene Plan to include SOPs when working with hazardous chemicals.

	Settlement	Current Cal/OSHA or UC Policy
	Safety Committee review and approval. SOP maintenance is same. Electronic copies are acceptable so long as they are readily accessible to laboratory personnel.	
Use of Pyrophoric Chemicals	All locations to have written procedures, but at a minimum follow UCLA policy.	Settlement requirement is consistent with Title 8 section 5194. Section 5194 requires employers to provide employees information about the hazardous substances to which they may be exposed. Pyrophorics are hazardous substances.
PPE Requirements	Only applies to UCLA	Settlement requirement is consistent with title 8, section 3383, 3380. These sections require PPE to be provided to employees and worn. System wide Draft PPE Policy has been developed based upon UCLA policy.
Inspections	Only applies to UCLA.	Settlement requirement is consistent with title 8, section 3203. Section 3203 requires "periodic" inspections of work areas. Although settlement language is specific to UCLA, other campuses should evaluate current inspection program.
Enhanced Reporting Requirements	PIs only required to report reportable injuries pursuant to title 8, section 342. Securing incident scene requirement changed to establish a deadline for Cal/OSHA to respond (only 24 hours), otherwise response deemed not required.	Settlement requirement is consistent with existing reporting requirements in title 8, section 342. Difference is securing incident scene.

	Settlement	Current Cal/OSHA or UC Policy
Cal/OSHA Inspections	Cal/OSHA Enforcement or Bureau of Investigations will have full access to any University laboratory for the purposes of conducting inspections to determine compliance with the terms of this agreement. Inspections limited to three annually. Cal/OSHA will contact facility representative or EH&S representative to be present.	Settlement requirement is consistent with existing law. Cal/OSHA has authority to conduct unannounced inspections of employer workplaces. Agreement language specifies that these inspections would be to verify compliance with agreement.

UC Laboratory Safety Future

Phase 1

Settlement Obligations

Phase 2

"Culture of Safety"

- American Chemical Society
- Systemwide Laboratory Safety Policies
- Laboratory Safety Fundamentals Online Training
- Systemwide Task Force on Laboratory Safety

UC Center for Laboratory Safety

ucsop.com

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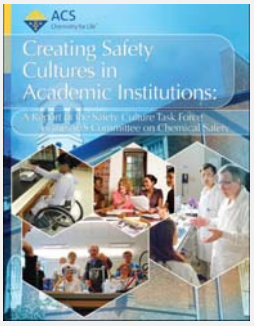
Long Term Goal: Creating a Culture of Safety



- Since October 2010, 65 lab incidents have occurred resulting in 136 injuries and 2 deaths (Chemical Safety Board Incident Database).
- ACS and other institutions have identified the need to improve laboratory safety practices in Academic Institutions.
- Beyond the settlement requirements is the need to Integrate safety into research operations and curriculum

Systemwide Policy on Laboratory Safety Training

- Proposed Systemwide Training Policy: **Laboratory Safety Training Policy**
- Submitted for OP review **June 2012**.
- Establishes:
  - **Training needs assessment**
  - **Laboratory Safety Training**
    - **Fundamentals of Laboratory Safety Training**
    - **Hazard-Specific Safety Training**
    - **Site-Specific Operating Procedure Safety Training**
  - **Training Documentation**
- Applies to ***all*** research areas and ***all*** faculty, staff, volunteer, or visitor/visiting scholars.

Systemwide Policy on PPE

- Proposed Systemwide Training Policy: **PPE Policy**
- Submitted for OP review **June 2012**
- Establishes:
  - **Perform Hazard Assessment**
  - **Identify Required PPE**
    - **Minimum PPE Requirements**
  - **Training**
  - **Maintenance and Replacement**
  - **Evaluating the Appropriateness of Identified PPE**
- Applies to ***all*** research areas and ***all*** faculty, staff, volunteer, or visitor/visiting scholars.

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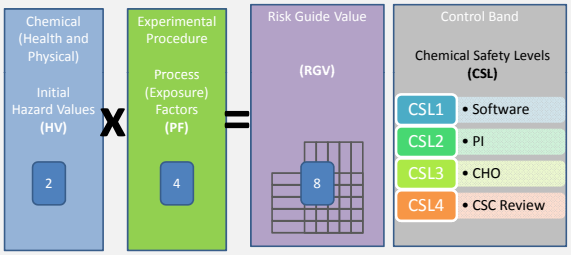
Risk
Assessment
Determinations
in
Chemical
Academic
Laboratories

SOP Control Banding Algorithm Level of Review Example

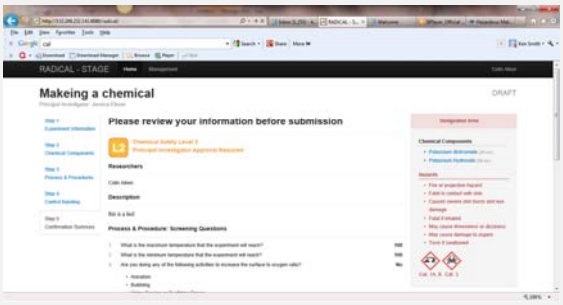


The Elevator Pitch

For researchers who work with chemicals "RADiCAL" is a Chemical Risk Management Tool that quickly determines banded safety operating parameters or if a detailed SOP is needed.

Unlike static safety data sheet (SDS) our tool is research environment-centric and communicates pertinent information to the researcher so they can safely conduct an experiment (SOP).

RADiCAL



Lab Safety Task Force Proposed Charge

- Evaluate current efforts to comply with the Regent's Settlement Agreement and provide systemwide recommendations to ensure programs and procedures support the University's continuous efforts to improve the culture of safety in both research and teaching laboratories.
- Review and provide recommendations regarding current laboratory safety training programs at both the campus and systemwide level to ensure that content is compliant with current regulations and instructional design is appropriate for faculty and lab personnel.
- Assist in the development and/or provide recommendations for development of systemwide policies, procedures, and technologies to improve laboratory safety operations and compliance with regulatory requirements.
- Provide recommendations for the development of an undergraduate curriculum on laboratory safety to help provide future researchers a solid foundation in laboratory safety and risk assessment techniques.
- Evaluate and provide recommendations regarding laboratory security policies, procedures and practices , and facility design.

Questions