**Final-Term Assignment (Spring-2020) (BS-MLT 2nd Sec-A & Sec-B)**

**Course Title: Basic Microbiology Instructor: Mr. Fazli Zahir Mian**

**Time: 6 Hours**

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**Department: AHS MLT 2ND SEMESTER**

**Q1: Fill in the Blanks.**

1. **Probiotic** are live bacteria and yeasts that are good for and have beneficial effects on the host by improving its intestinal microbial balance.
2. Foods containing the combination of probiotics and prebiotics are referred to as **sybiotics**.
3. When a chemical substance inhibits bacterial growth and proliferation is known as **bacteriostatic.**
4. Microbes that are always present are called **resident flora**.
5. The symbiotic relation in which one organism benefits, the other is neither helped nor harmed is known as **commensalistic**.
6. **Transduction** is the direct transfer of DNA from one bacterium to another.
7. A genetic structure in a cell that can replicate independently of the chromosomes is known as **Plasmid**.
8. The population of microorganisms that live on the skin and mucous membranes of health normal person from birth until death is called **Normal flora**.
9. The expression of a gene into a protein occurs by **transduction** and **transulation**.

**Q2: What is normal flora, advantages and disadvantages of normal flora?**

**Normal flora:**

Normal flora is mixture of microorganism especially bacteria and funji, which is found at any anatomical site of the body from shortly after birth to death. it can perform best function to the body, includes substrates, colonization resistance, production of vitamins, stimulation of the immune system and aid in intestinal transit. Various factor can disrupt the normal flora including age, exposure to antibiotics, illness, stress and diet. Their most important beneficial effect is show in the oral cavity, vaginal epithelium, skin and in the intestine.

**Advantages of normal flora:**

They give a protective host defense mechanism by occupying ecological niches. They are take place vitamin B and K production located in intestine. And also they perform a best role in degradation of toxic materials. They contribute to immunity by inducing low level of circulating and secretory antibodies that may cross react with pathogens.

**Disadvantages of normal flora:**

Normal flora can cause disease in that following conditions such as:

When individuals becomes immunocompromised.

When they change their usual anatomic location.

**Q3: Write in detail different stages of Pathogenesis.**

**Different stages of pathogenesis:**

There are four step or stages of pathogenesis through which pathogen causes disease to the organisam this stages are

1) Exposure or Contacts

2) Adhesion or Colonization

3) Invasion

4) Infection

the pathogen follow the following stages to inter in to the host body and travel to the specific point where it causes infection and causes damage to the cell of the host inter to the next cell by completely destroy or rupture the cell

* + - 1. **Exposure:**

When organism come in contact with pathogen organism which causes disease for example the food we eat and the object we handle all ways that we come in contact with pathogen is non as exposure stage. All the contact not result the infection or disease in organism for a pathogen to cause disease it need to be able to gain excess to the host cell the way which pathogen follow to inter in to the host cell or tissue is known as portal of interring these are the location where the host cell are in direct contract with the external environment. The major location through which pathogen inter in to the body are broken skin sensory organ, mucous membrane inset bite and parenteral routes

* + - 1. **Adhesion:**

After the exposure stage the pathogen adher them selve to the portal of intery the word adhesion means attachment so in this stage the pathogenic microbe using adhesion factor to attached with the tissue, cell of the body. Protein or carbohydrate molecule are called adhace which is found on the surface of pathogen and attach to specific receptor such as glycoprotein on host cell in bacteria adhesion present in flagella in protozoa it is present in saliva or hocks or barbs and capcete of membrane and spike protein in viruses work as a adhesion..

* + - 1. **Invasion:**

After the sussesful adhesion stage the next stage is invasion. Invasion involves the dissamention of a pathogen throughout local tissue or the body then pathogen produce toxin which allow the pathogen to damage the host tissue and they spead deeper in to the body they work against their immune system interacellular pathogen achieve invasion by intering the host cell and reproducing intracellular pathogen may be oligate and may be facultative intracellular pathogen they inter in to the host cell and exploiting the nutrients in the cell.

* + - 1. **Infection:**

In invasion the cell rupture and the pathogen transfer or travel to the next cell which causes infection so infection is the stage after invasion. Infection may be local focal and systematic its depend on the extent of the infection as the name indicate the local infection is related to the small area of the body typically it is near to the portal of inntery in focal infection the localized pathogen produce toxin and spread it to the secondry location. When in infection disemented through out the body it is known as systematic infecton.

**Q4: How the Gene Transfer for one bacterium to another.**

Bacteria are able to respond to selective pressures and adapt to new environments by acquiring new genetic traits as a result of mutation, a modification of gene function within a bacterium, and as a result of horizontal gene transfer, the acquisition of new genes from other bacteria. Mutation occurs relatively slowly. The normal mutation rate in nature is in the range of 10-6 to 10-9 per nucleotide per bacterial generation, although when bacterial populations are under stress, they can greatly increase their mutation rate. Furthermore, most mutations are harmful to the bacterium. Horizontal gene transfer, on the other hand, enables bacteria to respond and adapt to their environment much more rapidly by acquiring large DNA sequences from another bacterium in a single transfer.

Horizontal gene transfer, also known as lateral gene transfer, is a process in which an organism transfers genetic material to another organism that is not its offspring. There are three mechanisms of horizontal gene transfer in bacteria: transformation, transduction, and conjugation. The most common mechanism for horizontal gene transmission among bacteria, especially from a donor bacterial species to different recipient species, is conjugation. Although bacteria can acquire new genes through transformation and transduction, this is usually a more rare transfer among bacteria of the same species or closely related species.

**Transformation:**

Transformation is a form of genetic recombination in which a DNA fragment from a dead, degraded bacterium enters a competent recipient bacterium and is exchanged for a piece of DNA of the recipient. Transformation usually involves only homologous recombination, a recombination of homologous DNA regions having nearly the same nucleotide sequences. Typically this involves similar bacterial strains or strains of the same bacterial species. During transformation, DNA fragments (usually about 10 genes long) are released from a dead degraded bacterium and bind to DNA binding proteins on the surface of a competent living recipient bacterium.

**Transduction:**

Transduction involves the transfer of a DNA fragment from one bacterium to another by a bacteriophage. There are two forms of transduction: generalized transduction and specialized transduction.

Gernalized transduction:

Generalized transduction occurs in a variety of bacteria, including Staphylococcus, Escherichia, Salmonella, and Pseudomonas. Gerenalized transduction can be divided in to following steps.

* **Step 1**: A bacteriophage adsorbs to a susceptible bacterium.
* **Step 2**: The bacteriophage genome enters the bacterium. The genome directs the bacterium's metabolic machinery to manufacture bacteriophage components and enzymes. Bacteriophage-coded enzymes will also breakup the bacterial chromosome.
* **Step 3:**Occasionally, a bacteriophage capsid mistakenly assembles around either a fragment of the donor bacterium's chromosome or around a plasmid instead of around a phage genome.
* **Step 4**: The bacteriophages are released as the bacterium is lysed. Note that one bacteriophage is carrying a fragment of the donor bacterium's DNA rather than a bacteriophage genome.
* **Step 5:**The bacteriophage carrying the donor bacterium's DNA adsorbs to a recipient bacterium.
* **Step 6:**The bacteriophage inserts the donor bacterium's DNA it is carrying into the recipient bacterium.
* **Step 7:** Homologous recombination occurs and the donor bacterium's DNA is exchanged for some of the recipient's DNA.

**Conjugation:**

Genetic recombination in which there is a transfer of DNA from a living donor bacterium to a living recipient bacterium by cell-to-cell contact. In Gram-negative bacteria it typically involves a conjugation or sex pilus.

**Q5: Write short notes on the following:**

1. Symbiotic relationship

**Symbiotic Relationships (Symbiosis):**

**Symbiosis** is a close relationship between two species in which at least one species benefits. For the other species, the relationship may be positive, negative, or neutral. There are three basic types of symbiosis: mutualism, commensalism, and parasitism.

1. Antimicrobial drug

**Antimicrobial drug:**

 A drug used to treat a microbial infection.

"Antimicrobial" is a general term that refers to a group of [drugs](https://www.medicinenet.com/drugs_what_you_should_know_about_your_drugs/article.htm) that includes antibiotics, antifungals, antiprotozoals, and antivirals.

1. Antimicrobial resistance

Antimicrobial resistance happens when microorganisms (such as bacteria, fungi, viruses, and parasites) change when they are exposed to antimicrobial drugs (such as antibiotics, antifungals, antivirals, antimalarials, and anthelmintics). Microorganisms that develop antimicrobial resistance are sometimes referred to as “superbugs” New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases, resulting in prolonged illness, disability, and death.

Without effective antimicrobials for prevention and treatment of infections, medical procedures such as organ transplantation, cancer chemotherapy, diabetes management and major surgery (for example, caesarean sections or hip replacements) become very high risk.

Antimicrobial resistance increases the cost of health care with lengthier stays in hospitals and more intensive care required.

1. Probiotics

**Probiotics:**

Probiotics are live bacteria and yeasts that are good for you, especially your digestive system. We usually think of these as germs that cause diseases. But your body is full of bacteria, both good and bad. Probiotics are often called "good" or "helpful" bacteria because they help keep your gut healthy.

1. Prebiotic:

**Prebiotics:**

Prebiotics are types of dietary fiber that feed the friendly bacteria in your gut. This helps the gut bacteria produce nutrients for your colon cells and leads to a healthier digestive system ( 1 ). Some of these nutrients include short-chain fatty acids like butyrate, acetate and propionate ( 2 ).

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Good luck.