LSU Inter-Institutional Biological and Recombinant DNA Safety Committee (IBRDSC)

Policy: Autoclave Use and Validation

Adopted April 26, 2012

Requires operator training, written SOPs, and use of PPE

Efficiency dependent on

- Density of material to be autoclaved
- Steam penetration/internal steam generation
- Load configuration
- Verification of established run parameters (*Time/Temperature/Pressure)*

Autoclaves can pose physical hazards (e.g. heat, steam and pressure) and biological hazards. (e.g. inadequately sterilized infectious materials). All PIs at LSU are required to train their personal on the proper use, validation and maintenance of autoclaves they will use in your department.

Different varieties of autoclaves may have their own unique characteristics for loading, load sizes, cycle types and cycle settings. The materials to be sterilized will determine the sterilization cycle that will be used. For this reason it is important to read and understand the user's manual for the specific model of autoclave that is being used. Be certain that the user's manual is readily available incase questions or concerns arise during the operation of the autoclave.

An autoclave is suitable for the treatment of certain types of waste but not all types. The <u>following items of waste should not be autoclaved</u>:

1. Items of waste which are mixed with volatile chemical solvents or radioactive materials (this waste must be handled as either chemical waste or radioactive waste).

2. Pathological waste (pathological waste is handled as follows: animal carcasses are taken to the pathological waste freezers in the Research Animal Facility)

The following are the responsibility of the PI or Supervisor

A. Training:

The supervisor for each laboratory needs to develop and implement an autoclave safety training program. All users shall be trained before operating an autoclave; the supervisor is responsible for insuring that each person in the lab is appropriately trained. All training must be documented and the records maintained in the lab with other safety training materials. These records will be reviewed during during an Environmental Health and Safety Inspection.

B. Maintenance:

Autoclave maintenance is essential for a safe and properly functioning autoclave. The manufacturer's recommendations should be followed for preventative maintenance. All contractors hired to perform regular maintenance and repairs should be approved by the manufacturer. Each autoclave user is responsible for ensuring the autoclave is monitored as follows:

Heat Sensitive Tape Monitoring — All operators shall use heat sensitive sterilization indicator tape for each load.

- Tape will only indicate that the proper temperature for the cycle has been reached. Tape will not indicate that the load was heated at the proper pressure or for the appropriate length of time.

- Be certain that the heat sensitive tape does not contain a lead base indicator. This type of tape must be collected and managed as hazardous waste.

Biological Indicators — All operators that autoclave infectious/biohazardous waste must do the following:

- At least once a month use a biological indicator such as Geobacillus stearotherophilus placed at the center of a load processed to confirm adequate sterilization conditions. Remember for the autoclave to sterilize the steam must penetrate what you are autoclaving. Maintain these validation records.

C. Recordkeeping:

Documentation records of any autoclave preventative maintenance/repairs and validations shall be maintained. These records will be reviewed during your next inspection. The records should indicate who performed the work, the type of maintenance or repairs conducted and the date the autoclave was serviced. Biological indicator validation records and test results shall also be maintained. Records should be kept in the room with the autoclave or there should be a sign indicating where the records are located.

Autoclave Safety Practices:

Do not autoclave items containing corrosives, solvents, volatiles or radioactive materials.

I. Prior to loading

1. Before using the autoclave, check inside the autoclave chamber for any items left by the previous user that could pose a hazard.

2. Ensure that the drain strainer is clean before loading the autoclave.

3. Ensure that the door gaskets have not deteriorated, but are still intact and pliable.

II. Loading

4. Load the autoclave as per the manufacturer's recommendation. DO NOT overload the autoclave.

5. Liquids should be within a heat resistant plastic tray containing an inch of water.

    a. Bottles should not be filled more than 2/3.

    b. Keep 1-2 inches of space between bottles.

6. Individual glassware pieces should be within a heat resistant plastic tray on a shelf or rack and never placed directly on the autoclave chamber bottom or floor.

7. Make sure that the door of the autoclave is fully closed and latched and ensure that the correct cycle for the items being autoclaved has

been selected before starting the cycle.

III. Opening

8. Wear the proper PPE, including heat resistant gloves, lab coat, eye protection and close toed shoes when opening the autoclave door after a cycle. If there is a sharps hazard (e.g. biological waste), wear heat and cut resistant gloves.

9. When the cycle is complete, open the door slowly. Keep your head, face and hands away from the opening.

Additional Practices for Autoclaving Liquids:

1. When running an autoclave cycle with liquids, the cycle time is longer but uses lower temperatures to minimize evaporation of the liquids. Liquid cycles also have a longer depressurization time to avoid "boil-over" of liquids.

2. To prevent bottles from shattering during the pressurization, the caps of containers with liquids must be loosened before loading.

3. Use only borosilicate glass (Pyrex™ or Kimax™) which can withstand the high autoclave temperatures.

4. Use a heat resistant "autoclave" tray with a solid bottom and walls to contain the contents and catch spills.

5. Wait 10 minutes after the cycle ends before removing autoclaved liquid load items.

6. Let the liquids stand for at least a full hour before touching with ungloved hands. Be sure to let others in the area know that a heat hazard is present.

Additional Practices for Autoclaving Dry Loads:

1. Add ¼ to ½ inch of water to the tray so that the bottles will heat evenly.

2. Check plastic materials to ensure that they are compatible with being autoclaved.

3. Before removing autoclaved items, wait 5 minutes after the cycle ends for loads containing only dry glassware.

4. For dry loads, let the glassware cool for a minimum of 15 minutes before touching it with ungloved hands.

Autoclave Failure:

Discontinue use immediately if an autoclave is not working properly. Post a sign alerting others not to use the autoclave. Include the date and your contact information. Mechanical failures need to be attended to by a trained technician. Contact the service company responsible for the maintenance of your autoclave or your department's safety representative for further guidance.

Burn Emergency:

If you are burned, you should seek medical treatment immediately. Burns to the face, third-degree burns or burns over large areas of the body should be treated as emergencies. (Call 911 on a land line or 225-578-3231). Minor burns should be treated by using first aid procedures, including immersing the burn in cool water immediately, removing clothing from the burn area and keeping the injured area cool for at least 5 minutes. Regardless of the severity, notify your supervisor. and the Employee Injury Call Center (877-764-3574). Follow the instructions provided by the registered nurse at the call center.

General Cycle Parameters:

121°C, 15 psi, for 30 minutes (variable – depends on load)

For prions: (per CDC) 132°C, 30 psi for 4.5 hours

Many industries have strict rules about monthly biological indicators on high organic loads and are required to profile generic waste loads such as sharps containers full of pipettes, etc., since many types of materials, such as plastics, do not conduct heat well. Each decon autoclave has a specific cycle time for a certain type of load. Most universities go by state law, or just specify a "safe" time, with overkill built in. Some Universities are required to test decon autoclaves weekly. The Louisiana Sanitary Code, Title 51, Part XXVII. Management of Refuse, Infectious Waste, Medical Waste,

and Potentially Infectious Biomedical Waste, Chapter 11, Treatment; states "autoclaving at a temperature of at least 120°C., (248°F.), and a pressure of at least15 pounds per square inch for at least 30 minutes."