







STERILIZATION


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- Sterilization is a process to kill any microorganisms that exist, so if grown in a medium there is no micro-organism that can breed
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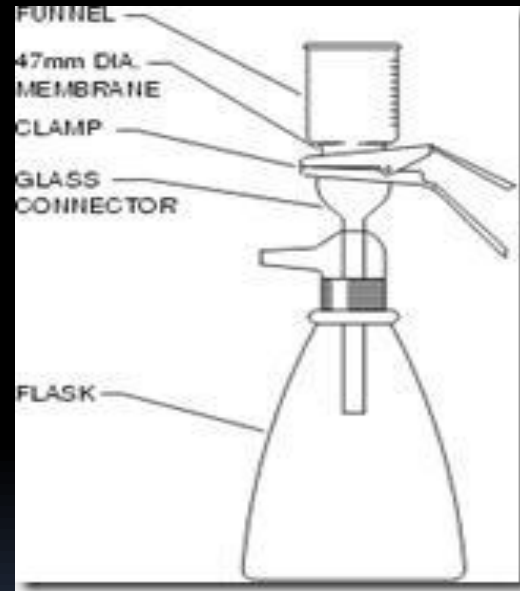
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- Sterilization should be able to kill microorganisms is the most heat resistant bacterial spores (Fardiaz, 1992).
 - The existence of the growth of microorganisms showed that the growth of bacteria is still going on and incomplete process of sterilization
 - If sterilization is complete, the spores of bacteria that are most resistant forms of microbial life will be crushed (Lay and Hastowo, 1992).

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- Sterilization can be done in various ways, namely heat, filtration, radiation, and the addition of chemicals.
 - While sterilization by heat consist of:
 1. mechanics (filtering)
 2. physical (wet heating, dry heating, gradual heating, boiling, ionizing radiation, UV radiation)
 3. chemical




Filtering

- Screening is the process of sterilization is performed at room temperature. Sterilization by filtration is used for heat sensitive materials such as serum, urea and enzymes (Lay and hastowo, 1992).
 - By way of filtering a solution or suspension was acquitted of all living organisms in a way to do it through the filter with pore size is so small that bacteria and cells of the larger suspended above it, while the filtrate is collected in a sterile container (Hadioetomo, 1985).
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Dry heating

- dry heat is less efficient and require higher temperatures and longer time for sterilization, because without moisture, there is no latent heat (Hadioetomo, 1985)
- Dry heat can cause dehydration and oxidation of cell components in the cell (Fardiaz, 1992).
- The advantage of dry heat is the absence of water vapor or wet material is sterilized equipment, other than that equipment used for dry steam sterilization is cheaper than wet steam (Lay and Hastowo, 1992)
- Dry heat sterilization is often performed in glass equipment in laboratories, which use the oven with a temperature of 160-180 °C for 1.5 to 2 hours with static air system (Fardiaz, 1992).
- To use dry heat sterilization:
Wrap the tools glass with paper umbrellas or aluminum foil
Set the oven thermostat to 1800C and sterilized equipment for 2-3 hours.

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- 170°C (340 F) → 1 hour
 - 160°C (320 F) → 2 hours
 - 150°C (300 F) → 2,5 hours
 - 140°C (285 F) → 3 hours

Gradual warming


- Gradual warming done when the media or chemical vapor resistant to 100 °C (Lay and Hastowo, 1992).
- Gradual warming (tyndalization) is done by heating the medium or solution using steam for one hour every day for three consecutive days.
- The concept of this method like by steaming.
- Materials containing water and can not stand the pressure or high temperature more precisely sterilized with this method.
- For example, milk is sterilized with high temperatures will have a starchy material coagulation and sterilized at a temperature of pressurized at acidic pH conditions will be hydrolyzed.

How it works:

- Materials incorporated into erlenmeyer or bottles and sealed with a cork or aluminum foil.
- Erlenmeyer / bottle and then inserted into the sterilizer (using standard tools Arnold Steam Sterilizer or cormorant).
- Turn on the heat source and wait until the thermometer shows the temperature of 100 °C and then countdown timer to 30 minutes (hot steam that is formed will kill microbes).
- When finished sterilizer is turned off and the sterile material removed
- After 24 hours, the material is sterilized again in the same way, while the time is intended to allow spores or vegetative cells that have not died to grow so easily killed.



Boiling

- Boiling water is heating in boiling water or steam at a temperature of 100°C for several minutes (Fardiaz, 1992).
 - At this temperature the vegetative cell is turned off, while the spores can not be eliminated (Lay and Hastowo, 1992).
 - Some bacteria are resistant to boiling temperature, such as *Clostridium perfringens* and *Clostridium botulinum* stay alive despite boiled for several hours (Lay and Hastowo, 1992)
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- UV Radiation


Ultraviolet light with shorter wavelengths have a very strong antimicrobial power. These drugs are absorption by nucleic acids without causing damage to the cell surface. The damage can be repaired when irradiated with a file that has a longer wavelength (Lay and Hastowo, 1992).



Wet Heating

Wet heating sterilization is used in conjunction with water vapor.

Wet heating is usually performed in a steam autoclave or sterilisator easily removed using a saturated water vapor pressure at a temperature of 121 °C for 15 minutes (Hadioetomo, 1985).



Wet heating can to kill micro-organisms or microorganisms, especially because wet heat may cause denaturation of proteins, including enzymes inside the cell (Fardiaz, 1992).

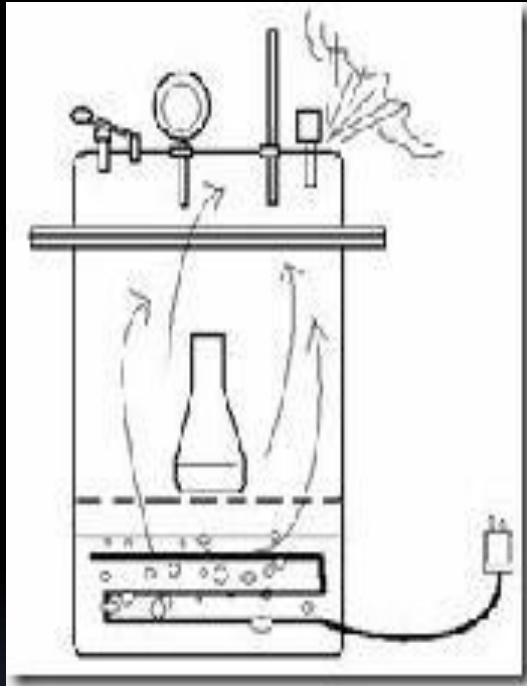
Heating with autoclave

- This device consists of a place that is resistant to high pressure which is equipped with a thermometer and barometer and kleb

To using autoclaves :

- fill water container with water then inserted into the autoclave equipment or materials.
- Set the regulator valve is closed so that the escape of water vapor pressure inside the autoclave reached 2 atm and a temperature of 121° and allow the sterilization lasted 15-30 minutes.
- For sterile drug preparations in volume less than 100ml performed sterilization 115° - 116° for 30 minutes while for the stocks in more than 100 ml in volume performed sterilizations performed until the entire contents are in a temperature of 115° - 116° with a time of 30 minutes.
- After autoclave sterilization is finished let it cool until the pressure shows the number 0 then the regulator valve is opened and last closed vessel is opened.

How autoclave work???

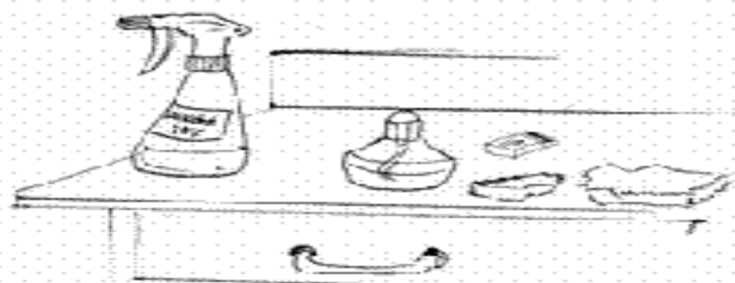


- At the time of the heat source is turned on, water in an autoclave over time will boil and steam water formed that fills the air urging the autoclave.
- After all the air in the autoclave was replaced with water vapor, valve steam / air closed so the air pressure in the autoclave rises.
- At the time reached the appropriate pressure and temperature., Then the sterilization process begins and the timer starts counting timer.
- After the sterilization process is complete, the heat source is turned off and the pressure allowed to drop slowly until it reaches 0 atm. Autoclave must not be opened before the pressure reaches 0 atm.

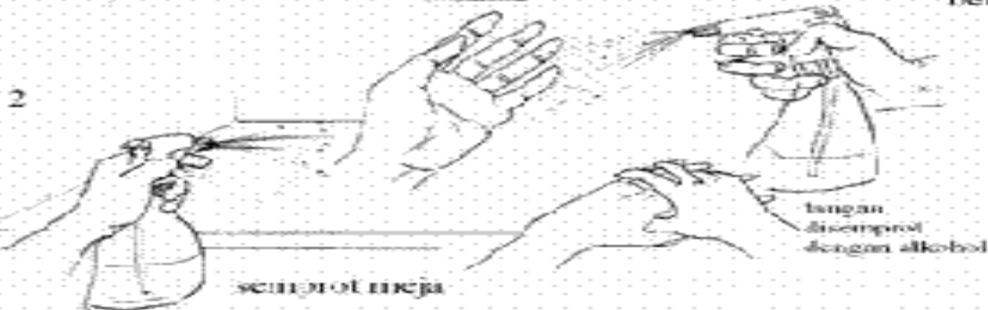
The addition of chemicals

- sterilization using chemicals. Usually using disinfectant compounds.
- Disinfectant is a chemical that can kill vegetative cells of microorganisms. The process called disinfection.
- Chemical substances that are disinfection:
 - 1) Phenol and its derivatives as a disinfectant and antiseptic
 - 2) Alcohol, for example: 50-70% ethanol
 - 3) Halogen and their groups, for example: iodine (infected skin before surgery), hypoklorit (sanitation, household equipment)
 - 4) Heavy metals, for example: merkurochrom, mertiolat (antiseptic), silver nitrate (eye drops preventing eye disease in infants)
 - 5) Detergent
 - 6) The names of aldehydes, ex formaldehyde
 - 7) Gas sterilizer, used for material or equipment that can not be sterilized with high heat or with liquid chemicals.

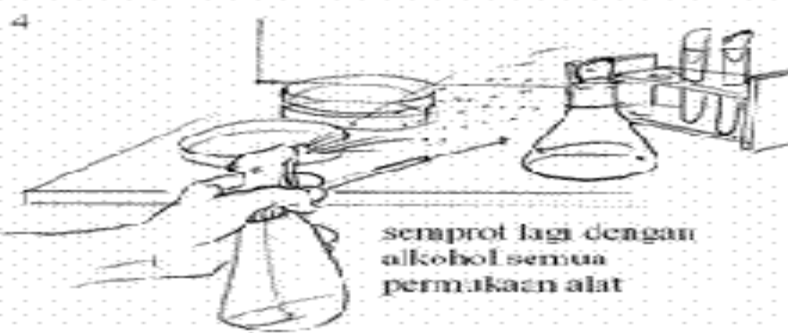
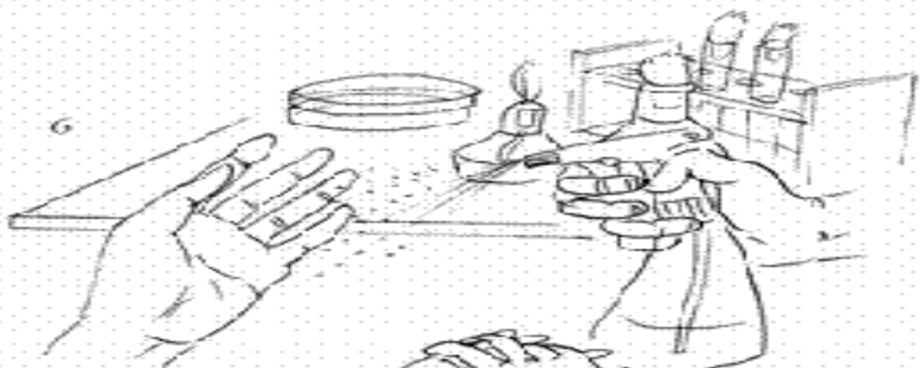
MENSTERILKAN MEJA KERJA



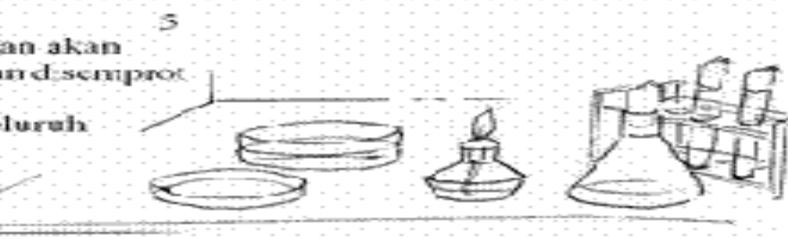
1
semprot sekitar meja kerja dengan alkohol 70% beberapa kali, sampai merata



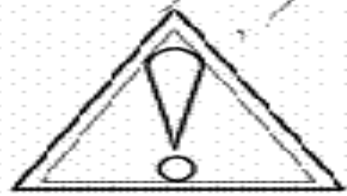
3
letakkan alat dan bahan yang diperlukan



4
semprot lagi dengan alkohol semua permukaan alat



5
letakkan pembakar spiritus lalu biarkan sebentar



hati-hati alkohol sangat mudah terbakar



MICROSCOPE

- Type of microscope???
 - Part of microscope???
 - Functions part of microscope???
 - How use the microscope???
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