Autoclaves: Safe Operating Instructions

General Operation

The effectiveness of decontamination by steam autoclaving is dependent upon the temperature, pressure and exposure time. Particular attention must be given to loading the autoclave, including the size of containers and their distribution in the autoclave. Containers must have good steam permeability and must be arranged in the autoclave in order to permit free circulation of steam. Tight fitting containers do not allow steam penetration. Stacking containers above one another and overloading can prevent steam contact resulting in failure to decontaminate the wastes.

There are two types of autoclave cycles, liquid and dry. It is important to choose the correct cycle:

**Dry cycles:** The temperature and pressure mount rapidly to 121°C / 15psi and hold for the desired time. At the end of this exposure time, the pressure drops rapidly until the autoclave is in a state of vacuum. It remains in a vacuum during the drying stage of the cycle. This can damage fragile containers, cause liquids to boil over or loose particles to be drawn into the plumbing. The dry cycle should therefore only be used for sturdy materials that have no loose or liquid components, such as empty glass, polypropylene and metal.

**Liquid cycles:** The temperature and pressure rise slowly to 121°C / 15psi and are held for the exposure period. The autoclave returns slowly to ambient pressure and unlocks at approximately 100°C. This cycle is the safest for all materials but particularly liquids, garbage (e.g., agar and plastics) and soils. The average cycle will take an hour to complete although it is set for 20 minutes.

Please follow the procedures below for loading, operating and monitoring the autoclaves on campus.

**Loading the Autoclave**

- the autoclave MUST NOT be overloaded with too many materials (allow space for steam penetration).
- low-sided autoclave containers/bins must be used and bags placed on their side.
- autoclave bags must not be sealed; they should be loosely taped with autoclave tape leaving an opening to allow for steam penetration.
- where possible leave the lids of containers loose to allow steam penetration.
- foil should be placed over the opening of graduated cylinders, flasks, etc.
- containers must not be overfilled (2/3 full is the max) or they will boil over.

**Operating the Autoclave**

- the time required for each load is dependent upon the volume and type of material (dense loads require much longer autoclave times).
- select the appropriate cycle for the load (e.g. liquid cycle with a slow exhaust for liquids; dry cycle for solid wastes.)
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- DO NOT abort the cycle to speed the process – open only after the completion of the cycle.
- Don the appropriate PPE (thick heat-resistant gloves, eye and face protection) anytime the autoclave door is opened. Be aware of the steam released upon opening – steam escapes at face level.
- Before removing your material from the autoclave, verify the autoclave cycle log to ensure correct decontamination parameters such as temperature and time were achieved.
- In the event of a malfunction follow the appropriate shut down procedures as prescribed by the autoclave manufacturer.
- If there is complete malfunction DO NOT OPEN; switch off the power and immediately contact your Supervisor.

Autoclave Monitoring and Testing

- Use autoclave tape with every load to ensure that the autoclave was turned on (note: this tape is not an indicator of sterility).
- Maintain records of each autoclave run, including the time, temperature, and pressure. A log book is provided in each autoclave room for this purpose.
- Use biological indicators (e.g., *Bacillus stearothermophilus* spores) at least weekly for autoclaves which are used for decontamination.
- Biological indicators (BIs) should be placed in the centre of the load during autoclave runs. Leave a positive control biological indicator outside the autoclave.
- Incubate the autoclaved and non-autoclaved BIs and verify for growth. Growth in the autoclaved BI indicates sterilization failure. No growth in the autoclaved BI indicates sterilization was achieved.
- Record all results on the Bio-Indicator Test Results form and send monthly to EHRS. Any unusual results must be reported immediately to the department Administrative Officer and to EHRS.

Training

- Before using this equipment, all autoclave users must be adequately trained in the safe use and operation of the autoclave including the quality control program.
- Training records for autoclave users must be maintained by each department using an autoclave.

Autoclave limitations

- Not all materials can be autoclaved: NEVER autoclave solvents, volatile chemicals, chlorinated compounds (HCl, bleach), corrosive chemicals (e.g. phenol, trichloroacetic acid, ether, chloroform etc), flammable material, radioactive material, some plastics.
- Items decontaminated with bleach do not require autoclaving,