A cautionary tale from the past

The following essay was written some time ago, but continues to pop up on laboratory doors around MIT, most recently at the Ceramics Processing Research Laboratory where it was read by a Tech Talk reporter. It is reprinted here with Dr. Sharpless' permission in an effort to reach everyone in the MIT community. Dr. Sharpless was a long-time member of the MIT faculty, last holding the Arthur C. Cope Professorship in Chemistry. He is now at the Scripps Research Institute in California.

Many of you may know that I was blinded in one eye during a lab accident in 1970, shortly after I arrived at MIT as an assistant professor. I always wore glasses whenever I was at my bench, and while I felt I conscientiously observed safety measures, my experience proves one can't be too cautious about wearing safety glasses.

As I prepared to go home from the lab during the early hours of the morning of the accident, I looked in the bays to see what my co-workers were doing, and then returned to my own bench, removed my safety glasses, and put on my parka. As I was walking to the door, I passed the bench where a first-year graduate student was flame-sealing an NMR tube. I asked how it was going, and he replied, "Good, I've got it sealed."

He was sealing off the tube at atmospheric pressure under a flow of nitrogen gas while cooling the tube in a liquid nitrogen bath, a technique neither of us had performed before. Nor, I regret to say, had we looked up the procedure, which we subsequently discovered to be incorrect.

I stopped by his bench, picked up the tube from the bath, and held it to the light. The tube immediately frosted over, and, as I wiped it to better see the contents, I noticed that the solvent level was exceedingly high. Suddenly the solvent level dropped several inches. Though I instantly realized condensed oxygen had been sealed in the NMR tube, I was quite literally unable to move a muscle before it exploded. Glass fragments shredded my cornea, penetrated the iris, and cause the partial collapse of one eye. My only other injuries were superficial face cuts.

My first two weeks at Mass Eye & Ear were spent totally immobilized and with both eyes bandaged. The pain was terrific, but my fear was even greater: I had been warned that when my eyes were uncovered there was a small chance I might blind in both eyes due to "sympathetic ophthalmia." Because eyes are walled off from the rest of the body in utero, eye protein driven into the blood stream can raise an immune response that leads to the "killing" of the uninjured eye. My disappointment at having no functional vision in my injured eye was, needless to say, surpassed by my joy at retaining full vision in my good eye.

The lesson to be learned from my experience is straightforward: there's simply never an adequate excuse for not wearing safety glasses in the laboratory at all times.

----------------------------------------------------------------------------------------------------------------------------------

Unexpected poison

When Karen Wetterhahn, a professor and toxic-metals expert at Dartmouth College, Hanover, New Hampshire, spilled a couple of drops of dimethyl mercury on her hand in August 1996, she quickly cleaned it up and assumed that her latex gloves had stopped the toxic chemical reaching her skin. Five months after the accident, Wetterhahn was having difficulty walking and her speech started to slur. Tests later showed that she had 80 times the lethal dose of mercury in her blood. After losing her vision and hearing, she slipped into a coma and died in June 1997, aged 48. The tragedy shocked
chemists, who were surprised at how easily the mercury had penetrated Wetterhahn's glove and how toxic the compound was.

The recent death of a research assistant at the University of California, Los Angeles (UCLA) from injuries sustained while working with a pyrophoric chemical have led to internal and external scrutiny of the university's laboratory safety procedures. The tragic event, which involved t-butyl lithium, a compound that spontaneously ignites on exposure to air, could have widespread implications for academic chemistry departments.

'Every single major university will have to look at their policies regarding the handling of this type of material and will make adjustments accordingly,' Russ Phifer, who chairs the American Chemical Society's chemical safety committee, tells Chemistry World. 'Some may restrict the use of pyrophoric materials, or put protocols in place that require additional training for researchers.'

Phifer notes that several important lab safety rules appear to have been violated by the victim - Sheharbano Sangji, a 23-year-old research assistant employed at UCLA since October. For example, Sangji was working alone in the lab, which is prohibited, and it appears that she was not wearing the appropriate protective clothing.

**Flash fire.** UCLA had told its researchers that they could work during the holiday break shut down for 'critical research needs,' and on 29 December Sangji was working with a bottle of t-butyl lithium dissolved in pentane. While using a syringe to withdraw a quantity of the reagent, it seems she accidentally pulled the plunger all the way out, introducing air and creating a flash fire.

The incident raises questions about Sangji's training and supervision. 'Sangji was not familiar enough with the material and delivery means to be doing the experiment on her own,' says Phifer.

The university believes Sangji was wearing nitrile gloves, safety glasses rather than goggles, and a synthetic sweater with no lab coat. When the fire ignited the gloves and the sweater, she sustained second and third degree burns over 40 per cent of her body and was immediately hospitalized. UCLA was notified on 16 January that she had died of her injuries.

After the incident and before Sangji's death, UCLA launched a full review of its laboratory safety protocols. The review is in progress, and the university says it is also cooperating with a separate investigation being conducted by state regulators at the California Division of Occupational Safety and Health, also known as Cal/OSHA. The investigation is likely to take two to three months, the regulator says, and any citations could bring fines ranging from $500 to upwards of $250,000.

'I would not be surprised if Cal/OSHA fines UCLA if, for example, the school can't document appropriate training,' Phifer adds.

'My hope would be that this raises awareness about the dangers of working in a chemistry lab,' states Robert Latsch, an environmental safety and compliance officer at Case Western Reserve University's Department of Occupational and Environmental Safety. He says the UCLA accident was preventable and hopes it triggers at least an evaluation of chemistry lab safety procedures at his university and others.