Lab 7

Microbial Physiology

Heat as Antimicrobial agent

- In many situations the growth of microorganisms may be harmful to the animals or plants, so it's important to control the microbial growth.
- The process of killing, inactivation or removing the pathogenic microorganisms from the environment is called **Disinfection**.

Heat has been used in striation in many situations because:

1- Its quick effect. 2- Cheep. 3- Dose not introduces toxic materials to the treated objects.

It's important to know that microbial cells in log phase are more susceptible than other phases. Vegetative cells are more susceptible than spores, mature cells more susceptible than young cells.

Relationship between kinds of microbial cells and Heat susceptibility

All bacterial cells are killed by using dry heat (60-70)c^o for about (5-10)minutes, while vegetative cells like Yeast and Fungi are more susceptible to be killed in (50-60)c^o for about (5-10)minutes, Viruses are similar to bacterial cells.

• The effectiveness of heat is much related to exposure time and this relationship determines the susceptibility of microorganisms to heat.

Types of Heat used as antimicrobial agent

There are two types of heat: 1- Moist heat. 2- Dry heat.

Moist heat method:

Simply boiling a sample for 30 minutes or more will kill all vegetative cells but will not kill spores because spores can germinate and resume growth. So boiling is an inefficient method for sterilization.

- Tyndallisation a three days process of steaming the sample and its very success to kill the spores and vegetative cells. In Tyndallisation we steam the sample one time for a day to ensure of killing the spores and vegetative cells and in the second day we steam the sample again to kill any surviving spores or cells from the first steam. Any spores or cells that are not killed in the previous two days will killed in the third day.
- ***** Moist heat causes **Denaturation of bacterial cells proteins**.

Dry heat method:

In dry heat method oven is used to kill microorganisms, it's important to know that dry heat is not effect as antimicrobial agent as moist heat. 2 hours heating at 180c° required to kill microorganisms in oven especially for the killing of endospores.

- Dry heat causes
 - 1. Protein denaturation.
 - 2. Oxidative damage.
 - 3. Inactive transports enzymes resulting in disturbance in permeability so many important cellular components will pass out such as proteins, Nucleic acids and ions like (K+).

Effect of heat on bacterial growth

When a material is exposed to heat, few amounts of bacteria population will be killed during **the time of exposure**. That's mean another bacterial population will survive at each exposure time.

The heat resistance of microorganisms usually is expressed by two terms:

1- D-value: means the time necessary in minutes under a certain temperature to kill 90% of bacteria or spores.

2- Thermal death time (TDT): defined as the shortest period of time at a temperature required to kill a suspension of cells or spores under specific conditions.