DEPARTMENT OF MOLECULAR AND CELLULAR BIOLOGY

SAFE OPERATING PROCEDURE

AUTOCLAVE: STERIS MODEL SV-120

Purpose:
To provide safe operation and instructional use for the STERIS© Scientific Eagle Century™ SV-120 Sterilizer for research laboratory staff and students in the Department of Molecular and Cellular Biology. Operation and sterilization is regulated by the Ontario Boiler and Pressure Vessels Act.

Emergency contact: Jamie Jones, SCIE 4482 ext. 53816

Autoclaves for shared MCB use are located in:
SCIE 3402A | SCIE 3222B | SCIE 4402B | SCIE 4223B

Safety Precautions and Checklist:

- ✓ All operators must receive training prior to using the equipment. Please arrange training by contacting ***Jamie Jones (Department Support Technician), ext. 53816 / SCIE 4482.*** It remains the responsibility of the supervisor to ensure their personnel are adequately trained.
- ✓ Report any problems with the equipment, including unexpected noises, vibration, or smells to the contact above.
- ✓ The door opening is surrounded by a bezel that does not conduct heat to protect the operator from burns, but care must too be used as all inside walls and shelving can be very hot.
- ✓ Always wear suitable personal protective equipment (PPE). Closed toed shoes, lab coats and insulated gloves must be worn when handling autoclaved materials. When a splash hazard exists, face shields and aprons must be worn.
- ✓ Never attempt to sterilize flammable materials. The sterilizer is not designed for flammables and this may cause a fire or explosion.
- ✓ When sterilizing liquids, use liquid cycle only and do not agitate containers of heated liquids. Jarring containers can cause hot-bottle explosions. Place containers on carts or trolleys lined with paper to avoid shattering of glass.
- ✓ Use only heat resistant glass (Type I borosilicate glass, Pyrex), or heat resistant plastics (e.g., polycarbonate, PTFE, many polypropylene plastics) that are suitable for sterilization. Contact manufacturer for a list of approved materials. Unsuitable primary containers are made of polystyrene, polyethylene, and high density polyethylene. These types of plastics can melt in the autoclave. Ensure all lids have loose, vented closures to prevent pressurization/vacuum.

- ✓ ***Sterilizers, racks, and materials will be very hot after processing. Stand back from the sterilizer when opening the door, and allow materials to cool before unloading.***
- ✓ It is the responsibility of the user to immediately clean any spilled material or condensate from the floor to prevent slippage in addition to the chamber of the autoclave (after cooling).
- ✓ Keeps hands and arms out of the door opening when closing the sterilizer.

Operating Procedure:

Preparation of Materials:

❖ **Confirm all materials and containers are safe to autoclave.**

- Oils, waxes, some plastics, flammable materials, radioactive materials, and samples containing solvents or substances which may emit toxic fumes must not be autoclaved.
- All glassware and plastic to be autoclaved must be heat resistant.
- Glassware should be inspected glassware for cracks. Examples of heat resistant plastics include polycarbonate, PTFE, and many types of polypropylene.
- If any biohazard materials are to be autoclaved, ensure they are labeled appropriately and placed in a suitable container or autoclave bag. Dry biohazard material can **ONLY** be autoclaved in SCIE 4104B (i.e. tissue culture plates/petri dishes, gloves, pipettes etc.). Bags **MUST** be of a reasonable weight for the safety of all concerned. Overfilled or overweight bags will be returned to the lab for repacking.
- For loose, dry materials, place in a container loosely covered with aluminum foil or bag/wrap with an autoclave, steam penetrable material.
- For liquids, ensure containers are less than 2/3 full and lids/covers are fully loosened.
- Any sharps must be placed in a designated sharps container.
- Place items to be autoclaved in plastic or metal secondary containers for ease of handling and to capture any spills. Secondary containers must have sufficient volume to contain the contents.
- Apply thermal indicator tape to all materials to ensure visual sterilization process.

Loading Autoclave

- Ensure Personal Protective Equipment (PPE) and clothing is worn. You must wear closed toed shoes and a lab coat and insulated gloves when loading the autoclave. If the sterilizer has been recently used, these gloves will protect against accidental contact with hot surfaces.
- Step on foot pedal to open autoclave door.
- Place materials to be sterilized into the autoclave. Do not overload the sterilizer as steam must circulate in order to effectively sterilize the contents.
- Step on foot pedal to close autoclave door.

Operating Autoclave

- From touch panel, select the appropriate cycle time for sterilization. There are 6 cycles to choose from (see Table 3 below).
- For liquid sterilization, refer to Table 1 for recommended sterilization times.
- When cycle is complete, a message will display on the screen.

- Never attempt to open the door while the autoclave is in operation.
- **To abort the cycle: do so from the touch screen options, not the emergency stop button.** Do not immediately open the autoclave, as there may be residual steam after the cycle has aborted. After waiting for at least a minute, stand well back or aside and use the foot pedal.

Unloading Autoclave:

- Wear PPE when unloading the autoclave (lab coat, insulated gloves and closed toed shoes). A face shield and splash apron should be worn if a splash hazard exists.
- Stand back from the door, and depress the foot pedal. Keep back from the door as residual steam may be released.
- Allow sterilized material to stand for 10 minutes before unloading. For large loads, items may need to stand for an additional 10 minutes. Do not remove caps or agitate containers of heated liquids.
- Remove the items from autoclave and place material on cart lined with paper or paper towel (this will prevent shattering of glass which may occur if it is place directly on metal). **Place in an area which clearly indicates the items are 'HOT'** to inform users entering the room of a safety hazard. Allow items to cool to room temperature.
- Clean the autoclave. Do not use chloride-containing solutions as these may corrode the metal components of the autoclave.

Autoclave Log:

- Entries must be placed in the log books each time autoclaves are used. These records are used for maintenance/service schedules and reporting of incidents, accidents or faults. Log information must include date used, name of operator and research lab, cycle used, and cycle parameters.

Sterility Assurance:

- Quality control programs for sterility assurance are coordinated by the autoclave contacts and are not the responsibility of typical operators.

Table 1: Steam Cycle Times - Liquids

Volume of Liquid in one container	Minimum recommended sterilize time at 121°C (250°F) in minutes
75 mL	25
250 mL	30
500 mL	40
1000 mL	45
1500 mL	50
2000 mL	55
>2000 mL	55 + 10 min/L

Table 2: Gravity Cycle Parameters		
Items	Minimum recommended sterilize time at 121°C (250°F) in minutes	Dry time in minutes
Glassware, empty, Inverted, without closures	15	0
Instruments, metal combined with suture, tubing or other porous materials (unwrapped)	20	0
Hard Goods, unwrapped	15	0
Hard Goods, wrapped in muslin or equivalent	30	30

Contingency Plans:

Equipment Malfunction:

- If you encounter smoke or steam escaping the unit or water flooding the floor, press the Emergency Stop (red button) and immediately leave the room. Contact the appropriate person for the autoclave and post a notice on the door.
- If there autoclave does not operate exactly as expected, but the malfunction does not appear to put people or property in danger, abort the cycle using abort button on touch screen. Place notice on autoclave indicating that it is out of service.
- Contact the appropriate contact person (see above) to arrange for investigation or repair.

Incident Response:

- If any injury occurs, seek first aid, and if necessary dial ext. 2000 and request emergency medical assistance.
- Should clothing become saturated with hot water or steam, remove it immediately and cool the affected area in cool water.
- Place a notice on the autoclave indicating that it is not to be used until the accident has been investigated.
- All incidents must be reported using the University of Guelph Injury/Incident Report Form, available at: https://www.uoguelph.ca/hr/hr-services-environmental-health-safety/forms
- The supervisor of the individuals involved must be notified, and the form must be submitted to the Department Chair's office: SCIE 4478. The completed form must be faxed to EHS within 24 hours.

Spill Cleanup:

- Spills may occur from boil over or breakage of containers. Do not attempt to operate the autoclave until the spill has been cleaned up.
- If a spill occurs, review the MSDS for items being sterilized, wear PPE, prevent the spill from spreading and wait until both the autoclave and the material inside have cooled to room temperature. Do not attempt to clean a spill when it is hot. Clean affected area and dispose of waste appropriately. Any broken glass must be placed in a sharps container.
- The operator of the equipment is responsible for spill cleanup. Record the spill in the autoclave log book.

Routine autoclave maintenance is required to avoid breakdowns and limit service interruptions.

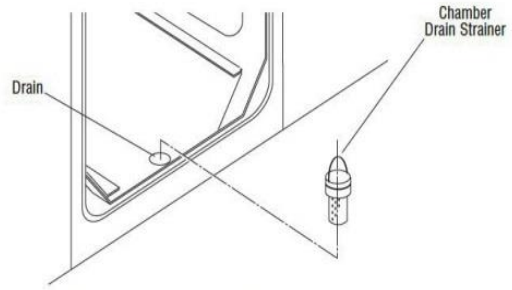
Clean chamber drain strainer daily before initial run, and after each media spill:

This ensures efficient steam flow, proper exhaust venting and reduces service calls. The most common cause for "too long in slow exhaust" alarm is a clogged drain strainer. Use a gloved hand to pull the strainer straight up and follow the 4 steps in the manufacturer's directions below. Be careful not to pull on the float alarm to the left of the strainer.

BURN HAZARD: *Failure to shut off the steam supply when cleaning or replacing strainers can result in serious injury. Allow sterilizer to cool to room temperature before performing any cleaning or maintenance procedures.*

IMPORTANT: The chamber drain strainer must be cleaned at least once a day, preferably in the morning before running the first cycle.

1. Remove the drain strainer from the drain in the bottom of the chamber as shown in Figure 11-1.
2. Remove any obvious debris from the strainer. If necessary, clear the screen in the strainer using a brush, wire or similar tool.
3. Once it has been cleared of obvious debris, reverse flush the strainer under running water.
4. Replace the strainer in the chamber drain.



Check that the recording device is working daily:

If the printer is running out of ink or paper is running low contact Jamie Jones ext. 53816, SCIE 4482. If you change the paper yourself, please ensure that the paper goes over the top of the take-up roller. If it goes under, the paper will hang down the front of the autoclave.

For Monthly Maintenance:

Ask Jamie Jones to turn off the steam, wait for the chamber walls to cool and clean the walls and ceiling of autoclave with a sponge mop and a mild detergent, nothing abrasive. Allow the cleaning water to run down drain to assist in cleaning the drain line.

Table 3: Autoclave Cycle Pre-Set	
1. Liquid 20	**|** Cycle Temp – 121°C **|** Sterilization Time – 20 min. **|** Dry Time – None **|** ***Total Run time – 50 min.***
2. Liquid 30	**|** Cycle Temp – 121°C **|** Sterilization Time – 30 min. **|** Dry Time – None **|** ***Total Run time – 60 min.***
3. Liquid 45	**|** Cycle Temp – 121°C **|** Sterilization Time – 45 min. **|** Dry Time – None **|** ***Total Run time – 75 min.***
4. Liquid 60	**|** Cycle Temp – 121°C **|** Sterilization Time – 60 min. **|** Dry Time – None **|** ***Total Run time – 90 min.***
5. Dry 20	**|** Cycle Temp – 121°C **|** Sterilization Time – 20 min. **|** Dry Time – 10 min **| *Total Run time – 45 min.***
6. Variable	*Cycle can be altered to specific user need. Refer to the instrument contact name(s) for information on programming.*

IF THE AUTOCLAVE ALARMS OR IF YOU HAVE ANY QUESTIONS OR CONCERNS, PLEASE CONTACT: JAMIE JONES AT EXT. 53816, SCIE 4482

DO NOT PUSH THE EMERGENCY STOP BUTTON TO ABORT CYCLE. IF YOU NEED TO ABORT THE CYCLE, DO SO FROM THE TOUCH SCREEN OPTIONS.

DO NOT MANUALLY FORCE THE DOOR UP OR DOWN, PLEASE USE THE FOOT PEDAL.

KEEP AUTOCLAVE DOOR IN CLOSED POSITION WHEN NOT IN USE.

LISTING OF WARNINGS AND CAUTIONS – STERIS Corp © 2005 – 129373-635

The following is a listing of the safety precautions which must be observed when operating the equipment. 'WARNINGS' indicate the potential danger to personnel and 'CAUTIONS' indicate the potential damage to equipment. Carefully read all safety precautions before using the equipment.

WARNING – ELECTRIC SHOCK AND BURN HAZARD:

Disconnect all utilities to sterilizer before servicing. Do not service the sterilizer unless all utilities have been properly locked out. Always follow OSHA Lockout- Tagout and electrical safety related work practice standards.

WARNING – PERSONAL INJURY HAZARD:

Avoid personal injury from bursting bottles. Liquid sterilization cycle must only be used for liquids in borosilicate (pyrex) flasks with vented closures.

When closing the chamber door. Keep hands and arms out of the door opening and make sure opening is clear of obstructions.

In case of emergency situation, press the Emergency Stop Button to halt sterilizer and contact a qualified service technician to return sterilizer to normal operation.

Door must be locked and the key retained prior to entering chamber for servicing. Always follow appropriate lockout-Tagout and electrical safety related work practice standards. Emergency stop button can be depressed and key retained for this purpose.

WARNING – BURN HAZARD:

When sterilizing liquids, to prevent personal injury or property damage resulting from bursting bottles and hot fluid, you must observe the following procedures:

- Use liquid cycle only; no other cycle is safe for processing liquids.
- Use only vented closures; do not use screw caps or rubber stoppers with crimped seal.
- Use only Type 1 borosilicate glass bottles; do not use ordinary glass bottles or any other container not designed for sterilization.
- Do not allow hot bottles to be jolted; this can cause hot-bottle explosions. Do not move bottles if any boiling or bubbling is present.

Sterilizer, rack/shelves, and loading car will be hot after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron must be worn when reloading sterilizer following the previous operation.

⚠ Do not attempt to open the sterilizer door if a WATER IN CHAMBER ALARM condition exists. Call a qualified service technician before attempting to use sterilizer.

⚠ After manual exhaust, steam may remain inside the chamber. Always wear protective gloves, apron and a face shield when following emergency procedure to unload sterilizer. Stay as far back from the chamber opening as possible when opening the door.

⚠ Allow sterilizer to cool to room temperature before performing any cleaning or maintenance procedures.

⚠ Failure to shut off the steam supply when cleaning or replacing strainers can result in serious injury.

⚠ Jacket pressure must be 0 psig (0 bar) before beginning work on the steam trap.

⚠ Proper testing of the safety valve requires to be operated under pressure. Exhaust from the safety valve is hot and can cause burns. Proper safety attire (gloves, eye protection, insulated overall) as designated by OSHA, is required. Testing is to be performed by qualified service personnel only.

WARNING – EXPLOSION HAZARD:

⚠ This sterilizer is not designed to process flammable compounds.

WARNING – SLIPPING HAZARD:

⚠ To prevent falls keep floors dry by immediately wiping up any spilled liquids or condensation in sterilizer loading or unloading area.

WARNING – PERSONAL INJURY AND/OR EQUIPMENT DAMAGE HAZARD:

⚠ Regularly scheduled preventative maintenance is required for safe and reliable operation of this equipment. Contact your STERIS service rep to schedule preventative maintenance.

⚠ When closing the chamber door, keep hands and arms out fo the door opening and make sure opening is clear of obstructions.

⚠ Repairs and adjustments to this equipment must be made only by fully qualified service personnel. Maintenance performed by inexperienced, unqualified persons or installation of unauthorized parts could cause personal injury or result in costly equipment damage.

WARNING – STERILITY ASSURANCE HAZARD:

Load sterility may be compromised if the biological indicator or air leak test indicates a potential problem. If these indicators show a potential problem, refer the situation to a qualified service technician before using the sterilizer.

According to the AAMI and EN285 standards, a measured leak rate greater than 1mm Hg/min (1.3mbar/min) indicates a problem with the sterilizer. Refer the situation to a qualified service technician before using the sterilizer.

CAUTION – POSSIBLE EQUIPMENT DAMAGE:

Gasket must be fully retracted prior to operating the sterilizer door

If 0 dry time is selected, sterilizer automatically initiates a vapor removal phase in place of drying. This phase can still draw a vacuum to 5 inHg. Consult device manufacturer's recommendations to ensure devices being processed can withstand this depth of vacuum.

Never use a wire brush, abrasives or steel wool on door and chamber assembly. Do not use leaners containing chloride on stainless steel surfaces. Chloride-based cleaners will deteriorate stainless steel, eventually leading to failure of the vessel.

Allow thermostatic traps to cool down to room temperature before removing cover. Since there is nothing to limit expansion, the bellows may rupture or fatigue if trap is opened while hot.

Actuation at less than 75% of rated pressure can allow debris to contaminate the seat and cause the safety valve to leak. A leaking safety valve must be replaced.

Insufficient service clearance will make repairs more difficult and time consuming.

Piping sized too small may cause water hammer, resulting in damage to the sterilizer.

After installation, it is mandatory to brace piping at drain funnel so that it will not move vertically.

Make sure door opening is clear of any obstructions before closing the door.

Do not attempt to open sterilizer door during manual operation unless chamber is at 0 psig (0 bar).

During manual operation, gasket must be fully retracted prior to operating sterilizer door.

⚠ Immediately wipe up saline solution spills on loading car, to prevent damage to stainless steel.

⚠ Do not use cleaners containing chlorides on loading cars. Chloride based cleaners will deteriorate the loading car metal.

⚠ Sterilization of chloride-containing solutions (e.g. saline) can cause chamber corrosion and is not recommended by the manufacturer. If, however, chloride-containing solutions must be processed, clean the chamber after each use.