



Seeking the promised land of chemical safety

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Introduction

- What was the state of chemical safety circa 1980?
- Significant events influencing safety.
- Changes in attitudes and cultures.
- The ACS and chemical safety.
- Are we there, yet?

In the beginning (OK, my beginning)

- Graduate school: a TA's lab accident; safety training for TAs; influence of advisor; high pressure lab; a tasteless solid; odd safety rules have stories.
- Lab rites of entry: lab fires (organic); loss of fingers (inorganic); x-rays.

Let there be . . . A Lab Standard

- Specific regulations for chemistry labs; covers industrial, academic, and government labs.
- Every organization must have a Chemical Hygiene Plan.
- Every organization must have a Chemical Hygiene Officer.
- All employees who enter the labs must receive training on the Chemical Hygiene Plan.
- Other important governmental directives: Bloodborne Pathogens; Methylene Chloride Standard; Johnson Controls decision.
- Safety Professionals looked at every regulation that the government had made, and they found it (mostly) good.

Significant Events

- 1/1990 – Publication of the OSHA Lab Standard.
- 8/1996 - spill of dimethyl mercury onto gloved hand of researcher.
- 1/1998 - US Chemical Safety and Hazard Investigation Board becomes operational.
- 9/11/2001- attack on World Trade Center.
- 12/28/2008 - fire in academic chemistry laboratory.

Changing Attitudes

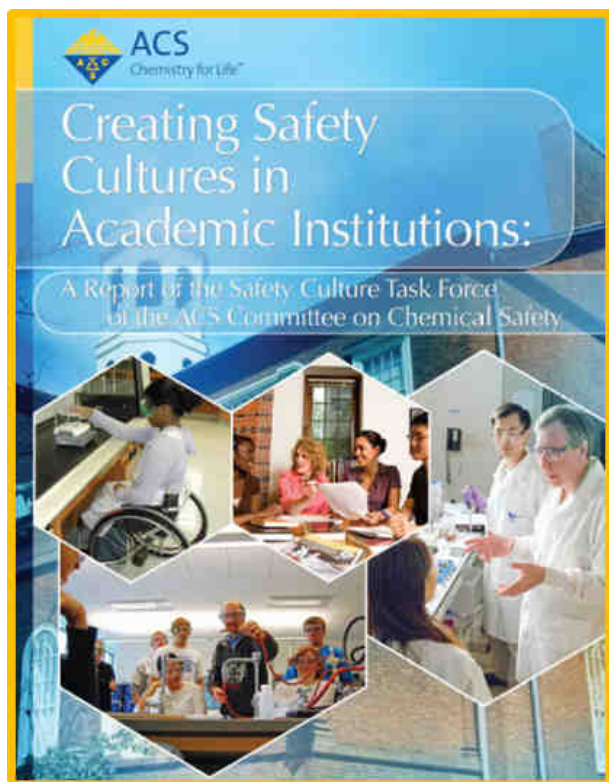
- Graduate students and young professionals
- Women and reproductive hazards
- Faculty
- College and University administrators
- American Chemical Society

Reproductive Toxins

- Mutagens and Teratogens
- Johnson Controls decision (US Supreme Court – 1991)
- Pregnancy Guidelines - *Chem. Health Safe.* 2001, 8 (3), 12-14
- List of reproductive toxicants – *Chem. Health Safe.* 2010, 17 (1), 29-53.

Changing Cultures

- *Creating Safety Cultures in Academic Institutions*
- *Laboratory Safety for Chemistry Students*
- Continuous learning of basic laboratory and chemical safety
- Institutional funding of safety programs
- Identifying and evaluating hazards
- Learning from incidents
- Safety Committees and Emergency Response Teams
- Joint Safety Teams (graduate students)



CREATING SAFETY CULTURES IN ACADEMIC INSTITUTIONS

ACS Committee on Chemical Safety; Safety
Culture Task Force – 57 pages - 2012

ACS Safety Initiatives

- Safety as a core value of the Society.
- *Safety in the Chemistry Enterprise* public policy statement.
- *ACS Chemical Health and Safety* (1/1/2020)
- Safety Programs Manager
- Increased safety emphasis in documents and procedures.
- www.acs.org/safety

ACS Safety Initiatives (cont.)

- Chemical Professional's Code of Conduct – “The Chemist's Creed” (1965); “The Chemist's Code of Conduct” (1994); “The Chemical Professional's Code of Conduct” (2007), (2012), (2016), and (2019 – 8 safety terms).
- CPT Guidelines
- Academic Professional Guidelines (5th Ed., 2013)

ACS Safety Initiatives (cont.)

- CCS Publications
- ACS Comments on safety (Executive Director, District Director)
- ACS Safety Summits – 2018, 2019 – Direct support of ACS Presidents.
- C&EN coverage of safety issues

Safety Guidelines for the Chemistry Professional

- Accept ethical and legal responsibility to work safely.
- Develop competency in evaluating and assessing hazards and mitigating risks.
- Understand, observe and contribute to organizational safety policies and procedures.
- Develop safety skills.
- Support employer/organization communication in health & safety issues.

Chemical Safety Publications

- *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards*, National Research Council, National Academy Press, Washington, DC, 2011. (www.nap.edu)
- *Creating Safety Cultures in Academic Institutions*, ACS Committee on Chemical Safety (CCS), 2012.
- *Chemical Safety Manual for Small Businesses*, 3rd Ed., ACS CCS and SCHB, 2009.

Safety in Academic Chemistry Laboratories (SACL), 8th Ed.

- CCS flagship publication, 71 pages, 2017
- Well-written in an attractive format.
- Sidebars for interest – easy to read.
- “In Your Future” sections for common lab hazards and concerns that are less likely to be encountered in lab courses but about which all students should be aware.
- SACL 7, Vol. 2 – Faculty & Administrators to continue for now.

Guidelines for Chemical Laboratory Safety in Secondary Schools

- CCS Taskforce for Safety Education Guidelines (TFSEG). 78 smaller (6" x 6") pages; 2016.
- Lists definitions, basic concepts, emergencies, hazards vs. risks. Suggested Learning Outcomes (6 pages). RAMP concept.
- Includes GHS, NFPA, SDS, incompatible chemicals, common lab hazards, basic lab glassware and equipment (with photos).

Guidelines for Chemical Laboratory Safety in Academic Institutions

- CCS TFSEG – 44 pages – 2016
- Undergraduate Learning Objectives: RAMP, terms and 104 other objectives.
- Could be used by teachers to develop gradually their expertise in lab safety. Pick relevant topics.
- Grad Student & Postdoc Safety Education, Continuing Safety Education, TAs, Building Safety Culture.

Laboratory Safety for Chemistry Students

- Robert J. Hill, Jr. and David C. Finster, John Wiley, 2010. Second Edition in 2016.
- Units cover all four years of chemistry lab topics.
- Can select individual units for incorporation into your program.
- Very thorough introductory coverage of lab safety topics.

Future Needs – We're not there yet!

- Chemical safety textbook.
- Establish tenure-track faculty positions for the study of chemical health and safety. *Chem. Health Safe.* 2015, **22**, (2), 45.
- Continue demanding authors describe any safety hazards encountered in a paper's description of the research.
- Make chemical safety education a significant part of every chemistry degree program.
- Chemistry minor or M.S. in Chemical Safety?

Conclusions and Recommendations

- CHAS has had an extremely positive effect on the field of chemical safety since its founding in 1979.
- Although serious accidents in chemistry labs are rare, some notable incidents have had a transformative effect on chemists' attitudes toward safety.
- Safety education has no final exam!
- “You may indeed view the land at a distance, but you shall not enter that land . . .” Dt. 32:52

