Safety Unit
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Autoclave Safety Instructions

An autoclave uses hot steam and super atmospheric pressure in order to sterilize solutions / items and destroy living organisms.

Due to the physical and biological risks inherent in working with autoclaves, workers / students who operate autoclaves are supposed to undergo training given by the manufacturer / vendor of the device, and from the entity appointed as being responsible for the device.

1. At every laboratory / unit operating an autoclave, a person who is responsible for the device is to be appointed, whose job it is to instruct those wishing to work with the device and to check the good working order of the device, once a week.
2. Make sure that the autoclave is inspected once a year (by a qualified inspector) and that a Standard label sticker has been affixed.

3. The responsible person will obtain operating instructions and practical drilling from the autoclave vendor.
4. The operating instructions are to be kept in close proximity to the device, together with the telephone numbers of the vendor and a list of people trained to work with the autoclave
5. Furthermore, telephone numbers are to be kept next to the device for contacting the person responsible for the autoclave and of the company technician.
6. The duties of the responsible person will be to carry out functionality /effectiveness testing, using a Bacillus Stearothermophilus Spore test kit, at least once a month (details in the additions clause).

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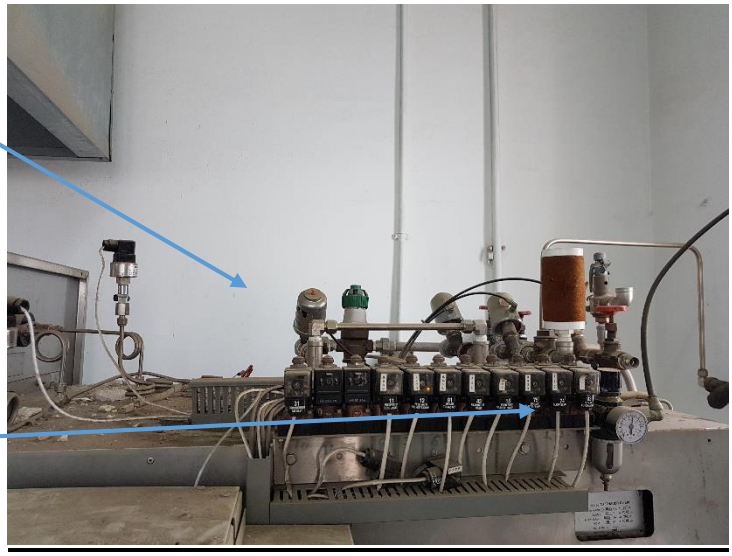
The Structure of the Autoclave:

Safety valve



Steam supply

Fluid drainage

Steam Supply Line:

Local generator:

The steam is supplied to the autoclave from a reservoir of water which is part of the autoclave. The manufacturer's operating instructions, with respect to the quantity and quality of the water, are to be adhered to.

Central generator:

The stream is supplied to the autoclave, via a pipeline from a remote water reservoir. It is crucial to refrain from the contamination of the pipeline and of the reservoir, in the event that the drainage of the fluids at the end of the process, is back to the steam generator.

Safety valve:

Opens in the case of excess pressure in the interior of the autoclave. Ensure the good working order of the autoclave prior to every use (exterior inspection). Do not use the autoclave if the valve is bent or blocked.

Drainage of fluids:

Upon the conclusion of the sterilization process, the steam condenses into a liquid, and is drained through the drainage aperture, which is located at the bottom of the autoclave, into: The reservoir - in the autoclave with **a local generator,** or into the sewage system or back to the steam generator, in the case of **a central generator**.
In the event that the drainage aperture is blocked, it is to be cleaned at once, in order to facilitate the drainage of the fluids from the interior of the autoclave.

Do not use the autoclave when the filter is blocked.

Protective equipment is to worn when working with / operating the autoclave:

- A long sleeved laboratory coat
- For regular autoclave operators: Wear a rubber apron over the laboratory coat when removing equipment from the autoclave.

- Gloves
- Heat resistant gloves (which are to be worn only when removing hot equipment from the autoclave).

- Protective goggles, with a preference for a face protector.
- Closed toe shoes.
- Sleeve protectors (make sure that the arms are well covered, in order to refrain from heat and steam burns, or as a result of the inadvertent spraying of hot liquids).

Preparing the Autoclave:

1. Check the autoclave sealers system. Make sure that there are no cracks / protrusions or swelling of the sealing system. The seals must be smooth and flexible.
2. Ensure that the drainage aperture is not blocked and that it does not contain remnants from previous operations.
3. In the case that any problem whatsoever is detected, contact the person appointed as the entity responsible for the autoclave in the department / laboratory.

Preparing Items:

1. The following items are not to be placed inside the autoclave: Flammable or reactive items, materials the boiling point of which is less than 100^0 C, toxins (in the case of doubt, contact the safety unit), corrosive substances, bleach, cytotoxic materials, organic solvents or radioactive materials.
2. Make sure that plastic items placed in the autoclave are suitable and are resistant to heat and to the autoclave (see the additions clause).
3. Check glass vessels and make sure that they are not cracked.
4. When placing liquids in the autoclave for sterilization: Leave the stopper of the vessel loosely closed, or cover the aperture with any means that will facilitate the entry of steam into the vessel, and in order to prevent the vessel exploding due to pressure

building up inside it. Do fill bottles more than 2/3 full of liquids in order to prevent liquids escape. Place the bottles containing the liquids in the reservoir tank and add 2 cm. of water in order to achieve uniform heat dispersal.

5. With respect to biological waste (in a bio-hazard packet): Close the packet loosely: Leave an opening of at least 5 cm. in order to allow the entry of steam and achieving the effective sterilization of the waste. In the case that the packet of waste is placed in a container, the packet can be left open. In order to prevent spillage that might be caused as a result of the explosion of the bio-hazard packet, it would be advisable to place the packet into a suitable container / bucket. The packet is not to be filled than 2/3 of its capacity, in order to facilitate effective sterilization.

6. Regarding a container of sharp waste, ensure that the pressure release aperture is open.

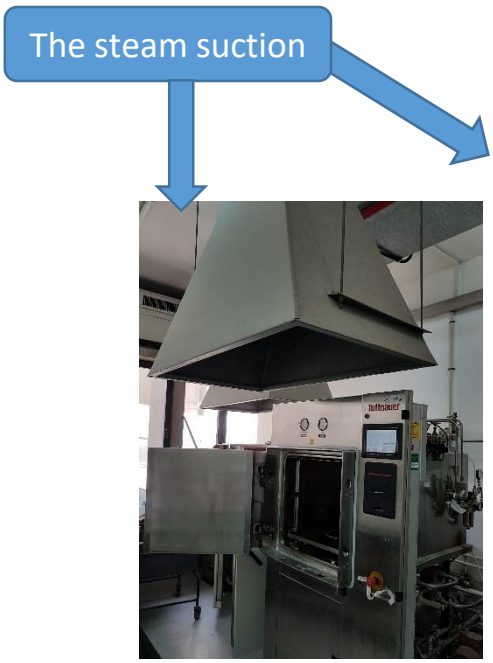
7. In order to streamline the sterilization process of dry waste, a little water can be added (carefully, in order to prevent aerosols forming) to the waste packet or the sharp waste container.
8. For sterilizing bottles: Release the bottle stoppers. It is recommended to cover the bottles with aluminum foil and lay the stoppers next to the bottle.

Placing Items:

1. Ensure that nothing is spilled when placing items in the autoclave.
2. Place the items on a tray / deep container, in the case of spillage / explosion. Never place items on the bottom of the autoclave.
3. Do not overload the autoclave. Leave gaps between the items, in order to facilitate the steam reaching all over.
4. In the event of dry waste, 100 mm. of water can be added to the packet, container, in order to streamline the sterilization process.

Operation:

1. Switch on the pumping system located on / next to the autoclave.



2. Make sure that the door is properly closed, prior to operating the device.
3. Select a sterilization program pursuant to the item being sterilized, (for example: Dry materials - containers, liquids, biological waste, etc.).
4. Check that the autoclave is functioning properly 20 minutes after operation.
5. The door of the autoclave is not to be opened during the sterilization process.
   As required, terminate the operation of the device and wait until the pressure in the autoclave stabilizes.
6. In the case that there is a malfunction in the operation, inform the entity responsible for the autoclave.

Removing the Items:

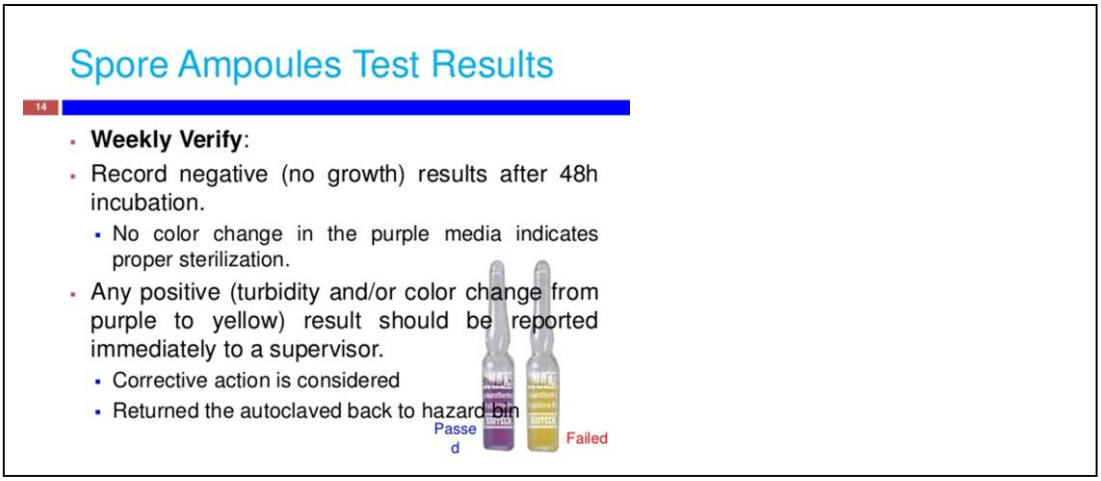
1. After completing the process, ensure that the interior temperature of the autoclave has decreased and that the internal pressure has reached 0.
2. Wear protective gear, in order to protect yourself against heat and steam.
3. Open the door slightly, (not fully) in order to allow hot steam to escape. Do not stand in front of the door, but rather to the protected side.
4. Leave the items inside the autoclave for 10 minutes before touching them.

5. Carefully take the items out of the autoclave and lay them aside to cool. Do not shake the containers / packets / bottles in order to prevent boiling or overheated liquids from spraying out of the containers (in the event that they are moved too rapidly).
6. Biological waste that has been sterilized in an autoclave, can be disposed of in the municipal garbage bins, after the bio-hazard symbol has been deleted (or crossed out with an X).

A Method for Testing the Effectiveness of the Sterilization Process

1. Chemical test: By using striped tape that changes color when affected by heat.
   A change in the color of the stripes in the tape does not attest to the effectiveness of the sterilization process, but only to the fact that the heat was achieved inside the autoclave.

2. Biological test: By using a kit containing Bacillus Stearothermophilus spores.
   The commercial kit serves as a quality control of the effectiveness of the sterilization process. The kit contains spores that are resistant to heat. The spores are destroyed at 121^0 C after exposure of 13 minutes. The success of the destruction of the spores will predict the effectiveness of the sterilization process. It is crucial to position the biological sensor in the center of the items being sterilized.



A change in the color of the sensor (ampule) after incubation (55^0 C) for a period of 24 hours attests to a non effective sterilization process.

Additions:

Resistant in an Autoclave	Not resistant in an Autoclave
Borosilicate (Pyrex) glass.	Regular glass
Polypropylene (PP)	Polystyrene (PS)
Stainless steel vessel	Polyethylene (PE)
Stainless steel	
Biohazard bag	

Risks in Working with an Autoclave:

1. Breakage of a glass vessel or spillage from containers containing contaminated biological fluids, upon placement in the autoclave.
2. Burns of the skin as a result of touching the interior sides (as well as pipes) of the autoclave.
3. Accumulation of steam and water due to the blockage of the drainage filter.
4. Release of toxic gases.
5. The shattering of a glass vessel, containers of fluids and packets containing waste, while the machine is in operation.
6. Escape of steam when opening the autoclave door (upon completion of operation).
7. Hot fluids escaping when removing the items being sterilized from the autoclave, upon the completion of the sterilization process.
8. Opening the door of the autoclave in the middle of the sterilization cycle as a result of damage caused to the impermeability of the device, the release of the pressure valve and occasionally the explosion of the autoclave machine itself.