Programme : Bachelor of Science (First year)

Subject : Microbiology

Semester : I

Paper Code : MIG 101

Paper Title : Introduction and Scope of Microbiology

Unit 4 : Sterilisation

Module Name : Sterilisation using moist heat.

Module Number : 22

Name of the Presenter: Dr. Rasika Desai Gaokar

NOTES

Sterilisation:

Sterilisation is the process of destroying all forms of microbial life such as fungi, bacteria,viruses, present on a surface, contained in a fluid or in a biological culture medium.Sterilization is fundamental to Microbiology because it provides an environment free from living microorganisms. These sterile environments (liquid or solid) can then be used to grow a single type of microorganism.In a non-sterile situation, many different microorganisms will grow together.

Sterilization using moist heat can be applied in 3 ways:

a. Steam
b. Free flowing steam
c. Compressed steam i.e. Autoclave.

Compressed Steam

Steam is produced in a totally packed heated container .

e.g. Pressure cooker and Autoclave.

It is a most widely used and the most dependable method. It is nontoxic, inexpensive, rapidly microbicidal, and sporicidal. Moist heat sterilization using autoclave is commonly used for the sterilization of culture media, solutions , discarded cultures and contaminated materials.

Autoclave:

An Autoclave is a equipment uses steam under pressure to kill harmful bacteria,viruses, fungi and spores on items that are placed inside the pressure vessel.

It was first invented by Charles Chamberland in the 18th century. Autoclave is a greek word

AUTO → Self

CLAVIS → Self- locking device

An autoclave is used to carry out industrial and scientific processes requiring elevated temperature and pressure in relation to ambient pressure/temperature. Autoclaves are of two types:

i. Vertical autoclave

ii. Horizontal autoclave

The time and operation to achieve sterility depends on the nature of the material being sterilized, types of autoclave and volume of it.

Fig !; Autoclave

“Autoclave”byUtkarsh Singh retrieved under https://commons.wikimedia.org/wiki/File:Autoclave.jpegris licensed by . CC BY-SA

****

Principle :

Autoclave works on the principle of compressed steam/heat.

It Consists of a double jacketed steam chamber which permits the chamber to be filled with saturated steam.It can be maintained at a designated temperature and pressure.Autoclave is operated at 121.6 °C and pressure of 15 lbs/square inch.The autoclave works on the principle of moist heat sterilization where steam under pressure is used to sterilize the material present inside the chamber.

High pressure increases the boiling point of water and thus helps achieve a higher temperature for sterilization.Air in the chamber must be completely replaced by steam.When this steam comes in contact on the surface, it kills the microbes by giving off latent heat.The condensed liquid ensures the moist killing of the microbes.Once the sterilization phase is completed, the pressure is released from the inside of the chamber through the whistle.

Working:

Autoclaves contain :

- A sterilising chamber to place articles.

- A steam jacket where steam is maintained.

Steam flows from the steam jacket into the sterilising chamber and cool air is forced out.A special valve increases the pressure to 15 pounds/square inch above normal atmospheric pressure.At this temperature, saturated steam destroys all vegetative cells and endospores.

Moist heat kills effectively by degrading nucleic acids and by denaturing enzymes and other essential proteins. It also disrupts cell membranes.The chamber is closed tightly so that the steam keeps on filling into it and the pressure gradually increases.The air in the chamber is flushed out and filled with saturated steam.Water is boiled to produce steam, which is released through the jacket and into the autoclave's chamber.Hot saturated steam enters the chamber and the desired temperature and pressure is attained.At this temperature saturated steam destroys all vegetative cells and endospores.Moist heat kills effectively by degrading nucleic acids and by denaturing enzymes and other essential proteins. It also disrupts cell membranes.The chamber is closed tightly so that the steam keeps on filling into it and the pressure gradually increases.The items to be sterilized get completely surrounded by saturated steam (moist heat) which on contact with the surface material to be sterilized condenses to release its latent heat of condensation which adds to already raised temperature of steam so that eventually all the microrganisms in all forms are killed.

The usual temperature achieved is 121.6 °C at a pressure of 15 lbs at exposure time of only 15-20 minutes.By increasing the temperature, the time for sterilizing is further reduced.