Chemical Hygiene Plan
BSL-2 Laboratory Safety
Exposure control plan (ECP)

Annual Review
Criminal case in fatal UCLA lab fire advances

Case against UCLA professor Patrick Harran moves closer to trial after judge refuses to dismiss 4 felony charges in 2008 lab fire.

August 26, 2013 | By Kim Christensen

The criminal case against UCLA chemistry professor Patrick Harran moved closer to trial Monday when a judge refused to dismiss four felony charges stemming from a laboratory fire that killed a 25-year-old staff research assistant.

Harran’s trial could begin within 60 days of an Oct. 3 pretrial hearing — or roughly five years after Sherabehno "Sheri" Sangji suffered severe burns when a plastic syringe she was using to transfer 1-butyl lithium from one sealed container to another came apart, releasing a chemical compound that ign...
Topics covered

- General lab safety
- CHP information
- Lab Procedures & Personal Protective Equipment
- Hazard Chemicals & NFPA symbols/GHS
- Laboratory use of Hazardous Chemicals
- SOP for Hazardous Chemicals and General procedures
- Fume Hoods
- Chemical & Infectious disposal
- Emergency Procedures
- BRT EO EP
- Exposure control plan
General Lab Safety/Safety Equipments
Chemical Hygiene plan (CHP)

- Location: BRT 760X (shelf)
- What is a CHP?
- Content:
  - Chemical safety
  - General/Lab specific SOP
  - Training record
- Purpose:
  - Protects laboratory employee
  - Hazardous Chemicals
  - regulations
  - facility, protocols, equipment, PPE, and work practice.

- Designated Area:
  - carcinogen, reproductive toxin, chemicals with acute toxicity
  - Lab and procedure rooms, RAM room
- Lab Supervisor (PI) is the Chemical Hygiene Officer in the lab
  - Training
  - PPE (availability & inspect)
  - Facility/Equipment
  - Internal Inspection, audit
- Designee:
  - oversee implementation

Note: Chemical inventory is located electronically on EHS HP assist webpage: [http://ehs.osu.edu/](http://ehs.osu.edu/) → EHS/HP Assist
General lab procedures

- Behavior (selected)
  - Escort visitors
  - Avoid exposure
  - Personal Habits: cosmetic, hand cream, lip balm; remove gloves before leaving the lab
  - Clean after yourselves: spill of ice/water
  - Do not block exits & safety equipment
  - No food or drink (consumption & storage)

- Equipment:
  - Inspect Fume hood/BSC before starting experiment
  - Inspect building safety equipment

- Chemical procurement and transportation
  - Keep MSDS
  - Label integrity: Stock and working solution
  - Update inventory
  - Proper storage (compatibility, flammable/acid/base)

- Exposure and monitoring of hazardous chemicals (as applicable)

- Medical surveillance: Employee physical, Medical follow-up (after incidence)
Personal Protective Equipment (PPE)

- Check for damage: cracked glove, holes on lab coats
- Remove before leaving the lab area: elevator, admin area
- Dispose PPE when contaminated
- Lab coat use and laundry
- Eye protection: handling chemical, biological, radiological, or mechanical hazards
- Gloves: Chemical compatibility
- Foot protection: No open toe shoes/shorts
- Body protection: Lab coat when handling liquid or powder that can injure or absorb through skin
- Other PPE: Cryo/insulated gloves, respirators
<table>
<thead>
<tr>
<th>Behaviors/Practices/Housekeeping NOT allowed in research lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horseplay and practical jokes</td>
</tr>
<tr>
<td>Perform hazardous procedure alone</td>
</tr>
<tr>
<td>No label on chemicals/bottles</td>
</tr>
<tr>
<td>No contact info for unattended reactions</td>
</tr>
<tr>
<td>Food and drink in lab fridge/freezers</td>
</tr>
<tr>
<td>Mouth pipetting</td>
</tr>
<tr>
<td>Tasting chemicals</td>
</tr>
<tr>
<td>Touching dangerous chemical without PPE</td>
</tr>
<tr>
<td>Eating/drinking/cosmetic application</td>
</tr>
<tr>
<td>Use lab glassware/utensils for food/beverage</td>
</tr>
<tr>
<td>Open toed shoes</td>
</tr>
<tr>
<td>Leave spills without clean-up</td>
</tr>
<tr>
<td>Not removing gloves in general areas</td>
</tr>
<tr>
<td>Blocking safety equipment/emergency exit</td>
</tr>
<tr>
<td>Not using PPE for hazardous experiments</td>
</tr>
</tbody>
</table>
Laboratory use of hazardous chemicals

- Laboratory scale chemical manipulation (easily & safely handled by 1 person)
- Used multiple chemical/procedure
- NOT chemical production
- PPE to minimize exposure

Hazardous chemicals

- Reproductive toxin: ex. Actinomycin D, Barbiturates, Toluene, etc.
- Carcinogen: regulated by OSHA, National Toxicology Program (NTP), International Agency for Research on Cancer Monographs (IARC): ex. Auramine O, Benzene, Butylated Hydroxyanisole, Chloramphenicol, Chloroform, Cobalt and cobalt compounds, Dichloromethane, EtBr, Mitomycin C, Nickel compounds, Potassium Dichromate, Thio Urea, Trypan Blue, etc.
- Acute toxin (defined by LC50/LD50): ex. Sodium Azide
- Appendix A listed chemical: Chloroform, Ethyl ether, Formaldehyde, HCl, Hydrogen peroxide, Nitric Acid, Potassium Nitrate, Potassium Permanganate, Sodium Azide, Sodium nitrate, Triethanolamine, etc.
Chemicals

- **Procurement**
  - Check inventory first
  - Is it in appendix-A?
  - Understand safety info
  - Damage to label/container?
  - Aliquots should have at least chemical name and date

- **Storage/Inventory**
  - Legible label firmly attached
  - Annual inventory, NFPA 2+
  - CCCC (Chemical compatible closed container)
  - Segregate by NFPA class and also by corrosive, flammable, oxidizers, poisons, & water reactive (>2L)

- **Distribution**
  - No redistribution without approval
  - Transfer documentation (HP assist)

- **Transportation**
  - Secondary container
  - Absorbance material
  - Use cart
  - Compressed gas must transport with cap, secured to dolly

- **Disposal**
  - Corrosive, reactive, toxic, and flammable chemicals
  - Label chemical properly (yellow waste label)
  - Contact EHS for pickup/disposal
  - Controlled substance regulations
Hazard Chemical/NFPA

Definition: health, flammability or reactivity > 2
All hazard chemical should be in EHS inventory (HP assist)
Review MSDS for chemical(s) that you are not familiar with!
MSDS

- Product/Chemical name
- Manufacturer
- Composition (more than one chemical)
- Hazard that are identified with the product/Chemical
- First Aid
- Handling and storage
- Recommended PPE
- Stability, reactivity, Flammability
- Physical/Chemical Properties
- Toxicology

Bookmark MSDS on at least one of the lab computers!
MSDS

- Product identifier/manufacturer
- Hazards identification with GHS label
- Composition
- First Aid
- Firefighting/Accidental release
- Handling/storage
- PPE
- Physical/Chemical Properties
- Toxicology
- Disposal
- Transportation
- Regulatory information
<table>
<thead>
<tr>
<th>OLD</th>
<th>Description</th>
<th>GHS-Symbols</th>
<th>Description</th>
<th>Hazard statement examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Explosive</td>
<td>GHS01</td>
<td>Exploding bomb</td>
<td>Explodes due to fire, shock, friction or heat; danger due to fire, blast and projectiles.</td>
</tr>
<tr>
<td>F+</td>
<td>Extremely flammable</td>
<td>GHS02</td>
<td>Flame</td>
<td>Flammable; catches fire spontaneously if exposed to air; in contact with water releases flammable gases which may ignite spontaneously</td>
</tr>
<tr>
<td>F</td>
<td>Highly flammable</td>
<td>GHS03</td>
<td>Flame over circle</td>
<td>May cause fire or explosion; strong oxidizer.</td>
</tr>
<tr>
<td>O</td>
<td>Oxidizing</td>
<td>GHS04</td>
<td>Gas cylinder</td>
<td>Contains gas under pressure; may explode if heated; contains refrigerated gas, may cause cryogenic burns or injury.</td>
</tr>
<tr>
<td></td>
<td>No equivalent</td>
<td>GHS05</td>
<td>Corrosion</td>
<td>Corrosive; may be corrosive to metals, causes severe skin burns and eye damage.</td>
</tr>
<tr>
<td>C</td>
<td>Corrosive</td>
<td>GHS06</td>
<td>Skull and crossbones</td>
<td>Small quantities are harmful or fatal.</td>
</tr>
<tr>
<td>T+</td>
<td>Very toxic</td>
<td>GHS07</td>
<td>Exclamation mark</td>
<td>Harmful, irritates eyes, skin or respiratory system; large quantities are fatal.</td>
</tr>
<tr>
<td>T</td>
<td>Toxic</td>
<td>GHS08</td>
<td>Health hazard</td>
<td>Causes allergic reactions; may cause cancer; may cause genetic defects; may damage fertility or the unborn child; causes damage to organs.</td>
</tr>
<tr>
<td>Xa</td>
<td>Harmful</td>
<td>GHS09</td>
<td>Environment</td>
<td>Harmful; toxic or very toxic to aquatic life with long lasting effects.</td>
</tr>
<tr>
<td>Xi</td>
<td>Irritant</td>
<td></td>
<td></td>
<td>No direct equivalent</td>
</tr>
</tbody>
</table>
Environmental/Health monitoring

- **Chemical exposure/monitoring**
  - 29 CFR Part 1910 z, monitor if exceed action level
  - Benzene, 1ppm/8hr, 5ppm/15min
  - Formaldehyde, 0.75ppm/8hr, 2ppm/15min
  - Use of fume hood, engineering control
  - Spill: Contact EHS for monitoring air level

- **Medical monitoring**
  - Medical surveillance, consultation, follow-up when >action level, or symptoms likely caused by hazard chemicals, spills
  - Employee Health Services (3-8146)
  - When consolation is needed, provide:
    - hazard chemical & MSDS, exposure condition, sign and symptoms
  - written opinion will be sent to PI
Standard Operating Procedures (SOP)

- Laboratory Chemical Experiments
- Moderate to High Chronic toxic chemicals and High Acute toxic chemicals (Acid/base/flammable)
- Cryogenic liquids
- Electrophoresis
- UV
- Centrifugation
- Compressed air
- Lab specific chemicals
- IACUC protocols
Chemical & Other General SOP

- **Flammables**
  - Ignite below 37.8°C/100°F
  - EtOH, MeOH, Ether, Acetone, Glacial Acetic Acid
  - Store in Flammable cabinet
  - First Aid: wash skin/ flush eyes
  - Spill: use non-combustible absorbent

- **Corrosives**
  - Separate acid/base >2L
  - Oxidizing acids: perchloric, nitric, sulfuric acid should be kept away from organic or combustible

- **Sodium Azide**
  - React with heavy metal and heat to form explosive compounds

- **Carcinogens/Reproductive toxin**
  - EtBr
    - All waste need to be collected (gels, liquids), contact EHS for disposal
  - Acrylamide
    - Polymerized acrylamide is not regulated
    - Unpolymerized liquid is hazard chemical
  - Formaldehyde, Phenol, chloroform
Department of Homeland Security (DHS)
Chemical of Interest used in CMIB/MI&I

- Chloroform
- Ethyl ether
- Formaldehyde
- HCl
- Hydrogen peroxide
- Potassium Nitrate
- Potassium Permanganate
- Nitric Acid
- Sodium Azide
- Sodium nitrate
- Triethanol amine
Fume hood

Use it!! when
- reactions that produce unpleasant and/or hazardous fumes/vapors/gas
- Airflow from non-lab to lab area
- Certified annually

Compressed air tanks
- Move on dolly and with cap on
- If leak is suspected, evacuate personnel

Cryogenic liquid
- Cryo gloves, care when removing racks
- potential of displacing Oxygen/low area

Centrifugation
- Balance, Balance, Balance!!!!!
- Use the correct rotor and attachments
- Never use a rotor with visible damage
- Check limits of the rotor
- spill cleanup

During ventilation failure:
- close sash
- cease all hazardous operations
- contact PI/Ops manager
  ➔ facility dispatch
Biological & Chemical Waste disposal

- **Solid Biological waste**
  - In red biohazard bag & in burn boxes
  - Fill no more than 75% full
  - Gloves should go in here, not regular trash
  - Label room number, phone, PI

- **Liquid Biological waste**
  - Liquid carboy
  - Fill no more than 75% full
  - In red biohazard bag & in burn boxes

- **Sharps**
  - Biohazard goes in sharp containers
  - Close and lock when 75% full
  - Dispose in burn box
  - Chemical contaminated sharps go into blue bin in media room

- **Hazardous chemical**
  - Corrosive, reactive, toxic, and flammable chemicals
  - Label chemical properly (yellow waste label)
  - Contact EHS for pickup/disposal
Emergency/spill response & recording

- **Emergency contact numbers**
  by the phone in each lab
  - Fire 911
  - Security 2-2121
  - EHS 2-1284
  - Operations manager 2-8684

- **Provide** the followings
  - Location
  - Nature of emergency
  - Chemical involved
  - Name
  - Phone number calling from (on the phone)

- **Chemical spill**
  - Small spill <1gal
    - cleaned by personnel
    - wear PPE
    - post spill sign
    - absorb chemical with absorbent
    - neutralize chemical if needed
    - Collect in labeled bag
    - contact EHS for pickup
  - Large spill >1gal
    - evacuate all personnel
    - turn off power if possible
    - if inside Fume hood, shut sash
    - post spill sign
    - contact EHS
BBP Exposure control plan

- Goal: minimize risk of occupational BBP exposure
- Annual review (Appendix A) to make lab specific
- In addition to the initial and annual BBP training……
- Covers exposure to human/non-human primate blood/body fluid & other potentially infectious materials
- Standard/Universal precautions - treat all human blood and body fluid as if infected with HIV, HBV, and other bloodborne pathogens
- Engineering controls, already covered in BSL-2 training - BSC - pipetting - sharp container, sharp protection - plastic guard/absorbent pads
- Work practice, already covered in BSL-2 training - hand washing - handling needles - minimize splashing - transportation - decontamination
- PPE, already covered in BSL-2 training - availability - laundering - disposal
BBP Exposure control plan

- **Housekeeping**: already covered in BSL-2 training
  - Infectious waste (labeling, disposal)
  - Contaminated sharps disposal (Use mechanical means)
  - Clean contaminated area

- **Spill cleanup**
  - Put on PPE → all waste in biohazard bags → Bleach for 30 min → report to PI and/or Ops manager

- **Medical Surveillance**
  - Hepatitis B Vaccine required

- **Post Exposure evaluation and follow-up**
  - During office hour: Employee Health 3-8146
  - Off-hour: Emergency Dept 3-8333
  - Employee Accident Report form
  - Sharp Injury Form Needlestick Report

- **HIV/HBV labs**
  - Access restriction
  - Waste decontamination
  - Vacuum line
  - Spill decontamination
Additional trainings

- [http://ehs.osu.edu/Training/rbst.aspx](http://ehs.osu.edu/Training/rbst.aspx)
- BSC & Fume hoods
- Use of autoclave
- Respirators