

STERILISATION

Thermal resistance of micro organisms

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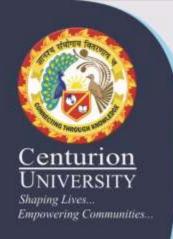
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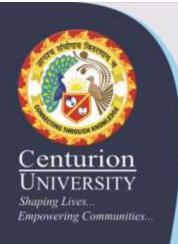
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Thermal Resistance of Microorganism

- Thermal resistance of various microorganisms & spores varies according to the method of sterilization.
- Therefore, selecting any method for sterilization, it is essential to know the condition & method must be lethal (sufficient to cause death) to microorganisms & spores. So, that some following points should be consideration.
- ☐ Thermal Death Time
- ☐ Death Rate of Microorganisms
- ☐ Decimal Reduction Time (D Value)

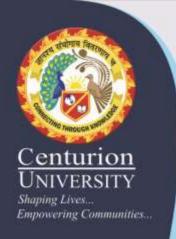


Thermal Death Time: -

- It is defined as, the time required to kill a specific microorganisms at a given temperature under specific condition.
- Thermal death time depends on factors like, Temp., pH, presence of bactericide, No. of microorganisms & their resistance to heat.
- There is a considerable variation in thermal death time between different types of bacterial spore.

Death Rate of Microorganism: -

- This is no direct method to determine when the sterility will be achieved.
- So, in this method of final death rate of microorganism is to plot graph between survivor against time of exposure.



Decimal Reduction Time (D Value): -

- ➤ It is defined as time in minutes required to reduce the number of viable microorganisms by 90%.
- The order of death of microorganisms can be calculated by following eq.

K = 1/t (log No - log N)

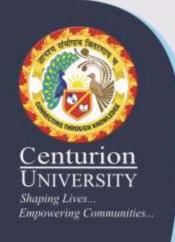
Where, K = Constant

t = time of exposure in minute

No = Number of viable organism in the beginning

N = Number of viable organism at the end.

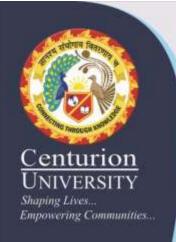
- ➤ After 90% reduction of microorganisms equation becomes,
- ightharpoonup K = 1/t or t = 1/K



- ➤ Where, t decimal reduction time or D value
- \triangleright So that, D= 1/t
- ➤ Thus, D value is the induction of efficiency of sterilization process & is calculated easily from graph between survivors & exposure time.

Factors affecting the thermal destruction of Microorganisms

- > pH
- > Protective substances
- > Antibacterial agents
- > Inhibitory medicaments
- > The inactivation factor of the process
- > Initial number of organisms

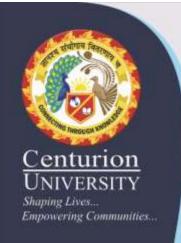


pH:

Most of the microorganisms are resistant to heat at a pH 6 to 8, so acidic or alkaline solution is used for sterilization.

Protective Substances:

- ➤ Organic substances like protein & carbohydrates make a coat around microorganism, thus protecting them from destroying, so those substance are called as protective substances.
- Microorganisms are difficult to kill in media containing high conc. of organic substances like protein & carbohydrates (Blood products).

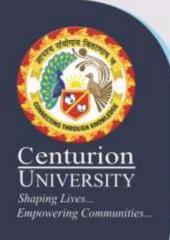


Antibacterial Agents:

The addition of antibacterial agents in injection can be reduce the sterilization temp. from 115 °C to 100°C. It is useful for thermolabile substances. This method also called as sterilization by heating with bactericide.

Inhibitory Medicaments:

- There are certain medicaments which when converted into solution are harmful to microorganisms.
- This is due to change in pH or toxic effect of medicament.
- Such medicaments are called as self sterilizing medicaments.



The Inactivation factor of the process:

The inactivation factor is the degree to which the viable count of organisms is reduced.

-It is given by – Inactivation factor = 10 t/D

t = Exposure time in minute

D = Decimal reduction time for same temperature & condition.

Initial Number of Organisms:

- When a certain number of organisms are heated at a lethal temperature, the organisms are not killed at once, but they are killed gradually as the exposure is prolonged.
- ➤ If certain fraction of initial number is destroyed in the succeeding interval of time & will continue till all the organisms are killed & the preparation is sterilized.
- ➤ If the initial number of organisms is less, then the time required for sterilization will be less.