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

Course Title: Basic Microbiology

Instructor: Mr. Fazli Zahir Mian

Time: 6 Hours

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_____.
3) When a chemical substance inhibits bacterial growth and proliferation is known as _____.
4) Microbes that are always present are called _____.
5) The symbiotic relation in which one organism benefits, the other is neither helped nor harmed is known as _____.
6) _____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 ____ _____.

8) The population of microorganisms that live on the skin and mucous membranes of health normal person from birth until death is called _____.

9) The expression of a gene into a protein occurs by _____and _____.

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

Q3: Write in detail different stages of Pathogenesis.

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

Q5: Write short notes on the following:

1. Symbiotic relationship
2. Antimicrobial drug
3. Antimicrobial resistance
4. Probiotics
5. Prebiotic

Good luck

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16291

BS MLT SEC A

BASIC MICRBIOLOGY

SIR FAZLE ZAHIR (MIAN)

ANS 1: Fil in the blanks.

1- Proboitic

2- Symbiotic

3- Bacteriostatic

4- Residental flora

5- Commensalism

6- Conjugation

7- Plasmid

8- Normal microbial flora

9- Transcription and translation.

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Ans 2:

NORMAL FLORA

Normal flora are the microorganisms that live on another living organism (human or animal) or inanimate object without causing disease. The human body is not sterile; we become colonised by bacteria from the moment we are born. We are covered with, and contain within our intestines, approximately one hundred trillion bacteria that form the normal flora of our bodies. This normal flora helps to prevent us becoming colonised with more dangerous bacteria, which might lead to infection.

Many circumstances can change normal flora, e.g. normal flora of the human body begins to change after admission to a hospital or long-term care facility. The process usually begins around day 4 of admission; this is why after 4 days of admission the antibiotics

for hospital acquired infections change. It is not because the severity of the illness is different.

ADAVANTAGES OF AND DISADVANTAGES OF NORMAL FLORA

ADAVANTAGES.	DISADVANTAGES
1- Prevent colonization by pathogens.	1-It can act as opportunistic pathogens.
2-Secrete vitamin K and B12	2- it can gain the access to Axenic tissues.
3-Inhibit it & kill pathogens by production of enzymes (e.g. peroxides, bacteriocins)	3- It can share nutrients and drug resistance with pathogens.
4- It contribute to the immunity by secreting antibiotics.	4-It may be a source of infection to other individuals
5- It constitute as a protective host defence mechanism.	6- When the immune system is weak, it can promote and can cause disease.

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ANS 3:

Pathogenesis

is the word used by science to detail the origin and development of a disease with all the factors included in it (Nature.com, 2017).

The term pathogenesis comes from the Greek páthos, meaning suffering and genesis, which means origin. It exposes the way in which the etiopathogenic agents – the causative agents to generate diseases – attack the organism.

For most infectious diseases, the ability to accurately identify the causative pathogen is a critical step in finding or prescribing effective treatments. Today's physicians, patients, and researchers owe a sizable debt to the physician Robert Koch (1843–1910), who devised a systematic approach for confirming causative relationships between diseases and specific pathogens.

STAGES OF PATHOGENESIS.

Accumulation: First Stage

Due to various causes like seasonal changes, diet, emotions and bad karma, the Doshas get accumulated in their respective sites. Vata in the colon, Pitta in intestine and Kapha in the chest.

If Vata gets accumulated there is hardness and fullness of abdomen.

The body detects an early change in Dosha balance of the body and creates a fondness or aversion from certain food. Vata accumulation (let's say due to cold weather) causes the body to become cold and dry, the body tips the brain towards craving of hot food and comfort.

Aggravation: Second Stage

The dosha eventually builds up to an excess in their respective sites. Vata continues to build up in the colon, Pitta in the intestines and Kapha in the chest. This is due to the ignoring of the bodily signs during the Dosha accumulation stage. For example, when you have eaten Pitta foods, the Pitta starts to accumulate in the intestine; your body starts to heat up. However, a friend calls you over and you go on to eat spicier Indian food without you recognizing the bodily signs. The next morning you start having heartburn and nausea. This is the state of Pitta aggravation.

Spread: Third Stage

The aggravated Dosha spillover from their respective sites of Aggravation. They get into the circulation and are on a lookout for other organs that they can encroach upon.

Once the Dosha start spreading throughout the body, they can be put back into their site of actin their place only through the process panchakama.

Infiltration: Fourth Stage

The Dosha that has spread from their sites starts to infiltrate the tissue that is susceptible, weak or defective. This may be due to previous trauma, genetic predisposition. A good example is diabetes. A person who has a family history of diabetes, starts consuming excess of Kapha diet, the Kapha accumulates in the chest, aggravates, spreads and finally infiltrates the pancreas to create less insulin.

Manifestation: Fifth Stage

In this stage, the disease becomes quite apparent. The disease sprouts and shows its sign and symptoms along the tissue that is affected. To continue with the above example, diabetes causes dryness of mouth, increased urination and excess of hunger.

Complication: Sixth Stage

If no proper treatment is done in the fifth stage the Dosha will pass onto the stage of complications. Structural changes start appearing in the organ affected. In this stage, the disease is most difficult to cure. Kapha in the fifth stage causes diabetes while in this stage it causes diabetic ketoacidosis.

The key is awareness. The more you are alert to how your mind, body, and emotions are reacting to changing circumstances; the more you are aware of your constitution and the moment-to-moment choices you can make to maintain health, the less opportunity you create for becoming sick.

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ANS 4:

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.

A few bacteria, such as *Neisseria gonorrhoeae, Neisseria meningitidis, Hemophilus influenzae, Legionella pneomophila, Streptococcus pneumoniae,* and *Helicobacter pylori* tend to be naturally competent and transformable. Competent bacteria are able to bind much more DNA than noncompetent bacteria. Some of these genera also undergo autolysis that then provides DNA for homologous recombination. In addition, some competent bacteria kill noncompetent cells to release DNA for transformation.

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. Depending on the bacterium, either both strands of DNA penetrate the recipient, or a nuclease degrades one strand of the fragment and the remaining DNA strand enters the recipient. This DNA fragment from the donor is then exchanged for a piece of the recipient's DNA by means of RecA proteins and other molecules and involves breakage and reunion of the paired DNA segments.

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*.

During the replication of *lytic bacteriophages* and *temperate bacteriophages*, occasionally the phage capsid accidently assembles around a small fragment of bacterial DNA. When this bacteriophage, called a transducing particle, infects another bacterium, it injects the fragment of donor bacterial DNA it is carrying into the recipient where it can subsequently be exchanged for a piece of the recipient's DNA by homologous recombination.

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ANS 5:

(I) Symbiotic relationship

The word *symbiosis* comes from the Greek *sym* and *bios*, which translated means *together* and *life*, or life working together. To understand how these relationships evolved, researchers developed a system to classify all life based on the distinct characteristics of individual organisms. Symbiosis describes close interactions between two or more different species. It is different from regular interactions between species, because in a symbiotic relationship, the two species in the relationship live together. Many organisms are involved in symbiotic relationships because this interaction provides benefits to both species. However, there

are types of symbiosis that are not beneficial and may in fact harm one or both species.

(II) Antimicrobial Drug

Synthetic origin that suppress the growth of, or destroy, micro-organisms including bacteria, fungi, helminths, protozoa and viruses.

Antimicrobial drugs can be bacteriostatic or bactericidal, and these characteristics are important considerations when selecting the most appropriate drug. The use of narrow-spectrum antimicrobial drugs is preferred in many cases to avoid superinfection and the development of antimicrobial resistance.

(III) Antimicrobial resistance

Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi. AMR is an increasingly serious threat to global public health that requires action across all government sectors and society.

Antimicrobial resistance is a significant public health problem in the U.S. and around the world as infections are becoming

increasingly difficult to treat, especially in healthcare facilities and in people with weakened immune systems.A number of pathogens are increasingly resistant to existing antibiotics and antifungals.

(IV) PROBIOTIC

- Probiotics are live microorganisms that are known as being the "good" bacteria and yeasts in our digestive tracts. These microorganisms are either the same or very similar to the kind of bacteria that are already present in our bodies and work to digest food, kill dangerous microorganisms that could lead to illnesses, and generate vitamins. The "good bacteria" may help healthy people but aren't formally recommended. Probiotics are "good" bacteria touted to help maintain digestive health and boost the immune system. You can take them in a dietary supplement or get them from food sources, such as yogurt..
- Probiotics are different in that they contain live organisms, usually specific strains of bacteria that directly add to the population of healthy microbes in your gut. Like prebiotics, you can take probiotics through both food and supplements. Probably the most common probiotic food is yogurt.

(V) Prebiotics

Prebiotics are specialized plant fibers. They act like fertilizers that stimulate the growth of healthy bacteria in the gut.

Prebiotics are found in many fruits and vegetables, especially those that contain complex carbohydrates, such as fiber and

resistant starch. These carbs aren't digestible by your body, so they pass through the digestive system to become food for the bacteria and other microbes.

The list of prebiotic foods is long, from asparagus to yams. A quick internet search will yield dozens of examples, as will a consultation with a registered dietitian.

Nowadays, the list of prebiotic supplements might be even longer, but they usually contain a complex carbohydrate such as fiber. Supplement companies market products to specific conditions, such as bone health and weight management, claiming that their ingredients enhance the growth of specific kinds of bacteria.

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