# Chapter 18 - Depth of Understanding

#### Why does the endospore present such a problem when controlling the growth of bacteria?

The bacterial endospore is a structure that is resistant to just about all measures that are used for disinfection and antisepsis. Therefore it is a particular problem in clinical settings and also in the food industry. It can only be destroyed by very high temperature and pressure, which could also destroy the material infected with the endospore.

#### Compare and contrast the effects of dry and moist heat as antimicrobial treatments.

Dry heat involves equipment such as ovens and flame which can be used to sterilize through the oxidation of organic material. This form of high heat will not be useful for all situations as it takes a long time to be effective. Moist heat such as steam under pressure is actually hotter than the boiling water that produces it. This moist heat is useful for many situations in the clinical setting as it achieves the same effectiveness as dry heat in a shorter time and at a lower temperature. Moist heat is the basis of the autoclave which combines this moist heat with high pressure. Remember that autoclaving is the only way to assure the destruction of endospores. Moist heat denatures proteins, which halts microbe metabolism and causes death. Dry heat dehydrates microbial cells, and the absence of water then inhibits metabolism. However, the loss of water can also stabilize some proteins present in microbes, and in these cases the object being treated must be exposed to the dry heat for a longer time so that the proteins are denatured.

#### Compare the benefits of ionizing and non-ionizing radiation as methods for controlling microbial growth.

Both of these methods can effectively control the growth of bacteria. Recall that ionizing radiation destroys the structure of DNA which effectively kills the organism but it requires the use of powerful and dangerous machinery. In contrast, UV radiation can control the growth of microorganisms by producing thymine dimers that inhibit the replication of DNA thereby inhibiting the growth of the organism. In this case however bacteria can use methods of nucleotide excision repair to correct the thymine dimers and resume replication.