Hello students, welcome to this E-Learning session in Microbiology and Biochemistry one.

In this session we will learn about dry heat. I am Valerie Gonsalves.

In this session we will learn about dry heat, the principle of control of microbial growth by dry heat. The methods of sterilization using dry heat, which include hot air sterilization and incineration. In this session we will learn about the working, application, limitations or drawbacks of hot air sterilization and incineration.

By the end of this module,you will be able to explain the principle of microbial control by dry heat. You will state the techniques of microbial control by dry heat. And you will be able to describe the working, state the applications, and explain the limitations or drawbacks of hot air sterilization and incineration. You will also be able to differentiate between hot air sterilization and incineration.

Dry heat sterilization as a method of microbial control. So, how does dry heat control microbes? Dry heat kills organisms, because it causes oxidation of cellular constituents. It also causes denaturation of proteins. There are two methods of sterilization using dry heat. These include hot air sterilization, and incineration

The first one, hot air sterilization. Hot air sterilization makes use of radiant heat. Here is an image of an oven. And you can see the door of the oven is open and there are a number of racks placed inside the oven. Right below you can see controls present. Hot air sterilization is done in an oven. And all materials that are required to be sterilized are placed on the racks. The oven is then operated for a particular time at a set temperature. Operation time depends on two factors, temperature of the oven and the volume of the sample. Higher the temperature, lower will be the time required for sterilization. For example, It takes about one hour for sterilization when done at a temperature of 171 degrees Celsius. But it takes a minimum 2 hours when the oven is set at a temperature of 160 degrees Celsius.Also, when the temperature is set at 121 degree Celsius, it takes a longer time for sterilization. That is a minimum of 16 hours. Therefore we can see higher the temperature, lower is the time required for sterilization. Similarly, the volume of the sample also determines the time required for sterilization. Larger the volume, more is the time required for sterilization.

Hot air sterilization can be used for a number of purposes. It is found suitable for materials which need to be sterilized in the absence of water. Some of such materials include oils and powders. Hot air sterilization is also used for materials which are sensitive to corrosion, such as instruments made of metal.

However, hot air sterilization has its own limitations. This technique is not suitable for heat sensitive materials such as plastics. It is less sensitive than moist heat. Spores of *Clostridium botulinum*, the causative agent of botulism are killed by moist heat in 5 minutes at a temperature of 121 degrees Celsius. However, it takes about 2 hours at a temperature of 160 degrees Celsius when dry heat is used for sterilization. Sterilization process is also slow in case of hot air sterilization when we compare it to moist

air sterilization. This is becauses heat from water is transferred more readily to a cooler object than heat from air.

The second technique is incineration. Incineration Is brought about by direct, flaming, and burning of the material. Incineration can be done by either using a Bunsen burner or a loop incinerator.

Let us first do the Bunsen burner. Below you can see an image of a burner with a flame. That is a Bunsen burner. For incineration, the Bunsen burner makes use of an open flame where the inoculating loop is sterilized by placing the loop directly in the open flame. Here this causes burning of the material present on the loop.

The second technique is using a loop incinerator. It is also called a benchtop incinerator. As you can see the image here, you can see a deep throat is present on the instrument. Incineration is done by placing the loop inside this deep throat.

Incineration can be used for sterilizing inoculating loops and needles. It can also be used for sterilizing the mouth of culture tubes. And for burning contaminated objects that are no longer required.

However, incineration has its drawbacks. The first, flaming using a Bunsen burner causes splattering. This leads to the formation of aerosols and floating ashes. and these floating ashes and aerosols, can be a means of spreading infectious agents if they are not burnt.

Let us summarize. Dry heat is a physical method of microbial control. It causes oxidation of cell constituents and denaturation of proteins. Two methods of dry heat sterilization are hot air sterilization, and incineration. Hot air sterilization involves use of radiant heat, whereas incineration involves direct flaming. Here is a list of references.

Thank you.