FEATURE

A research university's rapid response to a fatal chemistry accident: Safety changes and outcomes☆

The University of California at Los Angeles (UCLA) quickly and comprehensively transformed its laboratory safety program following a chemistry accident in December 2008 that caused the death of a researcher. UCLA's Chancellor immediately announced sweeping changes in the laboratory safety program and challenged UCLA to become "Best in Class" in academic laboratory safety. Given the size of UCLA's lab researcher population and the decentralized nature of the campus, it became a daunting task to reach out and improve compliance with newly implemented safety policies. The Office of Environment, Health and Safety (EH&S) improved their operations, enhanced overall inspection procedures, and instituted mandatory laboratory safety training of PIs and researchers. A Laboratory Hazard Assessment Tool (LHAT) was implemented to aid in the identification of hazards, track laboratory space and personnel, and guide lab groups in compliance with personal protective equipment (PPE) policies. Laboratory inspections were increased by more than 4-fold in 2012 as compared to 2007 and now followed a comprehensive checklist to improve reproducibility and thoroughness of the inspection process. To provide better customer service to the research community and expedite corrective actions, all laboratory inspection reports are required to be issued the next business day. Unannounced PPE inspections began in 2010, and inspection findings showed a robust decrease in non-compliance with the PPE policy within one year of its implementation. As of the first half of 2013, all PIs of active laboratory research programs had completed the initial, in-class PI-specific laboratory safety training. In 2012, more than 20,000 EH&S safety classes were completed either in-class or online by PIs, lab supervisors, research staff, students, and visitors to UCLA's research laboratories. Overall, analysis of outcomes from changes in UCLA's lab safety program indicates rapid improvements in compliance with lab safety regulations such as increased PPE use. Lab safety changes required commitment and cooperation at all levels – from executive leadership, to health and safety experts, to deans and department chairs, and to PIs and researchers.

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INTRODUCTION

The death of staff researcher Sheharbano Sangj resulting from injuries sustained in a 2008 chemistry laboratory fire required UCLA to respond quickly and effectively to this unexpected crisis while under intense regulatory scrutiny. Adding further complexity to the response efforts of the campus was unprecedented and widespread attention from both the mainstream and industry media, as well as from research institutions across the nation. The event had a profound impact campus-wide, especially on those involved in research and laboratory safety, including the Office of Environment, Health & Safety (EH&S), whose mission it is to protect the health and safety of the campus community. Since the 2008 accident at UCLA, the national landscape in laboratory safety has further intensified due to significant laboratory accidents at other universities including serious chemical accidents that prompted an investigation by the U.S. Chemical Safety Board.[1,2] As a result, UCLA has been asked to share laboratory safety findings and recommendations with numerous public and private research institutions. This exchange has been an educational and collaborative process.

To address immediate deficiencies, an interdisciplinary team of experts was formed consisting of lab safety specialists, injury prevention specialists, industrial hygienists and campus fire marshals. Within 30 days following the accident, the team conducted comprehensive inspections of more than 300 laboratories, chemical storage rooms, and shops within the Department of Chemistry and Biochemistry, where the devastating accident had occurred. The inspection identified numerous operational problems that extended campus-wide. Foremost, at the time of the accident it was not clear how many hazardous chemicals were stored in the thousands of laboratories on campus. Furthermore, there was only limited documentation on whether laboratory personnel were trained in the usage and storage of hazardous substances. It was also not known how many laboratories, PIs, or total researchers existed on campus – a conundrum caused by UCLA's decentralized research community. In addition, laboratory design flaws were identified that had the potential to increase the risk of accidental injuries. For example, the team discovered that storage cabinets for water reactive chemicals were located directly underneath emergency showers in eleven laboratories of the Department of Chemistry and Biochemistry, which had gone unnoticed and uncorrected for over a decade and had the potential to increase the risk of serious accidental injuries. Within weeks of their identification, improperly located safety showers were removed and signs posted in their place to direct researchers to a nearby location with a compliant emergency shower.

UCLA's Roadmap to Laboratory Safety

Following the fatal laboratory accident and concurrent with EH&S' emergency response actions, UCLA's Chancellor announced sweeping changes in the university's laboratory safety program and challenged UCLA to become "Best in Class" in laboratory safety among research institutions.[2,3] Top-down communication of laboratory safety became of paramount importance at UCLA. To assist in this effort and to help implement laboratory safety protocols, a Laboratory Safety Committee was established, which was led by faculty from several campus departments and included a research staff representative, EH&S senior safety officers, the EH&S director, the Senior Associate Dean of Research from the Medical School and UCLA's Vice Chancellor for Research. In July 2010, the Chancellor created a new position, the Associate Vice Chancellor for Research, charged with outreach to faculty members and researchers to support the campus laboratory safety initiatives and to act as a liaison between the research community, EH&S staff, and academic administration. The Laboratory Safety Committee conducted a thorough study of all aspects of laboratory safety at UCLA over the course of six months. In July 2009 the committee submitted the following recommendations to UCLA's Chancellor:

- *Develop a strong safety culture:* A top-down culture of safety consciousness should be developed that involves a management approach in which the Chancellor, Vice Chancellors, Deans, Department Heads and Principal Investigators (PIs) embrace the necessity of laboratory safety, support efforts to improve safety, and stress to staff that the health and safety of each individual depends on teamwork and personal responsibility.
- *Improve and expand outreach and training:* A critical element of safety education includes developing and encouraging basic attitudes and habits of prudent behavior in the laboratory so that safety is valued as an inextricable component of all laboratory activities. To achieve this, improvements in the quality, frequency, availability, tracking, and documentation of training are needed.
- *Increase accountability and oversight:* Oversight of safety in research activities should be expanded to ensure consistent maintenance of high professional standards and hold Principal Investigators and other laboratory staff accountable for implementation of safe laboratory practices and procedures. The Laboratory Safety Committee is charged specifically with oversight of research areas involving chemical and physical hazards to help strengthen laboratory safety and bring oversight closer to that in the more highly regulated areas of Radiation and Biological Safety.
- *Improve laboratory design:* It is essential that laboratories be designed by experts who are familiar with how laboratories operate. EH&S and faculty should routinely be included in the design of new or to be renovated laboratories to ensure presence of safe engineering controls and to comply with regulatory standards. Additionally, EH&S must be consulted whenever structural alterations take place to ensure health and safety of laboratory researchers as well as compliance with regulatory requirements. EH&S can also assist with optimization of chemical and hazardous

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