Back from the Future: What nanotechnology can teach us about chemical safety today

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Texas Tech University Explosion (2010)
West Fertilizer Company Fire and Explosion (2013)

Incident Description
- Detonation of ammonium nitrate stored in fertilizer retail facility
- 15 fatalities; >260 injured
- Destruction of two schools, nursing home, and apartment building
- ~150 homes destroyed or damaged
- ~$230 million in damages
Hey, should I be worried that my lab coat is covered in black dust?

Oh, and sometimes I cough up black stuff.

Hey, should I be worried that my lab coat is covered in black dust?

*Picture is not the actual lab tech. Quotes are real.*
Learning from the past

Anticipating the future
Texas City Explosion (1947)
Historical Ammonium Nitrate Explosions

- 32 incidents dating back to 1916
- Most explosions resulted from a massive fire
- Occurred within 20 min. to 1 hour from the initial report of the fire
- Slight variations in storage conditions can impact AN detonability during fires

July 30, 2009  El Dorado Chemical Company, Bryan, TX

The Eagle/Stuart Villanueva
Contributing Causes of West Incident

Storage of other combustible materials near fertilizer

Facility and storage bins constructed of combustible materials
Learning from the past

Anticipating the future
(Nano)Particulates and Public Health

http://commons.wikimedia.org/wiki/File:AirPollutionSource.jpg

Potential Targets of Risk

Workers

Consumers

Environment

What is known about the environmental, health, and safety (EHS) impacts of engineered nanomaterials?
Environmental, Health, and Safety (EHS) research has made up ~3-7% of the U.S. federal nanotechnology budget.
Key Points

- Much of the early nanoEHS research has focused on simple systems of limited relevance to human health (e.g., cytotoxicity)
- Some nanoparticles can translocate throughout the body after exposure via inhalation, contact with skin or ingestion
- Some nanoparticles can induce unwanted health effects in animals or cell cultures

It makes sense to control exposure to those nanomaterials for which preliminary hazard data show unwanted health effects or hazards are unknown.
Findings from TTU Incident

Findings for TTU
- No tracking of prior incidents
- Physical hazards of chemicals (scale-up)
- Safety management, incl. training

Broader Findings for Research Community
- Guidance on hazard evaluation in academic labs
- OSHA lab standard
- Influence of granting agencies
Incidents in Schools and Informal Educational Settings

Between 2001-July 2017

- 261 incidents in lab, classroom, or demonstration setting
- 130 in higher ed > 185 injuries and 5 fatalities
- 66 in elementary and secondary schools > 170 injured

12 Preschool Kids Burned When Teacher’s 'Rainbow Experiment' Goes Wrong

Melissa Chan
May 17, 2017
Back to School Safety:  
The Importance of Laboratory Safety in the Classroom

A Joint Safety Statement by
Board Member and Interim Executive Kristen Kulinowski
of the U.S. Chemical Safety Board
and
2018 President Peter K. Dorhout
of the American Chemical Society

As we begin another school year, the U.S. Chemical Safety Board (CSB) and the American Chemical Society (ACS) remind educators and students of the importance of performing laboratory experiments and classroom demonstrations safely to prevent injuries. Chemical safety is a shared core value of the CSB and ACS, and both organizations have worked separately, as well as collaboratively, to raise awareness of the importance of laboratory safety in the classroom.

In 2015, the ACS published guidelines, Identifying and Evaluating Hazards in Research Laboratories: Guidelines Developed by the Hazards Identification and Evaluation Task Force of the American Chemical Society’s Committee on Chemical Safety, following the January 7, 2010, incident at Texas Tech University where a graduate student was severely injured after the chemical he was working with unexpectedly detonated. The ACS guidelines emphasize the importance of reporting and discussing “incidents, near misses, and close calls.” The guidelines also stress the importance of striving for continuous improvement by identifying lessons learned during the course of work as well as using them to inform future hazard evaluations. The CSB attended the first ACS Safety Summit in February 2018, where participants discussed such topics as laboratory chemical safety information, laboratory safety education needs, and the importance of risk assessment in chemical safety practice and policies.
Learning from the past

Anticipating the future
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