Preliminary Results of the Chemical Safety Information and Education Survey

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Outline

- Recent CHAS Survey History
- Strategic Planning
- 1st survey
- IPG
- Work with Cornell Survey Research Institute- Focus Groups & Survey
- Next Steps
Recent CHAS Survey Work

- 23 surveys since January 2007 = ~ 2 per year
  - Prior to 2012 most of these were about divisional services and participation
- Institutional safety culture - 2 in 2010 to different audiences
- Most recent focused on understanding of chemical safety and methods of information searching
CHAS Strategic Planning

• 2015 workshop to develop goals to guide work within the division

• Goal to expand the educational programming offered by the Division and reach a wide variety of audiences
  – Workshops
  – On-line, self-paced tutorials
  – Webinars
  – Other platforms?
Initial Survey

• Collaboration between ACS CINF, CHAS, CHED divisions, along with the Committee on Chemical Safety;

• Common goal of learning about what the knowledge of chemical hazards is and what search practices are by those who we support;

• We discovered that we had more questions in the end and needed to dig deeper!
ACS Innovative Project Grant Awarded to CHAS and CINF

- Cornell Survey Research Institute (SRI)
- Focus groups
- 15 minute survey sent to Committee on Professional Training list of about 800, ACS certified chemistry bachelor’s degree program chairs
  - Information Practices (IP)
  - Risk Assessment (RA)
  - Lessons Learned (LL)
  - Demographics (DM)
Focus Groups

• Focused on K-12 teachers and undergraduate students and teachers

• Outcome: ACS has opportunities to collaborate with associations that support these groups

• Current Efforts: Working with American Association of Chemistry Teachers to develop chemical safety training for K-12 teachers
Guiding Direction in Chemical Safety Knowledge

Purpose: Conduct survey to establish a baseline

Goals: Identify gaps in chemical and lab safety knowledge, and information practices

- Reusable tool
- Can be used across demographics
Survey Demographics

- 283 Responses
- Field of study was chemistry representing 6 ACS divisions
- 50% < 10 years lab experience > 50%
- 66% reported being involved in a lab accident
- 83% report witnessing a lab accident
Information Practices (IP4)

“Where do you primarily search for lab safety and hazard information?”

- Safety Data Sheet = a trusted source

**MSDS = SDS**
Most Useful Sections of Safety Data Sheets (IP7)

Tier 1
(>80%)

• Section 2 - Hazards
• Section 7 - Handling and Storage

Tier 2
(40-50%)

• Section 8 - Exposure Controls/Personal Protection
• Section 10 - Stability and Reactivity
• Section 13 - Disposal Considerations
Increasingly Unfamiliar
Familiarity with GHS
Hazard Symbols
Hazard Classes
Hazard Statements
Signal Words
“Describe how you decide if the safety information you find is valid?”

- Experience- Common sense or “I don’t”
- Trust- Reputable source or due to education and training
- Check a 2\textsuperscript{nd} source
  - Check with Colleagues- oral tradition
  - Search for what others are doing
  - PubChem protocol
Secondary Sources

- Secondary SDS, 8
- Other, 79

Other Secondary SDS
Risk Assessment Tools

This does not include completing a Job Hazard Analysis.

- SDS
- Published procedures on similar work
- Safety information from chemical supplier
- Internet searches on specific chemical safety information
- Consultation with colleagues
- Verbal review of laboratory practices
- Other
Specific Comments

• Date of publication= GHS?
• “i am old enough to find most of the "safety" info to be over generalized, and often misleading or inaccurate in some fashion”
• “my research advisor warns me of any hazards. I take any precaution serious”
• Green Chemistry is less hazardous
• “it's an msds, it should be accurate, if a bit over the top on some topics”
Information Management Tool Suggestions

- “Interactive web interface”
  - searchable database, notebook, or app that has hyperlinks, is shareable, and has specific features
- Tutorials/ modules/ videos/ lists/ posters
- Easy, clear, and from a trusted, reputable source
- Lab specific methods
  - binders, safety minutes in meetings, in-house training
Information Management Tool

- Tutorials/ Modules: 84
- Ease + Clarity: 32
- Database: 37
- Other: 4
- Lab Specific Method: 12
“Safety is about having your brain on, first and foremost, and then having training and knowledge about safety.”

“...chemical safety component to reaxys/scifinder.”

“An extention onto the lab supply bank (chematix) that allows the user to include any hazard or personal experience.”

“... part of SciFinder.”
“I find Safety Data Sheets very cryptic and without much useful information. They always refer to "local laws" for disposal, which is not helpful at all, because local laws are impossible to find. Their advice for exposure to chemicals seems too extreme for some very common chemicals which makes one doubt the advice given for chemicals that are less common. We really need accurate information about how to dispose of all chemicals and information about exposure to reasonable amounts of a chemical (the amount and concentration one might encounter in a teaching lab) in a format that is easy to find and easy to understand!”
Risk Assessment

- Chemicals of highest concern
  - Explosives
  - Unknown reactivity
- Medium concern
  - Corrosives
  - Known reactivity or toxicity
  - Environmentally hazardous

- 53% report little concern for chemicals with unknown toxicity
HAZARD IDENTIFICATION SYSTEMS
IDENTIFICATION OF NON-CHEMICAL HAZARDS
IDENTIFICATION OF PROCESS HAZARDS
ASSESSMENT OF THE RELATIVE IMPORTANCE OF IDENTIFIED HAZARD
INSTITUTIONAL SAFETY POLICIES AND PROCEDURES
SAFETY CULTURE AND ETHICS DISCUSSIONS

Undergrad  Grad  Outside formal  Don't know much
Use of fume hoods and engineered safety equipment
Selection of personal protective equipment
Emergency response protocols
Laboratory waste disposal practice
Best practices relative to training and lab inspections

Lab Safety Planning

Undergrad  Grad  Outside Formal  Don't Know Much
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<th>Category</th>
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<th>Somewhat inadequate</th>
<th>Somewhat adequate</th>
<th>Don't know</th>
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Legend:
- Blue: Completely adequate
- Red: Somewhat insufficient
- Green: Somewhat adequate
- Purple: Completely inadequate
- Cyan: Don't know
Lessons Learned (LL)

- Sometimes they look for root-causes of accidents that include:
  - Operating irregularities that led to the event
  - Unexpected reactions

- 50% reported that their organization gathers and utilizes LL from lab safety incidents
  - But fewer found LL information helpful when developing an SOP

- 43% reported that LL should include root-causes and have the chemists involved in gathering this information
"Do you have any additional information you would like to share with us?" (DM8)

- Lab Management Issues: 9
- Accident Details: 6
- Cause of Accident: 3
- Institutional Safety Culture: 2
- Other: 9
Next Steps

• Work with SRI to fully report on focus group and survey results

• Identify common responses of high importance

• Recruit other audiences to compare practices between different groups and over time
Acknowledgements

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Questions?
Best Practices in Selecting & Presenting Safety Training Content

- In the spring of 2016 the ACS divisions of CINF and CHAS received an Innovative Project Grant. The purpose of this is to develop reusable focus group and survey instruments to ascertain the understanding of chemical hazards of students, staff and faculty at the various levels of education and the current chemical safety information tools that are being used by these academic laboratory populations. The intent is to develop training and education platforms in order to provide them with the understanding of and the tools they need to effectively use and communicate to students this chemical safety information so that they can conduct their work. This talk will discuss the 2 instruments we developed and the preliminary findings of the tools and training opportunities that the ACS should create for its members.