

# Safe Use of Autoclaves

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**Potential Safety Risks** – autoclaves are sterilizers using high pressure and high temperature steam. The potential safety risks for the operators are:

- a) Heat burns -from hot materials and autoclave chamber walls and door.
- b) Steam burns -from residual steam coming out from autoclave and materials on completion of cycle.
- c) Hot fluid scalds- from boiling liquids and spillage in autoclave.
- d) Hand and arm injuries when closing the door.
- e) Body injury if there is an explosion.
- f) Equipment to protect against scalds and burns:
- g) Heat-insulating gloves that provide complete coverage of hands and forearms.
- h) Closed-toed footwear.

## **Operator instructions training**

All operators must have successfully completed an authorized training session on the safe operating procedures of this autoclaves. This requirement applies to both new and experienced personnel. A list of authorized users will be kept with the cycle records.

## **Before autoclaving the following must be completed**

1. Before turning the autoclave on drain the blue generator by:
  - a) Opening the tap (labeled #1) at the bottom of the generator,
  - b) opening the tap (labeled #2) on the side of the autoclave facing the wall to the lab, and
  - c) allow the water to drain for 5 minutes.
2. Close the taps that were opened to drain the generator.
3. Turn on the power supply switch on the wall beside the autoclave (labeled power switch).
4. Turn on the water supply lever labeled water supply. (it is on when it is parallel with the water supply pipe and off when it is perpendicular to the pipe)
5. Allow the pressure in the jacket to come up to 15 pounds before starting the autoclave. (about 30 minutes)

## **Material Preparation**

1. Ensure that the material is able to be autoclaved. Samples containing solvents or substances that may emit toxic fumes should not be autoclaved.
2. Glassware must be inspected for cracks prior to autoclaving.
3. Prepare and package material suitably:
  - a) Loose dry materials must be wrapped or bagged in steam-penetrable paper or loosely covered with aluminum foil. Wrapping too tightly will impede steam

- penetration, decreasing efficiency of the process.
- b) All containers must be covered by a loosened lid or steam-penetrable bung.
  - c) Containers of liquid must be a maximum of 2/3 full, with lids loosened.
  - d) Glassware must be heat-resistant borosilicate.
  - e) Plastics must be heat-resistant e.g.: polycarbonate (PC), PTFE ("Teflon") and most polypropylene (PP) items.
  - f) Items or containers must be tagged with autoclave tape to verify sterilization.
  - g) Loosen all lids to prevent pressure buildup.
  - h) Add water to containers as appropriate.
4. Place items in containers to secure and contain spills:
- a) items should be placed in a stainless steel or autoclavable plastic container for their stability and ease of handling,
  - b) place containers of liquid, bags of agar plates, or other materials that may boil over or leak, into a secondary pan in the autoclave,
  - c) the pan must be large enough to contain a total spill of the contents,
  - d) bags must not be tightly sealed as steam cannot penetrate, and
  - e) remove all labels from glassware prior to autoclaving.
5. Biohazard materials must be labeled as such and secured in containment vessels or autoclavable bags and processed as soon as possible according to requirements for the handling of infectious or biohazard materials.

### **Loading Autoclave**

1. Wear heat-insulating gloves, and closed toed shoes.
2. Place material in autoclave. Do not mix incompatible materials.
3. Do not overload; leave sufficient room for steam circulation. If necessary, place the container on its side to maximize steam penetration and avoid entrapment of air.
4. Close and latch door firmly by raising the lid gently till it clicks into place.
5. Do Not Let the door slam at the top as it will break the switch located there.

### **Operating Autoclave**

1. Choose appropriate cycle (e.g. liquid, dry unwrapped or wrapped etc.) for the material.
2. Set appropriate temperature for the cycle (if necessary, 121°C usual temperature).
3. Press the start button.
4. Do not attempt to open the door while autoclave is operating.
5. The manuals for operation of the autoclave are located in the cupboard adjacent to small autoclave and under behind door panel of large autoclave.

### **Unloading Autoclave**

1. Wear heat-insulating gloves and closed toed shoes.

2. Ensure the load is complete.
3. Wear gloves and stand back from the door as a precaution, carefully crack door open no more than 1 inch (2.5 cm) to release residual steam and allow pressure within liquids and containers to normalize.
4. Allow sterilized material to stand for 10 minutes in the chamber. This will allow steam to clear and trapped air to escape from hot liquids, reducing risk to operator.
5. Do not agitate containers of super-heated liquids or remove caps before unloading.
6. After removal from the autoclave, place liquid agar in the water bath in the media area that should be turned on before starting the load. This will allow the media to cool to a temp ideal for pouring.

### **Equipment Malfunction**

1. If the autoclave does not operate exactly as expected, do not attempt to fix the problem. A notice shall be placed on the autoclave indicating that it is not to be used until the problem is diagnosed and corrected.
2. Record the problem in the autoclave log book. Contact the Lab Technician to report the problem.
3. Repair of autoclaves shall be performed by qualified persons only.
4. All incidents are to be reported to the Lab Technician.
5. If any injury occurs seek first aid or, if necessary, seek medical assistance by dialing security at 5033.
6. If clothing is soaked in hot water/steam, remove clothing and cool the injured part in cool water.
7. Place a notice on the autoclave indicating that it is not to be used until the cause of the incident is determined, procedures enacted to prevent future incidents, and the autoclave is deemed safe for operation.

### **Spill clean-up**

1. Spills may occur from a boil over or breakage of containers.
2. No operation of the autoclave is allowed until the spill is cleaned up.
3. The operator is responsible for cleanup of spills. Before initiating cleanup, evaluate the situation, shut down the autoclave, remove any contaminated PPE, evacuate the area of personnel using standard exit procedures for 30 minutes to allow aerosols to settle.
4. Post signage forbidding entry to the area for this period of time.
5. Exposed personnel should thoroughly wash any exposed areas prior to seeking medical attention if needed.
6. Supervisor, senior lab staff, or the BSO should be notified of the spill.
7. After 30 minutes, assemble the spill kit and provided the apparatus has sufficiently cooled,

contain the spilled material using paper towel.

8. Review the MSDS (found on-line using the MSDS online icon on the desk top, if appropriate, to determine the protective equipment, spill cleanup and disposal protocols that are necessary.
9. Clean the equipment and work area in order to collect and remove all spilled materials.
10. Dispose of the waste following the protocol appropriate for the material. If materials have been intermingled, follow the cleanup and disposal protocol for the most hazardous component of the mixture.
11. Cracked glassware must be disposed of properly in the "Broken Glass" disposal pail.
12. Report the spill and the clean up to the BSO.