

U.S. Chemical Safety and Hazard Investigation Board



Prevention of Academic Laboratory Explosions

Lessons from TTU Laboratory

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U.S. Chemical Safety & Hazard Investigation Board

246th ACS National Meeting

Indianapolis , IN

September 8, 2013



Agenda

- **CSB: Who we are**
- **Incident Synopsis**
- **Key Findings**
- **Recommendations**
 - **American Chemical Society (ACS)**
 - **Texas Tech University (TTU)**
 - **Occupational Safety & Health Administration (OSHA)**
- **Announcement of ACS Publication of Laboratory Guidelines**



U.S. Chemical Safety and Hazard Investigation Board (CSB)

- Independent Non-Regulatory federal agency

Mission---Prevent Chemical Accidents

- Investigates major chemical accidents
- Finds *root causes* of accidents
- Issues recommendations to stakeholders
 - Regulatory Agencies (OSHA, EPA)
 - Non-Governmental Organizations (NFPA, API, ASME)
 - Companies & Industrial Sectors
 - Legislative Bodies (States, Local)
- Report Disseminates Findings Publically –Press, Reports Videos

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Texas Tech University Laboratory Explosion

January 7, 2010



Incident Synopsis: Laboratory Explosion

- January 7, 2010
- Lubbock, TX
- Texas Tech University
Chemistry Department
- 5th-year graduate student
- Detonation during energetic
material synthesis activities:
Nickel Hydrazine Perchlorate
(NHP)
- Loss of three fingers, one
eye perforated, burns to
hands and face





Academic Laboratory Safety





Incident Description





Incident Description (cont)





CSB Incident Database

Recorded laboratory incidents since TTU:

65

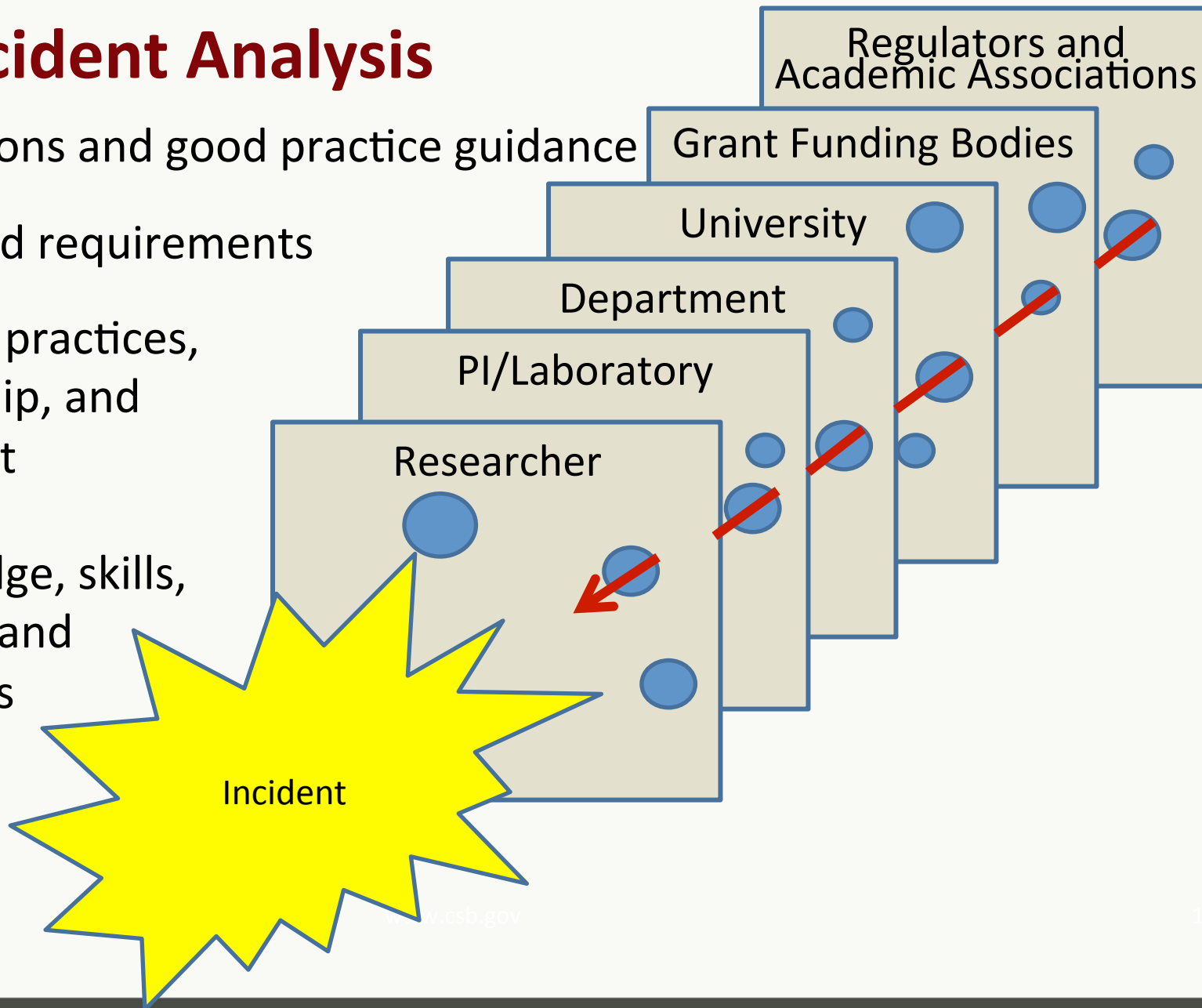
2 deaths

136 injuries



Incident Analysis

- Regulations and good practice guidance
- Rules and requirements
- Policies, practices, leadership, and oversight
- Knowledge, skills, actions, and decisions



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Texas Tech Laboratory Explosion

Recommendations



Recommendation to American Chemical Society

2010-5-I-TX-R2

Develop good practice guidance that identifies and describes methodologies to assess and control hazards that can be used successfully in a research laboratory.



Publication by the Committee on Chemical Safety of the ACS –Guidelines: Identifying and Evaluating Hazards in Research Laboratories

Document under Evaluation by the CSB

- **Comprehensive and Flexible approach**
- **Provides well developed techniques**
 - **Control Banding**
 - **Job Hazard Analysis**
 - **What-if Analysis**
- **Allows for the variable nature of research tasks**



Recommendation to Texas Tech University

2010-5-I-TX-R4

Develop and implement an incident and near-miss reporting system

- **an educational resource for researchers**
- **a basis for continuous safety system improvement**
- **a metric for the university to assess its safety progress.**



Recommendation to OSHA

2010-5-I-TX-R1

Effectively implement programs and procedures to control physical hazards of chemicals (as defined in 1910.1450(b)).

At a minimum:

- a. Develop a Safety and Health Information Bulletin (SHIB) pertaining to the need to control physical hazards of chemicals; and**
- b. Disseminate the SHIB (and any related products) on the OSHA Safety and Health Topics website pertaining to Laboratories (<http://www.osha.gov/SLTC/laboratories/index.html>)**

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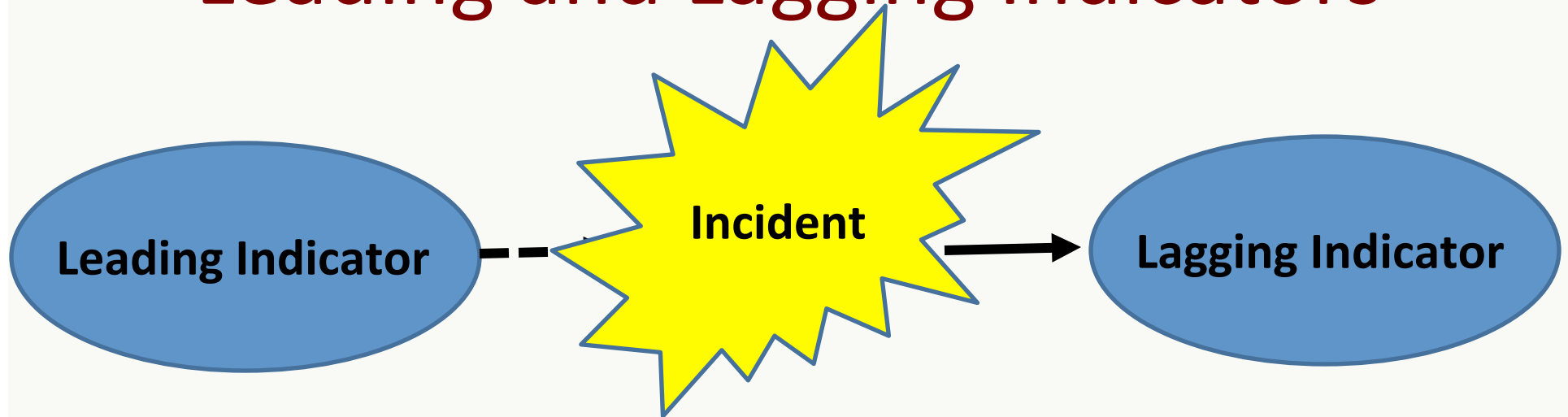


Safety Indicators





Leading and Lagging Indicators



Lagging:

Retrospective measurement of factors related to operations occurring after an incident

Leading:

Prospective measurement of factors related to operations occurring before an incident



Leading and Lagging Indicators



Examples:

- Open safety audit items
- Length of SOP review cycle
- New orders of highly hazardous chemicals
- Type of hazardous waste

Examples:

- Number of Injuries
- Emergency response calls
- Fire alarms/time of day



Safety Operations Management

Attributes of Effective Indicators

Workforce and Management

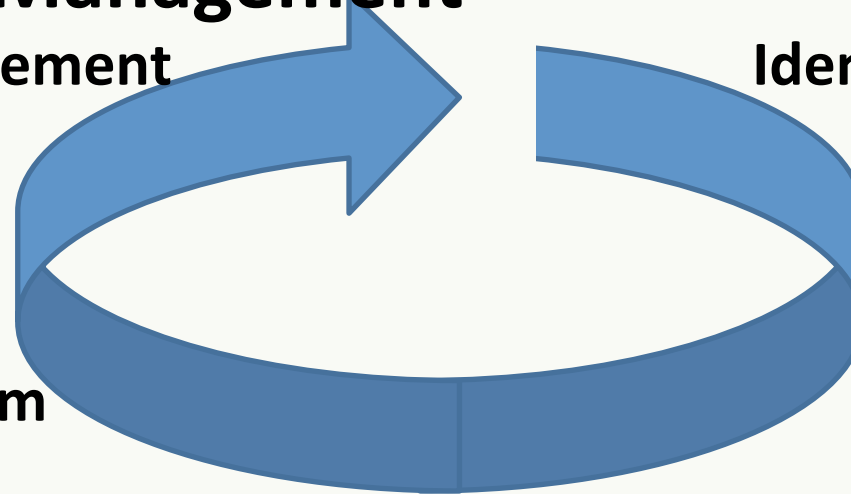
Continuous improvement

Identify risk

Incorporate data
into safety
management system

Identify indicator

Compile and analyze collectively



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