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EVALUATION OF EFFICIENCY OF STERILIZATION METHODS

I. Evaluation of the effectiveness of the chemical agents used for sterilization:

a. The phenol coefficient

By taking phenol as a standard disinfectant, the activity of other disinfectants is measured and compared with the activity of phenol. Any disinfectant which has phenol coefficient equals to 1 is having same activity as that of phenol, while having phenol coefficient less than 1.0, the activity of that disinfectant is said to be lesser than that of phenol and vice-versa.

For the determination of the phenol coefficient, two organisms, namely, *Staphylococcus aureus* and *Salmonella typhi* are used. In two culture samples, phenol and disinfectant are mixed separately and the activity can be measured after a certain time for phenol and the disinfectant used against the organisms. Phenol coefficient can be similar or different for different microorganism.

It can be understood by the example of Lysol. Lysol shoes no growth at 10 minutes when used as 1:450 dilution, while phenol shows no growth at 10 minutes when used as 1:90 dilutions. Therefore, the phenol coefficient for Lysol is 5, that means, Lysol is 5 times more effective than phenol.

b. Filter paper method

In this method, a small disk of filter paper is soaked into the disinfectant and then placed on the agar plate cultured with test microorganism. A zone of inhibition is visible after some time. Disinfectant having a wider zone of inhibition is said to be more active for that test sample. The activity of disinfectant can differ with the test microorganism.

c. Use dilution test

In this, the broth culture of the test microorganism is coated over the stainless steel cylinder and is allowed to dry. These cylinders are then dipped in the test tubes filled with broth and having different dilutions of the disinfectant. The effectiveness of the disinfectant can be measured by the greatest dilution at which the growth of microorganism is inhibited.

II. Sterilization controls

For the evaluation of the efficiency of the sterilization by the moist heat, the following methods can be used:

a. Thermocouples: Thermocouples can be used for the determination of the temperature inside the autoclave. Sterilization is considered to be proper if a particular standard temperature is reached inside the autoclave.

b. Brown tubes: These tubes are placed inside the autoclave along with the articles. These tubes are red in color, which turns green when the temperature inside the autoclave reaches 121° this helps in determining the proper sterilization of the articles.

***c. Bacillus stearothermophilus* spores**: It requires exposure to 121°C for 12 minutes to kill these spores. The paper strips having 10^6 spores are placed inside an envelope and then in the autoclave. After the autoclaving of the articles, these strips are then inoculated in culture media. Proper sterilization is determined if there is no growth of these spores in the culture media.

d. Autoclave tape: It is lead carbonate based tape, which changes its color when exposed to 121°C in the autoclave.

MCQs

1. Organisms that are usually used for the determination of phenol coefficient is/are?

a. Salmonella typhi

b. Staphylococcus aureus

c. Plasmodium

d. Both a. and b.

2. Phenol coefficient of Lysol is?

a. Less than 1

b. More than 1

c. Equal to 1

d. Equal to 0

3. A disinfectant would be said to be better if?

a. Its zone of inhibition is wider

b. Its zone of inhibition is narrower

c. It does not form zone of inhibition

d. Cannot be determined by help of zone of inhibition

4. Following methods can be used for the evaluation of efficiency of sterilization through moist heat, except?

a. Thermocouples

b. Brown tubes

c. Autoclave tape

d. Filter paper method

5. Brown tubes on exposure to temperature 121°C changes color from?

a. Red to green

b. Brown to orange

c. Green to brown

d. Yellow to red

6. Correct sequence of true/false for the given statements can be?

- ***Bacillus stearothermophilus*** **spores can be used for sterilization control.**
- **Autoclave tape changes its color on exposure to 100^{o}C temperature**
- **Disinfectant which inhibits the growth of bacteria at greater dilution is said to be poor disinfectant than the disinfectant which inhibits same microbes at lower dilutions.**
- **Phenol coefficient can be different for same disinfectant against different pathogens.**

a. FTTF

b. FFFT

c. TFTF

d. TFFT

7. Which of the following statements are incorrect?

I. Lysol is better disinfectant than phenol.

II. Brown test tubes can be used for evaluation of efficiency of chemical sterilization methods.

III. Phenol coefficient must be same for a disinfectant against all the microorganisms.

IV. Phenol is considered as a standard disinfectant for evaluation of activity of other disinfectants.

a. I, III, IV

b. II, III

c. I, IV

d. II, IV