Practical Microbiology

Cihan University
Medical Laboratory Analysis

Lab 2: Microbiological Laboratory Equipment & microbial control methods

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MSc: Microbiology & Animal Cell Culture

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Objective

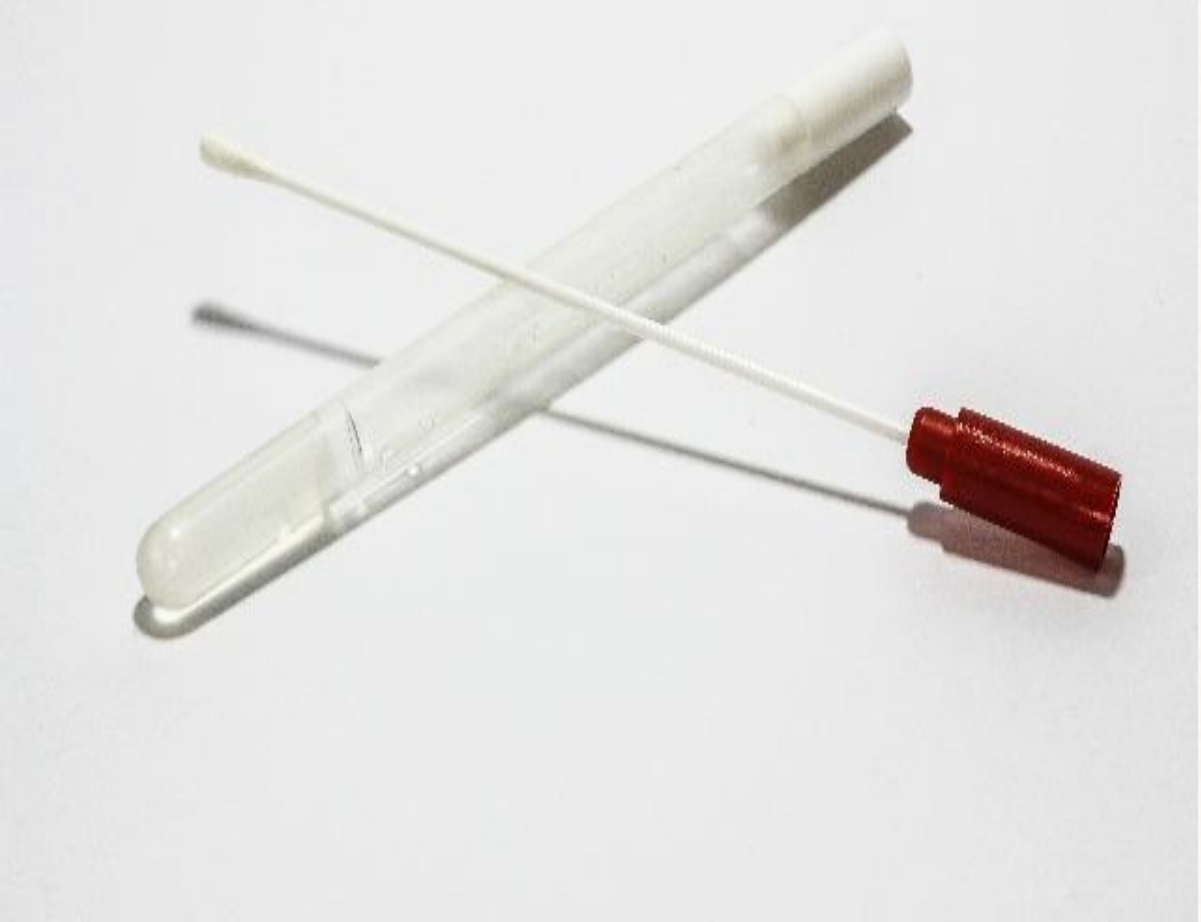
- The subject focuses on the common equipment and instruments used in any microbiology lab
- Methods in microbial growth control.

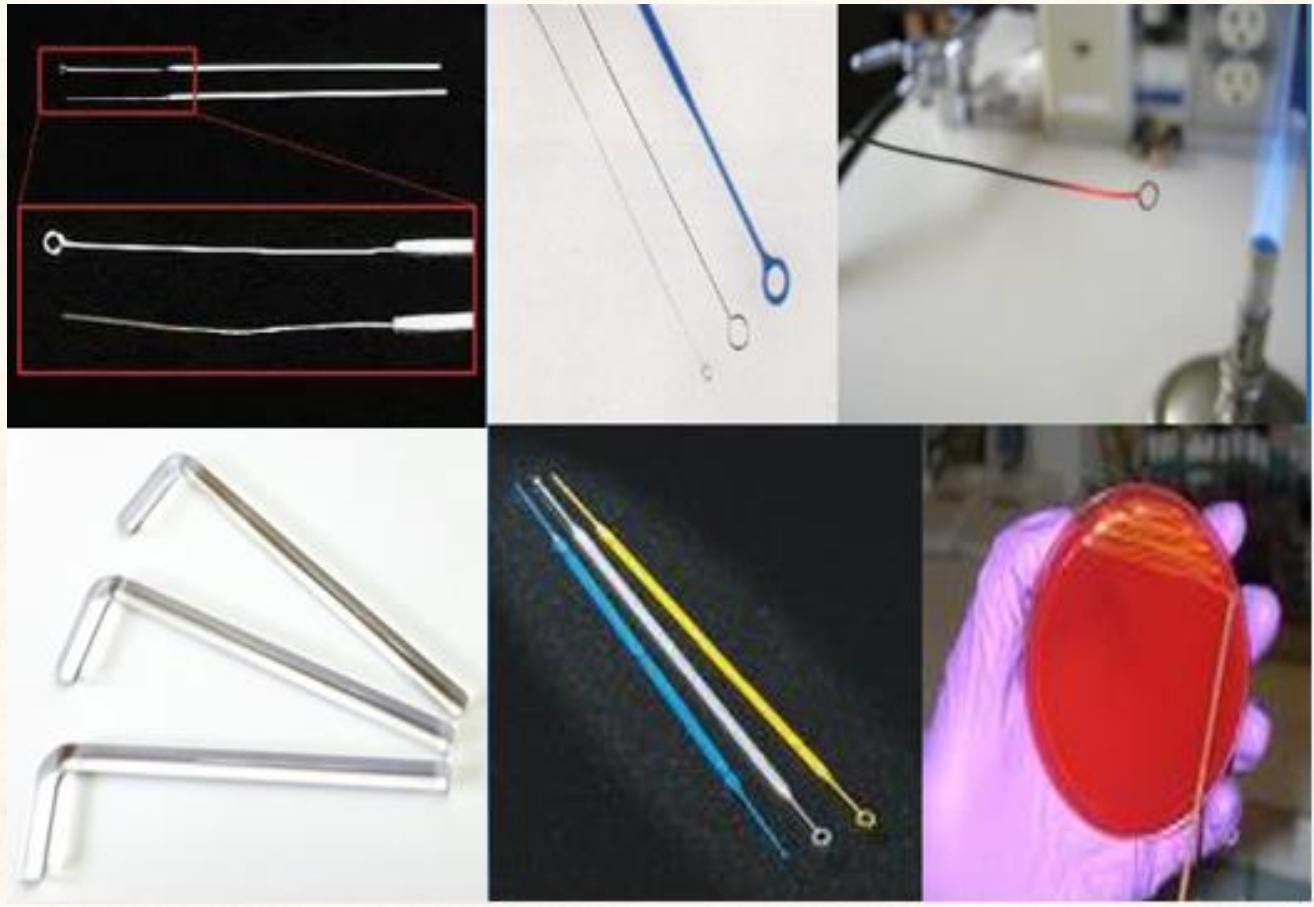
Petri dishes or plates

- A petri dish is a type of glass or plastic shallow round dish with a close fitting lid holding a culture medium.
- Used for the cultivation of microorganisms like Bacteria and Fungi.

Needle, loop & glass rod & sterile swab

- Loop & needle are used to transfer microbes.
- Sterile cotton swab is used for collection of specimens.
- L- shape Glass rod is used in spreading method.





Glass ware

- Routinely used in lab for holding liquids, solids, reagents and measurement of liquids.
- Beaker, conical flask, volumetric flask, cylinder, test tube.

Hot air oven

- Hot air ovens are electrical devices used in sterilization.
- The oven used dry heat to sterilize Pyrex types of glass ware.
- The temperature reached to (160 – 200 ^{0} C) and the time required for sterilization is 2 hrs.

Autoclave

- Autoclave is used to sterilize culture media, liquids, Instruments, dressing, lab coat, solutions, syringes, used cultures plate, tubes and other items that can withstand high temperature and pressure.
- The temperature is121 ^{0} C, under pressure of 15 pounds/ Inch^{2} = 1.5 Bar, to 15 minutes.

Incubator

- Used for incubating microorganisms at appropriate or suitable temperature .
- The incubator maintains optimal temperature, humidity and other conditions such as oxygen and carbon dioxide content of atmosphere inside.
- Incubator used to culture both prokaryotic and eukaryotic cells.

Water Bath

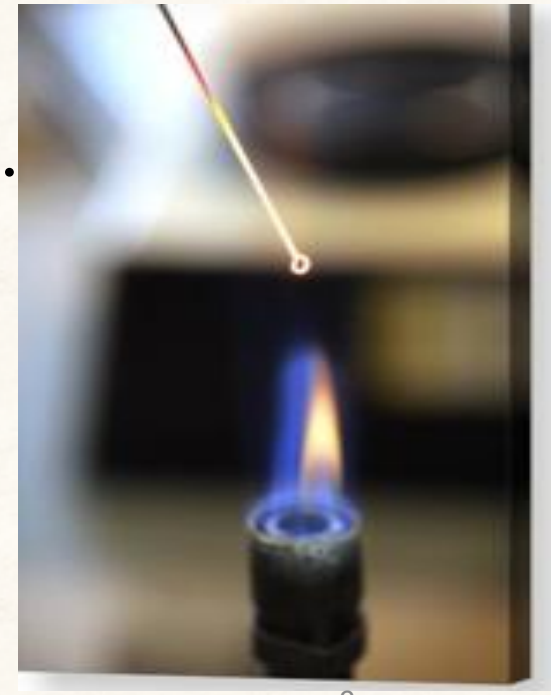
- Used for incubation and to keep culture media hot and liquid.

Gas and Bunsen burner

- Used for the sterilization of inoculating loops, needles glass rods.

  (Incineration: direct burning of microbes by flame).

- Glass rods should be alcohol flamed to sterilize it.
- Keep the environment surrounding the working area sterilized.



Hood or laminar air flow (biosafety cabinet)

- Used as working area.
- Provides aseptic environment for microbiological works.
- Aeration and UV system.

Other equipment

- Distillator.
- Slide and cover slides.
- Sensitive balance.
- Pipettes.
- Microscope.
- Refrigerator and freezer.
- Culture media.
- Chemicals.
- Reagents.
- Stains.

Microbial control methods

- **Aseptic techniques:** refer to those practices that are used by microbiologists to exclude all organisms from working area, contaminating media or contacting living tissues (excluding unwanted microbes).

- ✓**Sterilization:** is a term referring to any process that eliminates (removes) or kills all forms of microbial life, including bacteria, virus, fungi and even spore, organisms may be killed with steam, dry heat.

✓**Antisepsis:** chemicals applied to body surfaces to destroy or inhibit vegetative pathogens, that can be safely applied to human tissues.
(Ethanol 70&, Soap & detergent).

✓**Disinfection:** is a process in which pathogenic or nonpathogenic vegetative and some viruses are destroyed, but not bacterial endospores.

➢Used only on inanimate objects because they are toxic to human tissues.

➢Agents that cause disinfection are called disinfectants.

Physical agents

- **Dry Heat Oven:** (sterilization).
- **Autoclave (moist heat):** (sterilization).
- **Incineration:** (sterilization).
- **Radiations:** used for sterilization of food, drug, lab & operation rooms.
- **Non-ionizing radiation:** Ultra violet (U.V.) around **260 nm** is quite lethal to many microorganisms but does not penetrate glass and dirt films (disinfection).
- **Ionizing radiation:** x-ray & gamma-ray: (sterilization).
- **Boiling water:** (disinfection).

Chemical agents

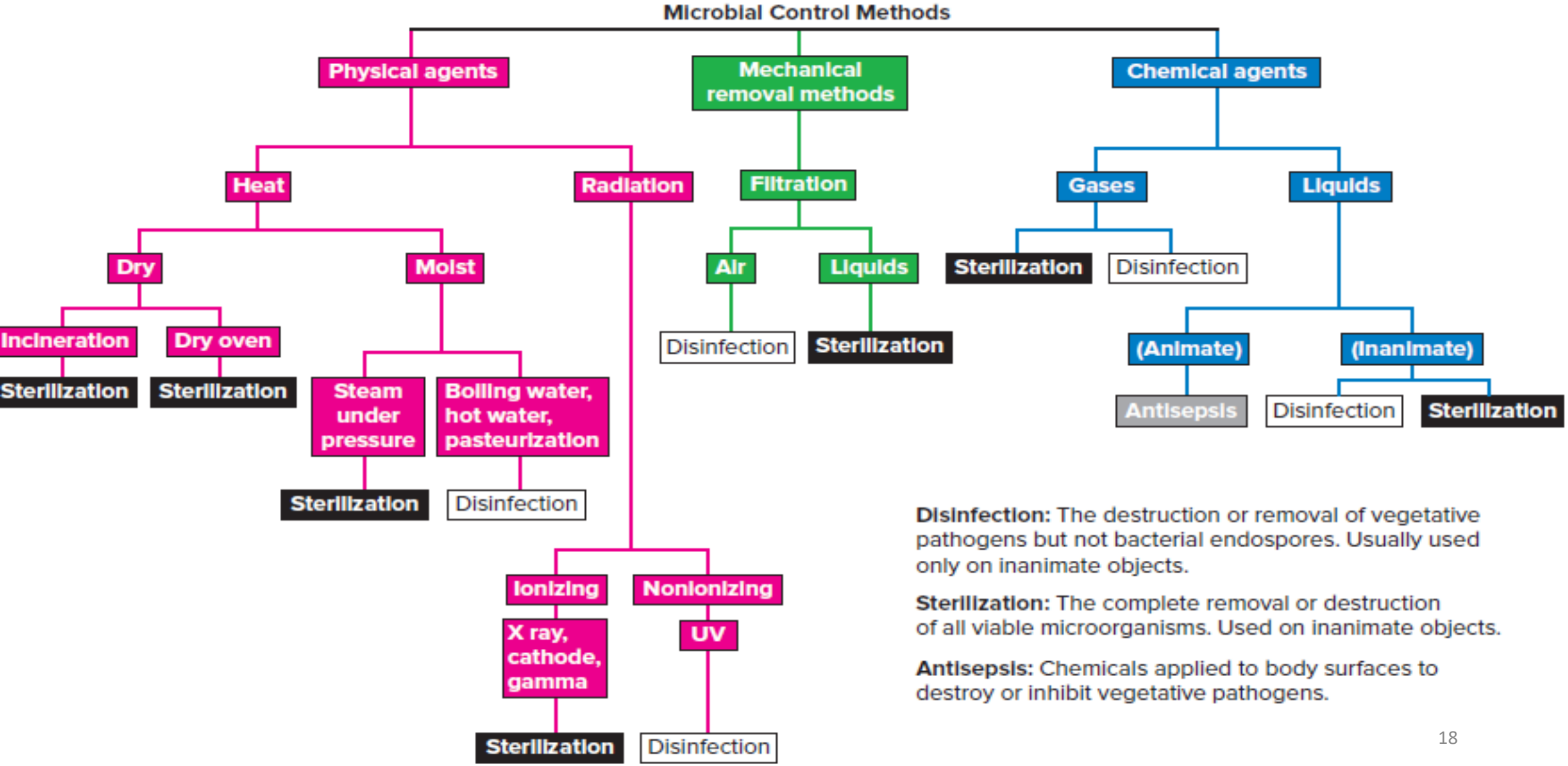
- **Alcohol 70%: (**antiseptic and disinfection).
- **Iodine: (**antiseptic and disinfection).
- **Dettol:** (disinfection).
- **Ethylene oxide**: Many heat-sensitive items such as disposable plastic petri dishes and syringes, sutures, and catheters are now sterilized with ethylene oxide gas. Ethylene oxide is both microbicidal and sporicidal, it rapidly penetrates packing materials, even plastic wraps (sterilization).
- **Sodium hypochlorite:** (disinfection).

Mechanical agents

- **Filtration:** to sterilize hormones, vitamins, antibiotics, serum, enzymes and proteins that are heat sensitive (sterilization).
- millipore syringe filter paper (0.1, 0.22, 0.45, 1um).

Sodium hypochlorite (5%)	Disinfectant	External surfaces, such as tables
Iodine (1% in 70% alcohol)	Disinfectant	External surfaces, such as tables
Iodophors (70 ppm avail. I_2)	Disinfectant	External surfaces, such as tables
Lysol (5%), a solution of phenolics and/or quaterinary ammonium compounds with soap	Disinfectant	External surfaces, such as tables
Phenol (5%), carbolic acid, source coal tar	Disinfectant	External surfaces, such as tables
Hexachlorophene (pHisoHex, Dial soap)	Disinfectant	Presurgical hand washing
Formaldehyde (4%)	Disinfectant	Oral and rectal thermometers
Iodophors (70 ppm avail. I_2)	Disinfectant	Oral and rectal thermometers
Zephrin (0.001%)	Disinfectant	Oral and rectal thermometers
Alcohol, ethanol (70%)	Antiseptic	Skin
Iodine (tincture in alcohol with KI)	Antiseptic	Skin
Iodophors	Antiseptic	Skin
Organic mercury compounds (merthiolate, mercurochrome)	Antiseptic	Skin
Hydrogen peroxide (3%)	Antiseptic	Superficial skin infections
Potassium permanganate	Antiseptic	Urethral, superficial skin fungus infections
Silver nitrate (1%)(Argyrol)	Antiseptic	Prevention of eye infections in newborn babies
Zinc oxide paste	Antiseptic	Diaper rash
Zinc salts of fatty acids (Desenex)	Antiseptic	Treatment of athlete's foot
Glycerol (50%)	Antiseptic	Prevent bacterial growth in stool and surgical specimens
Ethylene oxide gas (12%)	Sterilization	Linens, syringes, etc.
Formaldehyde (20% in 70% alcohol)	Sterilization	Metal instruments
Glutaraldehyde (pH 7.5 or more)	Sterilization	Metal instruments

Microbial control methods



Disinfection: The destruction or removal of vegetative pathogens but not bacterial endospores. Usually used only on inanimate objects.

Sterilization: The complete removal or destruction of all viable microorganisms. Used on inanimate objects.

Antisepsis: Chemicals applied to body surfaces to destroy or inhibit vegetative pathogens.

References

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