LET’S TALK FOOTWEAR IN
THE LAB!!

Now that the warm weather is upon us, we’re finding more and more flip-flops and other inappropriate clothing in the laboratories, so it’s time again to remind everyone of the expectations regarding personal clothing worn in the lab. The Chemical Hygiene Program, which applies to all labs where chemicals are present, states the following (http://www.safety.rochester.edu/ih/chp/chpplan15.html):

**Personal Apparel**

Severe injuries and death have been reported to have occurred to lab personnel because their hair was caught in moving lab equipment or inappropriate clothing was worn. Although the PI/supervisor is responsible for having his/her personnel wear appropriate apparel, EH&S requires lab personnel:

1. to confine or tie long hair and loose clothing;
2. not wear clothing that contain dangling laces/strings, including neckties;
3. not wear dangling jewelry;
4. utilize break-away lanyards for IDs;
5. wear only closed toed shoes/sneakers;
6. never wear high-heeled shoes or lightweight shoes/slippers that do not provide protection from broken glass or hazardous materials that may be on the floor and are not suitable for the work environment;
7. wear lab coats over street clothes to minimize potential fire hazards or chemical contamination when working with chemicals, especially flammable and pyrophoric materials;
8. utilize natural fibers (cotton) when working with flammable materials as this material is less combustible than synthetic fabrics; wear eye and face protection; and, wear hearing protection when required.

For those of you who find it difficult to put aside your flip-flops, Crocs, sandals, and ballet-style shoes, please take a few moments to read through an article that was published in the American Biological Safety Association’s journal called “Applied Biosafety”. This article highlights some real world experiences that have happened to others in the lab and which could happen to you.

**How important is foot protection in the laboratory?**

**Question**

I am having problems convincing lab personnel, particularly those right out of the university, that they should be wearing appropriate footwear in the laboratory. Are there any recommendations and/or regulations requiring that the feet of laboratory workers be covered, and are there any instances of injury reported because of not wearing the proper foot protection in a laboratory?

**Answer**

[The OSHA Bloodborne Pathogen Standard, indicates that the employer must ensure that personnel are protected from potential exposure of the skin to blood or other potentially infectious materials (OSHA, 1991).] [Ensuring appropriate covering of the skin is required. The Bloodborne Pathogen Standard (BBP) under Personal Protective Equipment 1910.130(d)(3)(i) states:

(see page 2)
When there is occupational exposure, the employer shall provide, at no cost to the employee, appropriate personal protective equipment such as, but not limited to, (bold type added for emphasis) gloves, gowns, laboratory coats, face shields or masks and eye protection, and mouthpieces, resuscitation bags, pocket masks, or other ventilation devices. Personal protective equipment will be considered “appropriate” only if it does not permit blood or other potentially infectious materials to pass through to or reach the employee’s work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time, which the protective equipment will be used.”

Wearing appropriate footwear is noted in several well-respected texts on laboratory safety. Hawley and Eitzen (2000) in their chapter “Bioterrorism and Biological Safety,” state: “As a minimum...fully fastened laboratory coat...closed-toe shoes, eye protection....” Stain-brook and Runkle (1986) in a chapter on personal protective equipment write: “An area of laboratory safety that is frequently omitted is foot protection. The laboratory can be a wilderness of foot injuries, from spilled chemicals...broken glass, hot liquids and dropped heavy objects.” They suggest that “most foot exposure problems can be solved very simply by requiring that all employees wear low-heel, fully enclosed, leather shoes.” Finally, in Prudent Practices for Handling Hazardous Chemicals in the Laboratory, Section 1.F.3 states that “shoes should be worn at all times in buildings where chemicals are stored or used. Perforated shoes, sandals or cloth sneakers should not be worn in laboratories or areas where mechanical work is being done” (NRC, 1990).

If these documents and recommendations are not sufficient to convince laboratory personnel to wear appropriate footwear, perhaps a little specific injury information will help. Several months ago, Dr. Pat Cox at Mississippi State University polled some laboratory safety personnel about the failure to wear proper footwear in the laboratory (personal communication). She submitted the poll responses to the Biosafety List Serve and they are published below with Dr. Cox’s permission.
Lab Personnel polls on proper footwear in the lab (actual communication)

(1) “I worked in an academic research lab. Aside from my lab work, I was also responsible for ordering supplies. On one of my ordering days, I was wearing long pants with sandals. I figured it’d be ok since I wasn’t performing any lab work that day. I opened one of our refrigerators to check supplies and a plastic conical tube fell from the door shelving onto the floor and shattered—splashing my bare foot with some of the contents. At first I’m thinking—’Dummy me… I know better than to wear sandals in the lab! I need to clean this up.’ Then my next thought was ‘…what’s in this solution?!?!?!” because I was in the early stages of pregnancy. Fortunately, it wasn’t anything bad and my child was unaffected as a result of my lax attitude. Moral of the story: It doesn’t matter if you’re doing the research or not…you can still be involved in a lab accident/exposure.”

(2) “We had a student drop a 2-liter aspirator flask of tissue culture media on her sandaled foot, requiring a trip to the ER and many stitches.”

(3) “I usually tell them about a friend of a friend years ago who went to pull a 2-liter flask of hot agar out of the autoclave, bumped the bottom of the flask against the lip, broke the flask and had boiling agar spill over her bare legs and feet—second and third degree burns.”

(4) “We had a biology graduate student decide that he would make up several solutions of nitric acid/alcohol in plastic bottles to use as a cleaning solution, particularly for glassware. He was wearing shorts and sandals, but had put on a lab coat that went down to about mid-calf level. The build-up of pressure in one of the bottles caused a rupture and getting the solution over his back when he was turned around. Unfortunately his lower legs and feet, and neck, were severely burned as he was working alone after normal working hours.”

(5) “In my previous life as a lab rat in a lab, a girl in a lab booted a piece of glassware accidentally, while wearing sandals, and had about a 6-inch laceration requiring stitches on her foot.”

(6) “We got a call from our HazMat team about a small (4 liter) concentrated H$_2$SO$_4$ spill in one of our labs. When I got there and entered the lab, one of the first things I see is a pair of shoes submerged in a bucket of water. Turns out a grad student had not so much spilled as dropped a 4-liter bottle of concentrated H$_2$SO$_4$ right at his feet. Fortunately, the bottle really contained only 1 liter of acid. Unfortunately, it soaked his brand new and expensive Nikes, which were what I saw soaking in the bucket. Had he been wearing sandals, it would have been his feet drenched in concentrated sulphuric acid (and, presumably, soaking in the bucket). And had it been full and landed on his toes, he probably would have been on his way to the hospital to have his broken toe(s) set.”

(7) One hot summer day, in the basement of a then non-air conditioned university building, a lab tech was transferring concentrated nitric acid from a carboy to individual bottles (for a chem. lab) via a pressurized line. The line came loose and sprayed the acid; her PPE protected her and that PPE included canvas sneakers. There were holes burned through the sneakers, but the acid was all used up in that process. Her feet did not get burned. If she had been wearing sandals (this was pre-flip-flop craze)—and given the heat and humidity of that day, wearing sandals would have been more comfortable—her feet would have been badly burned.”

(8) “Actually, as a young punk scientist, I was mixing a xylene solution and did not know xylene melts parafilm, as I flipped over a parafilm covered 2-liter cylinder. Much to my surprise, the solvent (2 liters) passed thru the parafilm to the floor. As I went to get a spill pillow, I meandered thru the xylene. Several minutes later, I could feel the floor with my socks. The xylene had completely melted the bottoms of my tennis shoes. I decided to take an early lunch and walked out with my ‘shoe covers’ to get replacements. Needless to say, the snow was very cold and wet walking in socks!!!” There is a suggestion within the BBP regulation that “skin must be covered” but not a specific requirement for foot covering. However, several well accepted laboratory safety texts indicate that personnel should wear appropriate footwear while working in the laboratory. These documents constitute a “standard of the industry,” which an employer should adhere to. In addition, during a lab safety evaluation following a laboratory accident, an OSHA inspector could cite for failure to wear appropriate footwear. That, in and of itself, might not convince a researcher to wear shoes in the lab, but the answers to the poll published by Dr. Cox should be enough to make him or her consider the problems that might be encountered.
References


