TEXAS TECH UNIVERSITY™
Department of Chemistry and Biochemistry

# Chemical Safety at Texas Tech

## Responses and Lessons Learned Since January, 2010

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# Disclaimer

The opinions expressed in this presentation are those of the presenters and not necessarily those of Texas Tech University nor any agency affiliated with Texas Tech University. While every attempt has been made to verify the accuracy of the statements made in this presentation, the presenters are solely responsible for its content.

# Texas Tech University:

- **Founded**: 1923
- **Carnegie Foundation Classification:** doctoral research-extensive university
- **Degrees**: 150 undergraduate, 100 master's and 50 doctoral
- **11 Colleges + Law School and Graduate School**
- **Population**: 31,637 students (fall 2010)
- **Accredited:** by the Commission on Colleges of the Southern Association of Colleges (SACS)

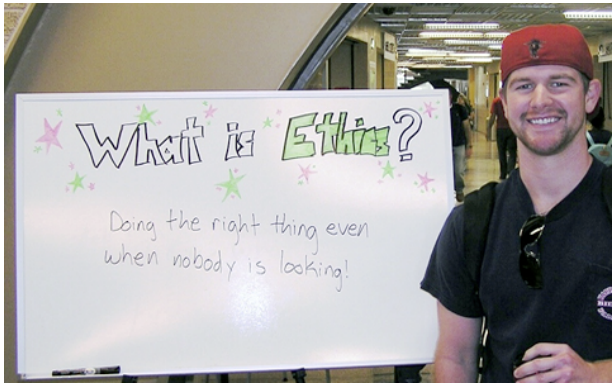

# Texas Tech Chemistry:

- **Buildings**: Two (1928 (Renovated 1988); 1968-1971)
- **Faculty:** 24
- **Graduate Students:** 105
- **Postdoctoral Research Associates:** 34
- **Technical Staff:** 9
- **Clerical Staff:** 10
- **Chemistry Undergraduate Majors:** 146
- **Biochemistry Undergraduate Majors:** 184

- **Total Funding (2009):** $4,225,265
  - **Federal Grants:** $ 1,939,044
  - **Non-Federal Grants:** $ 1,532,962
  - **Co-PI:** $ 753,259
- **Federal R&D Expenditures (2009):**
  - Ranked 94th

# Texas Tech University:

**1) Quality Enhancement Plan (2005, SACS)**: Ethics
- "Do the Right Thing" Campaign: www.depts.ttu.edu/provost/qep
- University-Wide Committee




**2) Ethics in the Curriculum:**
- PHIL 5125: Introduction to Research Ethics (Fall, 2010)
- University-Wide Committee

**3) RCR**:
- Hired Dr. Alice Young as AVPR for RCR (June, 2009)
- www.depts.ttu.edu/VPR/integrity/nsf-ethics-plan.php

**4) Murdough Center for Engineering Professionalism/ National Institute for Engineering Ethics**
- www.depts.ttu.edu/coe/centers/murdough.php

# Texas Tech Chemistry:

- **Chemical Hygiene Plan**:
  - Developed in 1998 by Safety Committee
    - Based on BYU Plan
    - One Copy Issued per Lab
  - Later Updates by EH&S: Website

- **Chemical Inventories**
  - Developed and Updated in all labs 1998 – 2003
    - Each lab responsible for inventory

- **MSD Sheets**
  - Paper Copies in Labs/Stockrooms to 2003
  - Computerized MSD from Suppliers + 2003

- **Safety Training:**
  - All Academic Lab Classes:
    - Mandatory
  - Research Labs:
    - Mandatory Once a Year (< 2003)
    - Last Mandatory: 2006
    - Faculty Responsible for Training after 2006

# Texas Tech Chemistry:

- **Chemical Waste Disposal**:
  - Every Tuesday/Thursday (EH&S)

- **Chemical Safety Inspections**
  - Consistent Inspections Until ~ 2003
  - Push Back from Faculty, Staff, Graduate Students Resulted in Sporadic Inspections unless specific requests made > 2003

- January 7, 2010: Explosion in Energetic Materials Lab Injures Student

- Accident Picked Up in National Media:
  - C&EN, Jan. 25, page 7
  - C&EN, Feb. 1, pages 25-26
  - C&EN, July 23 (Online)
  - C&EN, Aug. 23, pages 34-37

- Feb. 11: Lab Reopened

- Feb 26: DHS Visit (Northeastern)

- March 19-23: Visit by Chemical Safety Board

- April 9: Internal Investigation Results Released

- May 25: DHS (ALERT) Visit

# Texas Tech University:

- Working Group Established to Review Lab Safety Policies and Training
- University-Wide Research Safety Committee Established
- Peer Review Panel Commissioned to Review Safety Culture (April 4, 5, 2011)
- Research Programs Requiring Significant Monitoring Identified
- Search for Ph.D. – Level Departmental Safety Officer
- Safety Information to be Required in Tenure and Promotion Packages
- Safety Information to be Required in Theses and Dissertations
- New Emergency Action Plan (EAP) Instituted Campus-Wide

# Texas Tech Chemistry: Completed

• Department Safety Committee Reorganized and Charged to Change Department Safety Culture:

-Weekly Meetings Originally

-Now Biweekly Meetings

• Committee Contains Representation from Faculty, Postdocs, Graduate Students, Staff, and EH&S

• New Model Results from Reflection on Visit from Rick Danheiser on March 30, 2011

• Each Research Group has a "Safety Captain":

- Primary Lab Contact
- Work with Safety Committee and EH&S for Better Communication

# Texas Tech Chemistry: Completed

• Regulatory Authority of Safety Committee Increased: Loss of Pay and/or Rekeying of Labs for Serious Lack of Compliance

• Solvent Reduction Below NFPA Limits in Each Lab Now Required

• Safety Surveys by EH&S, Dean, VPR in March, 2010
  - Labs can be Rekeyed or Shut Down if Seriously Non-Compliant

• Incident Report Forms Developed For Both Research and Teaching Labs

• "Peer Safety Surveys", Involving Faculty, Graduate Student/Postdoc, and Safety Officers Instituted in Summer of 2011.
  - One per semester.
  - Complement EH&S safety surveys.

# Texas Tech Chemistry: Completed

• All Continuing Lab Researchers are Required to Undergo Mandatory Chemical (and other) Safety Training (September): Verification in Personnel File

- 100% Compliance, Spring 2011

• All New Lab Researchers are Required to Undergo Safety Training Before They Can Chose a Research Mentor: Verification in Personnel File

- 100% Compliance, Summer, 2011

• T.A.s Undergo Additional Safety Training. Walk Through By Faculty and Prep Chemist in Each Academic Lab. Loss of Pay and/or Assistantship if Graduate Student Lax. Three strikes rule. Time 1 = Written warning in personnel file. Time 2 = Loss of three days wages. Time 3 = Loss of Assistantship

# Texas Tech Chemistry: Completed

• All Relevant PPE Required in Research Labs by Researchers

• No One Can Enter Labs Without PPE (Two workers in lab at a time now normative)

• Safety Committee, in Conjunction with EH&S, Revamp CHP

•Each Lab Has Safety Guidelines Prominently Displayed

• Common University Chemical Inventory System In Use: (EH&S Assistant): Research Groups Now Transitioning Inventory

# Texas Tech Chemistry: Completed

- Instrument Safety Training Required on All Instruments

- All Laboratories Have a Hazard Plan in Place

- Synthesis Labs Have Protocols and Procedure in Place, Code of Conduct, General Laboratory Rules or SOP's. Reviewed and Signed by Students in most labs.

- Strengthened EH&S Lab Walk Through (Unannounced)

- University –Wide Safety Summit Every Fall for Continuing Safety Education Beyond Initial Safety Training Planned by EH&S:

- Jack Breazeale,
LSI, Sept. 9. 2011

# Texas Tech Chemistry: Ongoing

• Train at Least One Division Member in CPR and First Response Methodology to Aid Safety Officer

• List Rooms Under Alarm System with Types of Hazards for First Responders

• Common Departmental Scheme for Labeling All New Chemicals

• Annual Assessment of All Safety Plans

• Work to Improve Culture of Safety for All Academic Laboratories

• Develop "Carrots" for Superior Laboratory Safety Activities

• Develop Safety Course in Department and in Intro to Research

Currently: Safety/RCR
Graduate Cumulative Exam
Each November

# Texas Tech Chemistry: Energetic Materials

- Experimental Protocols for All Procedures in Place, Written by Students and Checked by Faculty and EH&S and Reviewed with Students.

- Instrumentation Protocols for All Procedures in Place, Written by Students and Checked by Faculty and EH&S and Reviewed with Students.

- All Appropriate Shielding in Place in Lab

- All Required PPE in Place in Lab and Required by All Students

# Texas Tech Chemistry: Energetic Materials

• Group Code of Conduct and Operating Procedures in Place, and Provided to and Signed by Students

• Failure to Comply with Policies and Protocols Results in Immediate Dismissal from the Laboratory

# *Lessons Learned, Attempted, and Underway*

1) Accidents at Public Universities are Public Events
   - Good Safety Doesn't Make Headlines: Lack of Safety Does!

2) Chemistry Labs are Dynamic:
   The Safety Culture Must Be Vigilant and Can No Longer Be Complacent

3) Faculty: EH&S Relationships Must Be Changed
   - Communication is the Key!
   - Not Everyone Has the Same Idea of What Constitutes Safety in a Pluralistic Society: Dialogue Needed!

# *Lessons Learned, Attempted, and Underway*

4) ) A Stick is More Effective than a Carrot to Start

- Consequences for Lack of Safety Need to Be In Place

*- We Need More Carrots!*

5) Faculty Under Increasing Pressure to Get Results

- What Mechanisms Will Allow For Change with this Reality?

- Address Safety Concerns for Grant Funding???

6) Computerization of MSD and CHP Can Lead to Complacency

# *Lessons Learned, Attempted, and Underway*

7) A Survey of the Current State of Academic Safety Practices Needs to be Shared with the Community

8) We Need More Safety Videos, etc.

9) We Need Specific Protocols for Specific Lab Procedures In a Common Database

10) We Need Templates for Common Safety Paperwork

11) We Need Active Participation by Industry and the Government

# *Lessons Learned, Attempted, and Underway*

12) The University, College, Department, Faculty, Staff, Students Must All Work Together for the Culture to Change: Safety Really is EVERYONE'S Responsibility

13) It Saves Time and Resources to be Safe! Safety Costs Money, but Saves Money (and Lives)

14) The Culture Must Change Through the Younger Generation of Scientists

15) The "Nothing Ever Happened to Me" Mentality of Safety Must Be Challenged and Changed.

# Changes from the EH&S Perspective

**Additional EH&S Staffing**

- Two additional laboratory safety specialist positions.
  - With approximately 650 laboratories, the previous manning level of one did not allow for an annual visit to each laboratory, much less the amount of contact time with laboratory personnel desired to assist them with understanding and complying with regulations and policies.

# Changes from the EH&S Perspective

**Greater Faculty & Staff Cooperation**

- The emphases placed on the various components of the laboratory safety program by senior administration have resulted in a higher level of cooperation than previously experienced. This, of course, makes everything easier.

# Changes from the EH&S Perspective

**Reduction of Inventories in Laboratories**

- General inventory reductions along with sharp reductions in flammables.
- More appropriate storage of remaining flammables.

**Required Training**

- All laboratory staff are required to complete general laboratory safety training.
- Training regarding the specific hazards of operations within a laboratory is provided by the principal investigator or laboratory coordinator.

# Changes from the EH&S Perspective

**Standard Operating Procedures**

- There has been an increase in the number of SOP's in laboratories. This increase is continuing.

# Culture Change from the EH&S Perspective

## What Culture Change Means to Us

- The culture change that we believe must occur is one where safety is not something separate from daily operations in the laboratory.
- If safety is not incorporated into every procedure and process taking place, the wrong culture exists.
- EH&S must not be viewed as regulators or enforcers, they must be seen as a resource.
- Our goal during laboratory compliance surveys is to identify situations where compliance is not being achieved and offer assistance in achieving it

# Culture Change from the EH&S Perspective

## What Culture Change Means to Us

- We are **not** interested in playing 'gotcha'.
- Our continuing existence does not depend on writing discrepancies during every laboratory survey.
- Our greatest desire is to survey laboratories and find everything in compliance.

# Culture Change from the EH&S Perspective

**Where We Currently Stand and How Will We Know When We Get There**

The most apt description for our current status is that we are in a state of transition. A culture cannot be changed quickly. The existing culture developed over a period of decades. While the cultural change is expected to happen in a much shorter time frame, it still requires a great deal of time to truly change the way people think. When we arrive at the point where those in charge of a laboratory automatically analyze new operations for hazards, look for ways to reduce the potential hazards, and then train laboratory staff concerning the remaining hazards, we will have arrived at a true culture change.

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