

Lessons Learned

Autoclave Explosion



What Happened?

A Laboratory Technician was using an autoclave machine to sterilize some tools and materials. After the machine ran its cycle, he opened the door to retrieve the load. As he opened the door, **a bottle inside the autoclave burst** and sprayed him with about 4 liters of hot liquid and steam; **causing serious burns on multiple parts of his body.**

Lab workers rushed to the technician's aid, took him to the safety shower to cool the affected burn area, and called the NYP Emergency Department immediately. EMS arrived in minutes, triaged the employee and took him to the NYP Emergency Room for admission.

Why Did This Happen?

The pictures on the right show the autoclave contents immediately following the accident; which included two half-full 10-liter bottles of phosphate-buffered saline.

- **One of the bottle's caps had been sealed tightly**, which caused pressure to build up in the vessel and burst.
- **The bottles were placed directly on the autoclave rack instead of on secondary containment**, which would have contained most of the spill.
- **The technician was not wearing Personal Protective Equipment**, which would have protected him from the hot liquids.

Lessons Learned

There are many different types of autoclave machines on campus, but they all use high-pressure saturated steam in a pressurized chamber; which allows water to boil at a temperature higher than it would at atmospheric pressure to sterilize tools and materials.

Though it is a routine lab operation, key safety measures should be taken to ensure proper autoclave operation and to avoid injuries or equipment damage:

- **Autoclaving should be supervised by an FDNY C-14 Certificate of Fitness holder.**
- **Supervisors must train autoclave users on proper operation.**
- Autoclave users need to review the manual for that particular unit; as well as the [EHS Update on Autoclave Use and Safety](#).
- All laboratory personnel must **know their nearest safety shower and eyewash stations** for immediate treatment in case of exposure.
- **Additional Personal Protective Equipment (PPE) must be worn when autoclaving**; besides minimal PPE for lab work (lab coat, clothes that cover legs, closed shoes) is required at all times:
 - Latex gloves when handling potentially contaminated materials.
 - Thermal gloves when retrieving objects from the autoclave.
 - Face-shield and liquid-resistant apron when autoclaving liquids.



Above: Photos of the autoclave immediately after the incident. Note the burst bottle placed directly on the racks, and the bottle cap ruptured due to the pressure built up inside.



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- **When loading the Autoclave, users must:**
 - Check the interior for items left behind by the previous user.
 - Make sure all materials used are autoclave compatible.
 - Verify that bottles are not overfilled.
 - **Always check and loosen bottle caps, regardless of size.**
 - Use secondary containment trays.
 - Make sure materials and instruments are not touching the walls or floors of the autoclave.
 - Make sure autoclave is not overloaded.
 - Run all pre-checks required for that particular unit, including checking the drain strainer and ensuring the door seals properly.
 - Choose the correct cycle for the load.
- **When unloading the Autoclave:**
 - Always make sure the chamber pressure has returned to zero before opening the autoclave door.
 - **Wear PPE to retrieve the load (as required for solids vs liquids).**
 - Open the door slowly and carefully, standing behind it. Allow for the steam to be released and wait 30 seconds before opening the door completely.
 - Wait for autoclaved materials to cool down before retrieving them from the autoclave. This is especially important when autoclaving liquids, as they may still be cooling and returning to normal pressure.



Personal Protective Equipment (PPE) must be worn and safety precautions followed when operating autoclave devices.

Note: never autoclave animal carcasses or flammable, corrosive, or radioactive materials.

For additional training or guidance in autoclave operation, or to request additional PPE; please contact EHS at 646-962-7233 or ehs@med.cornell.edu, or your assigned Safety Advisor.