

**Mid term assignment**  
**Pathology and microbiology (DPT 4<sup>th</sup>)**  
**Instructor: Dr. Imran khan**

**Max Marks: 30**

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**Q1:** Write down any viral or bacterial disease in detail.

Ans: **Tuberculosis:** (TB) is a disease caused by bacteria called Mycobacterium tuberculosis. The bacteria usually attack the lungs, but they can also damage other parts of the body.

TB spread through the air when a person with TB of the lungs or throat coughs, sneezes or talks. If you have been exposed, you should go to your doctor for tests. You are more likely to get TB if you have a weak immune system.

➤ **Symptoms:**

- A bad cough that lasts 3 weeks or longer.
- Weight loss.
- Loss of appetite.
- Coughing up blood or mucus.
- Weakness or fatigue.
- Fever.
- Night sweats.

➤ **Diagnosis and Tests:**

- Acid fast bacillus test.
- Chest x-ray
- Testing for TB infection
- Tuberculin skin testing
- Tuberculosis screening

➤ **Prevention:**

- BCG(bacille calmette guerin) vaccine.

➤ **Treatment:**

- Medication
- Management of TB

**Q2:** What is cancer? How cancer is diagnosed? What is the role of genetics in cancer? Also explain TNM diagnostic test for cancer?

Ans: **Cancer:**

Cancer is the uncontrolled growth of abnormal cells in the body. Cancer develops when the body's normal control mechanism stops working and old cells do not die and instead grow out of control, forming new abnormal cells. These extra cells may form a mass of tissue called a tumor. Some cancer such as leukemia do not form tumors.

➤ **Cancer Diagnosis:**

Cancer can be diagnosed through different methods such as.

- **Physical exam:** Doctor may feel areas of body for lumps that may indicate a tumor.
- **Laboratory Tests:** Laboratory Tests, such as urine and blood tests may help doctor to identify abnormalities that can be caused by cancer.
- **Imaging tests:** Its allow doctor to examine bone and internal organs in a noninvasive way. Its used to diagnosing cancer may include ct scan, bone scan, MRI, ultrasound and x-ray and some others.
- **Biopsy:** During a biopsy doctor collects a sample of cells for testing in the laboratory. Doctor look at cell samples under the microscope. Normal cells looks uniform with similar size and orderly organization. But cancer cells look less orderly with varying sizes and without appreciate organization.

➤ **Role of Genetics in Cancer:**

Cancer is a genetic disease. Cancer is caused by certain changes to genes that control the way our cells function, especially how they grow and divide. Genes carry the instructions to make protein, which do much of the work in our cells. Certain Gene changes can cause cells to evade normal growth controls and become cancer. For example, some cancer causing gene changes increase production of protein that makes cells grow. Others result in the production of a misshapen, and therefore non-functional form of a protein that normal repairs cellular damage.

➤ **TNM Diagnostic Test for Cancer:**

The TNM system is the most widely used cancer staging system.

- The T refers to the size of extent of the main tumor. The main tumor is usually called the primary tumor.
- The N refers to the number of nearby lymph nodes that have cancer.
- The M refers to whether the cancer has metastasized. This means that the cancer has spread from the primary tumor to other parts of the body.

When Cancer is described by the TNM system, there will be numbers after each letter that give more details about the cancer. For example, T1M0N0 this shows the staging of cancer.

**Q3:** Explain structure of bacterial cell. How antibiotics kill bacteria? What is the mode of action of antibiotics?

Ans: **Structure of Bacterial Cell:**

It is a gel like matrix composed of water, enzymes, nutrients, wastes, gases and contains cell structure such as ribosomes, a chromosome and plasmid. The cell envelope encases the cytoplasm and all its components. Unlike the eukaryotic cells, bacteria do not have a membrane enclosed nucleus.

A prokaryotic cell have five essential structure components, a nucleoid (DNA), ribosomes, cell membrane, cell wall and some sort of surface layer which may or may not be an inherent part of the wall.

Structurally there are three regions: appendages in the form of flagella and pili, a cell envelope consisting of a capsule, cell wall and plasma membrane, and a cytoplasmic region that contains the cell chromosome, ribosomes and various sorts of inclusions.

➤ **How antibiotics kills bacteria?**

Antibiotics fight Bacterial infection either by killing bacteria or slowing and suspending it's growth. They do this by attacking the wall or coating surrounding bacteria. Interfering with Bacterial reproduction.

An antibiotic is a type of antimicrobial substance active against bacteria and is the most important type of antibacterial agent for fighting bacterial infection. Antibiotic medications are widely used in treatment of such infections. They may either kill or inhibit the growth of bacteria.

➤ **Antibiotics Mode of Action:**

Different antibiotics have different modes of action, owing to the nature of their structure and degree of affinity of certain target sites within the bacterial cell.

• **Inhibitors of cell wall synthesis:**

While the cells of humans and animals do not have a cell wall, this surface is critical for the life of bacterial species. A drug that targets cell wall can therefore selectively kill or inhibit the bacterial organisms. Example, penicillin.

• **Inhibitors of cell membrane function:**

Cell membranes are important barriers that separate or regulate the intra and extracellular flow of substances. A damage to this structure would result to leakage of important solvents essential for cells survival. Because this structure is found in both eukaryotic and prokaryotic cells, the action of class of antibiotics often poorly selective and can often be toxic for systemic use in mammalian host. Most clinical usage is therefore limited to topical application. Example, polymyxin B and colistin.

• **Inhibitors of protein synthesis:**

Enzymes and cellular structures are primarily made of protein. Protein synthesis is an essential process necessary for the multiplication and survival of all bacterial cells. Example: aminoglycosides, macrolides.

• **Inhibitors of nucleic acid synthesis:**

DNA and RNA are key to the replication of all living forms, including bacteria. Some antibiotics work by binding of components involved in the process of DNA and RNA synthesis, which causes interference in normal cellular processes which will ultimately compromise bacterial multiplication and survival. Example: quinolones and rifampin.

• **Inhibitors of other metabolic processes:**

Other antibiotics act on selective cellular processes essential for the survival of bacterial pathogens. For example: both sulfonamides and trimethoprim disturb the folic acid pathway, which is a necessary step for bacteria to produce a precursor important for DNA synthesis. Sulfonamides target and bind to dihydropteroate synthase, trimethoprim inhibits dihydrofolate reductase, both of these enzymes essential for the production of folic acid, a vitamin synthesized by bacteria but not for humans.