



Subject: Medical Instrumentations  
Lecturer: MSc. Mohammed Tareq Fakhri  
Class: Second Class  
Academic year: 2023-2024  
Lecture: Third lecture



## Auto Clave

**Introduction:** Is an instrument used moist heat sterilization techniques by using steam in the range of 121-134°C. Steam under pressure is used to generate high temperature needed for sterilization.

Saturated steam (steam in thermal equilibrium with water from which it is derived) acts as an effective sterilizing agent. Steam for sterilization can be either wet saturated steam (containing entrained water droplets) or dry saturated steam (no entrained water droplets).

**Autoclaves use pressurized steam** to destroy microorganisms, and are the most dependable systems available for the decontamination of laboratory waste and the sterilization of laboratory glassware, media, and reagents.

This method of sterilization works well for many metal and glass items but is **not** acceptable for rubber, plastics, and equipment that would be damaged by high temperatures



Fig 1 autoclave



## Why is it called an autoclave?

Because it describes a device that automatically locks shut when the pressure rises (to avoid steam spraying out if you open it by accident).

### ➤ Theory of Operation

An autoclave is a large pressure cooker; it operates by using steam under pressure as the sterilizing agent. *High pressures enable steam to reach high temperatures*, thus increasing its heat content and killing power. Most of the heating power of steam comes from its latent heat of vaporization. This is the amount of heat required to convert boiling water to steam. Ensure that there should be sufficient water in the autoclave to produce the steam. The stages of operation of autoclaves include air removal, steam admission and sterilization cycle (includes heating up, holding/exposure, and cooling stages).

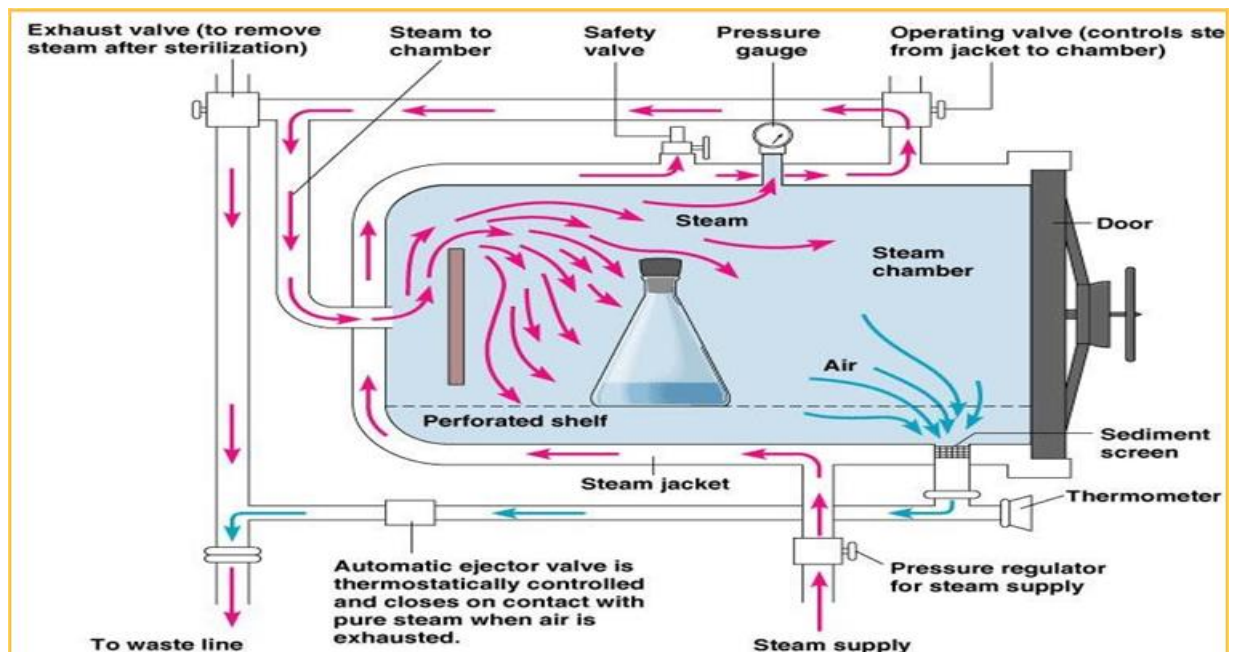


Fig 2 autoclave system



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Autoclaves, or steam sterilizers essentially **consist of** the following:

1. Fully stainless high-alloy steel structure .
2. Digital display of working status, touch of key.
3. Manual or semi-automatic control.
4. Auto discharge the cool air, and steam discharging automatically after sterilization.
5. Automatically shut off with beep reminding after sterilization
6. The accident protection system.
7. Automatic off of heating elements at reducing of a water level.
8. Blocking top cover at working.
9. Blockage of starting at opening.
10. Heater protection sensor.
11. Pressure and water level control.
12. With three stainless steel sterilizing baskets.
13. Water heating system or steam generating system
14. Single or double doors with locking mechanism.
15. Thermometer or temperature gauge
16. Pressure gauges

Safety valve: it is a system simply contain valve with mechanical principles that work on spring push to the lever that close pipe which out from it steam.

## ➤ Principle of Operation

The diagram of an autoclave (figure 2) shows the simplicity of its operation:

1. The steam enters the chamber, passes through an operating valve and enters therear of the chamber behind a baffle plate.
2. It flows forward and down through the chamber and the load, exiting at the frontbottom.



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3. A pressure regulator maintains the chamber pressure at a minimum of 15 psi, the pressure required for steam to reach 121°C (250° F).
4. Overpressure protection is provided by a safety valve.
5. The conditions inside are thermostatically controlled so that heat (more steam) is applied until 121°C is achieved, at which time the timer starts, and the temperature is maintained for the selected time.

➤ **What is the standard temperature and pressure of an autoclave?**

Processes conducted at high temperatures for short time periods are preferred over lower temperatures for longer times.

Some standard temperatures/pressures employed are 115 °C/10 p.s.i., 121 °C/15 p.s.i., and 132 °C/27 p.s.i. (psi pounds per square inch). Autoclave, autoclaving generally involves heating in saturated steam under a pressure of approximately 15 psi, to achieve a chamber temperature of a least 121°C (250°F) but in other applications in industry, for example, other combinations of time and temperature are sometimes used. Please note that after loading and starting the autoclave, the processing time is measured after the autoclave reaches normal operating conditions of 121°C (250°F) and 15 psi pressure, NOT simply from the time you push the "on" button



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## ➤ GENERAL AUTOCLAVE SAFETY GUIDELINES

### OPERATE

- ✓ Follow the manufacturer's user manual and laboratory SOP for operating the autoclave.
- ✓ Close and lock the door. Ensure the door is secure before starting a cycle.
- ✓ Select appropriate cycle (e.g. dry heat, sterilize media, sterilize biohazardous waste).
- ✓ Record run on log sheet.
- ✓ Check about 20 minutes into the cycle to verify the autoclave has reached sterilization temperature (121°C).
- ✓ Do not open the autoclave door during a cycle! If necessary, abort the cycle and wait until the chamber depressurizes.
- ✓ If cycle fails, notify the person responsible for the autoclave. Items may not be sufficiently decontaminated if the cycle did not complete.

### UNLOAD

- ✓ When the cycle is complete, verify that chamber temperature has dropped and pressure is zero.
- ✓ Wear appropriate PPE to protect yourself from heat and steam (e.g. heat-resistant gloves, lab coat, safety glasses).
- ✓ Slowly open the door to allow steam to escape gradually. Keep your face away from the door.
- ✓ Allow items to stand in the autoclave for 10 minutes.
- ✓ Cautiously remove items, and place in a safe area to cool. Do not agitate containers as boiling or superheated liquids can explode if moved too quickly.
- ✓ Record cycle information on autoclave log sheet or logbook



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