



Safe Use of Autoclaves

An autoclave uses hot, pressurized steam to render biomedical waste noninfectious. Improper use of an autoclave presents a serious injury hazard as it increases the chance for equipment malfunction. This document should be used in addition to hands on training specific to the autoclave being used.

Autoclave Training Requirements and Record Keeping

The Principle Investigator of each lab is responsible for developing and implementing an autoclave training program and record keeping. Since biological and medical waste go into the general waste stream after autoclave decontamination, it is important that this process be documented. These records must be kept for a minimum of three years. In addition to the required Autoclave log records should include autoclave ticker tapes as well as integrators. During laboratory operations reviews, the Office of Biosafety will review autoclave run logs and training records. The Office of Biosafety can give additional autoclave training upon request.

To further ensure autoclaves are running as they should, the Office of Biosafety recommends running chemical integrators (3M Comply-SteriGage Steam Chemical Integrators can be found on the VWR punch-out in UGAMart. The, supplier # 1243A.) with each load. These integrators indicate whether proper temperature, time, and pressure were reached during the run. An autoclave log template can be found on the Office of Biosafety webpage (<http://www.ovpr.uga.edu/biosafety/>). Parameters of the autoclave run should be recorded and the chemical indicator should accompany the information on the log. A space has been left to attach each indicator to the log sheet.

Please do not let large volumes of “to-be autoclaved” waste build up in your lab. Saving up waste can crowd areas of your laboratory making maneuvering difficult and the laboratory environment unsafe. Please autoclave waste when enough is collected to justify a load. Make sure to empty your waste from the autoclave in a timely manner so others may use it. Autoclaved waste must be placed in black garbage bags prior to placing into a bin for disposal or taken to the dumpster for disposal.

Autoclave Cycles

The state of Georgia requires all biological waste to be autoclaved at a minimum of 121C for 30 minutes.

There are three autoclave cycles used to decontaminate/sterilize:

- *Gravity*: The gravity design is utilized for sterilizing non-porous heat and moisture stabilized goods. These include liquids and media as well as solids such as laboratory waste.
- *Pre-Vacuum (Vacuum)*: The pre-vacuum increases the speed and efficiency associated with sterilization. It expands the capability of the gravity cycle design by its ability to sterilize porous heat and moisture stabilized materials. A great example of this is animal bedding.
- *Isothermal*: The isothermal design addresses the need to sterilize materials at lower temperatures for heat sensitive material, such as media. This cycle is normally used for pasteurization, inspissation or fractional (intermittent) sterilization.

Safe Autoclave Use

It is important for autoclave users to respect and understand the extreme heat and pressure produced by an autoclave. The following safety precautions should be observed:

- Be sure autoclave is OFF and the pressure has regulated before opening the doors. Autoclave doors should be opened slowly, keeping the head, face, and hands away from the opening to prevent steam contact.
- Check the autoclave for items left behind before loading.
- Load each autoclave in accordance with manufacturer recommendations to ensure complete sterilization. DO NOT OVERLOAD THE AUTOCLAVE.
- If you are placing bottles in the autoclave, be sure to loosen caps so pressure buildup doesn't cause bottles to shatter or rupture during the run.

- Waste should be autoclaved in specific autoclaving bags (that have the biohazard symbol) that are designed to withstand the extreme conditions of the autoclaving process. A chemical integrator should be taped to the outside of the bag being autoclaved (one integrator per load). Bags must be placed into a secondary, melt-proof container for autoclaving.
- Since steam has to be in contact with the material being sterilized to be effective, bags and containers must be sealed loosely to allow steam penetration into the bag.
- Flammable, reactive, corrosive or toxic materials should not be autoclaved. Radioactive materials can be autoclaved if autoclave has been designated as “Radioactive Use Only” by the Radiation Safety Office.
- Autoclave door should be locked before operation. Be sure not to over tighten the door to prevent damaging the seal. Most autoclaves will not operate if the door is not completely closed and locked.
- Older autoclaves may not provide heat shielding around the unit. Signs should be placed around the area to ensure passers-by are aware of the hazards (“Hot Surfaces, Stay Clear”).
- For non-liquid loads, allow 15 minutes for cooling prior to touching with bare hands.
- For liquid loads, allow to stand at least 1 hour before touching with bare hands.
- Do not store combustible materials near autoclaves.
- Use personal protective equipment (PPE) when placing items into, or removing items from an autoclave. PPE should include heat resistant gloves, safety goggles, and, if handling large amounts of liquid, rubber boots and a rubber apron to protect against splash and spill hazards.
- Use a tray with a solid bottom and sides to contain the material being autoclaved to catch any spills, should they occur. Before placing plastic materials into autoclaves, check to ensure they are compatible. All manufacturer’s safety precautions should be observed in addition to these listed in this document.

Secondary Containers

The way materials are prepared before autoclaving will greatly affect the outcome of a run. Consideration of primary container (containing the actual waste), secondary container (containing the primary container), volume of liquid and amount of material should be given. Structural integrity of containers is also an important consideration. Not all containers are designed to withstand the extreme conditions within an autoclave. The following are materials that are good and bad choices for autoclave use:

Good choices:

- Borosilicate glass (Pyrex) has low thermo expansion properties and is resistant to breaking due to heat.
- Polypropylene and polycarbonate are heat resistant plastics.
- Stainless steel is a good heat conductor and thus facilitates sterilization.

Bad choices:

- Polystyrene, polyethylene and high density polyethylene do not resist heat well.

Preventative maintenance and Cycle Failure

If the autoclave cycle fails to complete, the load must be re-autoclaved. If a power-outage causes the cycle to not complete, you will need to restart the cycle from the beginning once power is restored. If the load is removed from a finished cycle and chemical integrators indicate that the proper parameters were not met, the load must be re-autoclaved. If cycles are not decontaminating/sterilizing correctly, please contact the campus contractor who services the autoclave to have it repaired. All autoclaves used to decontaminate biological or medical waste should be under a preventative maintenance contract to be serviced at least annually and to be sure that a technician is available to make unscheduled repairs as needed. All autoclaves at UGA should be spore tested at least annually by the Office of Biosafety. Please contact the Office of Biosafety to ensure your autoclave is up to date on annual testing.

If you have any questions or need any assistance with your autoclave, please contact the Office of Biosafety at biosfty@uga.edu. For issues requiring immediate assistance, please call 706-542-5300.