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Twelve Tips for Working Safely with Laboratory Glassware

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If you examine your recent accident and injury reports, we bet that the most frequent type of injury will be cuts or lacerations. Given the volume of glassware used, the frequency of daily use, and the diverse types of glassware in many laboratory operations, chances are great that someone is going to have an accident that results in cuts, slashes, or slices. Minor cuts are the most frequent result of laboratory glassware accidents. But more serious accidents present hazards from flying glass, exposure to chemical solutions, and potential fires. Consider these recent scenarios.

- While filtering an ethidium bromide solution through activated carbon into a standard Erlenmyer flask using house vacuum, the extraction flask imploded, spraying broken glass and solution into the air.
- During an attempt to upscale an Ozonolysis procedure, the reaction flask exploded embedding flying glass into the face, neck, and (luckily) safety glasses of the lab researcher.
- A 250ml glass flask became over pressurized and burst spraying two lab workers with glass. The worker holding the flask was cut on the hands, face, chest, and stomach while the other worker standing across the room received cuts on the stomach. The worker holding the flask noted glass shards embedded in his safety glasses.[1]

As an example take a look at our data. During the period between 2006 and 2008, the STARS report for the University of Florida shows the group cause code for cuts, punctures, and scrapes accounted for 742 of the 3,359 workers compensation claims reported. And the incurred costs for those claims totaled more than $100,000.[2]

Animal research facilities are no different than most laboratories and at risk when it comes to tasks using specialized glassware in potentially dangerous procedures. We guarantee your facility has many laboratory jobs where glassware could present hazards to workers. The biggest thing for working safely with laboratory glassware is hazard awareness. In addition to reducing injuries, hazard awareness can save time by preventing ruined procedures and reactions and save money by minimizing broken glassware and wasted reagents. Read on for the Safety Guys' dirty dozen tips on safe use of laboratory glassware.

1. Begin with the right PPE. At a minimum, personal protective equipment for lab work should include a lab coat, proper gloves, and eye protection. Long pants and closed toe shoes are also a must.
2. Pay attention to apparatus set up. Many procedures require clamping glass to supports, ring stands, etc. Take care not to over-tighten any glassware clamps. Hand-tighten only to firm, but not extreme, pressure. Over-tightening can produce mechanical stress.
3. Always examine glassware for any chips. Chips weaken glassware and can lead to possible breakage and injury. Since specialty glassware is expensive, repairs may prove economical. Make sure any glassware sent for repair is empty and clean. If solvents are used, rinse the item with water and let dry completely.
4. Take special care when washing glassware by hand. This single task is the source for most of the injuries. Wear heavy duty gloves and handle glassware delicately.
5. Beware of potentially hot glass. The problem is that glassware looks the same whether it is hot or not. We recommend you develop standard operating procedures (SOPs) that follow routines and set up out of the way areas for allowing hot glassware to cool. Keep appropriate gloves hanging near autoclaves and other apparatus where glassware is routinely heated.
6. Handle glass tubing carefully. Another common procedure in labs is inserting glass tubing into rubber stoppers or similar operations. These tasks are safer and easier if the glass tube is first lubricated. Laboratory grease is best but may not be suitable for all applications. Remember even deionized water is better than nothing. Be sure to wear appropriate gloves or protect hands with rags or other means.
7. Ditto for plastic tubing. Lubricate the nipple or side arm of the flask and then gently work the tubing on, using gloves of course. The bigger problem we run into here is when removing plastic tubing. Do not try to pull it off.

Put the tubing and nipple against a strong support and cut the tubing close to the end of the glass. Finish by then cutting the tubing lengthwise along the nipple and removing the waste material.

8. Pay attention to fittings. After tubing, the many different types of glass fittings present the next biggest potential for accidental cuts. From the barbed glass nipples to the ground glass joints, when it comes to mating fittings problems arise. Take care when making and undoing connections. Choose hardware that is less prone to "freezing."
9. Use care when dealing with frozen joints. Applying laboratory grease can reduce the likelihood of "freezing." If grease is not suitable, Teflon sleeves may be an option. Soak frozen joints overnight to loosen. Failing the soak, heat may be used. First try a heat gun. Also, a gas torch works well but all flammable solvents must be removed first and proper technique used. Heat the outer surface quickly, hopefully while keeping the inner glass piece from heating too much. Tug gently while heating and do not heat for more than about 30 seconds.
10. Equipment under pressure or vacuum requires extra care. Before using any glassware for this type of work, carefully inspect each piece for any surface scratches which can lead to weakness and breakage. Pressurized and vacuum pump systems should be set up in a fume hood with the sash down. If out on a bench, use shields where practical. Design systems with relief devices to reduce chances of breakage. Keep in mind that round vessels will withstand more pressure or vacuum than flat-sided ones.
11. Test for stressed glass routinely. This occurs when glass is heated unevenly above its strain point and is most severe in thick glass. Polarized light is used to identify glass stress lines. Annealing may remove the stress.
12. Dispose of broken glass safely. Make sure all chemical and biological hazards are removed prior to disposal. Use a puncture-resistant "sharps" container. Do not overfill, three quarters full is the maximum. Affix proper labels and close securely before placing in the appropriate trash dumpster or recycle receptacle.

Summary
Every laboratory uses glassware. By observing our twelve step program, you can greatly reduce the number of accidents and injuries from cuts and lacerations. Be safe out there.

References

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2. University of Florida STARS Report FY 08/09, 09/10, 10/11, Florida Department of Financial Services, Division of Workers Compensation, Tallahassee, FL. 2011

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