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SECTION:B

PAPER: Basic Microbiology

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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 Synbiotic.

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 commensalism.

6: conjugation 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 microbial flora .

9: The expression of a gene into a protein occurs by transcription and translation.

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

Ans: 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.

Advantages:

1. They prevent colonization by pathogens by competing for attachment & nutrients.

2. Some synthesize vitamins that are absorbed as nutrients by the host (e.g. K & B12).
3. Some produce substances that inhibit pathogenic species.
4. They stimulate the development of certain tissues, e.g. colon and lymphatic tissues in gastrointestinal tract.
5. They stimulate production of cross-reactive antibodies. Since the normal flora behave as antigens in an animal, they induce low levels of antibodies that cross react with similar antigens on pathogens, preventing infection

Disadvantages:

- Disadvantages of Flora It has both advantages and disadvantages,
- They can cause disease when individual become immunocompromised.
- When they changed their usual anatomic location.
- It has both advantages as well as disadvantages. (i) They prevent or suppress the entry of the pathogens. ... (iv) Colonies produced by some organisms of normal flora have a harmful effect on the pathogens. (v) Endotoxins liberated by normal flora may help the defense mechanism of the body.....

Q3: Write in detail different stages of Pathogenesis.

1: transmission =

In order to begin infection and eventually cause disease, pathogens must find a transmission route.

Transmission of an infectious agent can occur in many ways, but it is typically through exposed skin (e.g., a cut, abrasion, puncture, or wound) or mucous membranes (e.g., gastrointestinal tract, respiratory tract, or urogenital tract).

2:Adherence =

Once the pathogen has gained access to the body, it must have some means of attaching itself to the host's tissues.

This attachment is called adherence and is a necessary step in pathogenicity. Microbes contain ligands, which are projections that attach host receptors or surface proteins.

If a microorganism cannot adhere to a host cell membrane, disease will not occur.

3: Invasion =

At this point, microbes begin to invade the host and produce a bacteremia (i.e., presence of bacteria in the bloodstream) or viremia (presence of a virus in the bloodstream).

Some bacteria are able to cause disease while remaining on the epithelial barriers, while many need to penetrate that barrier.

Once this barrier has been penetrated, these pathogens can multiply without competition.

4:Colonization =

Colonization is the multiplication of pathogenic organisms where toxins are produced and the normal flora are overcome.

During this stage, pathogens compete with normal flora for space and nutrients. Pathogens usually colonize host tissues that are in contact with the external environment.

5: Evasion of Host Defenses.

After colonization, pathogens circumvent the host's innate & adapted defenses by phagocytosis.

Multiple mechanisms are used by pathogens to evade a host's immune system. Pathogens must also avoid adapted defenses.

They can also utilize antigenic variation to alter the antigen structure.

In addition, pathogens can mimic host molecules, which can cause disease-related damage.

6: Cause Damage or Disease to Host .

Damage can occur through direct or indirect pathways.

Direct methods produce toxins, which are poisonous substances that produce toxemia within a host.

Three types of toxins are produced to cause damage:

- Exotoxins: Proteins secreted by pathogens that cause damage to the host (botulinum toxin, tetanus toxin).
- Endotoxins: Toxic substances that are released when a cell is killed (Lipopolysaccharides).
- Exoenzymes: Enzymes that function outside the host cells or tissues.

7: Exiting the Host

A pathogen must exit the body.

This occurs through various routes.

Examples include sneezing, coughing, diarrhea, coitus, pus, blood, or insect bites.

8. Survival Outside the Host .

Finally, a pathogen must be able to survive in the environment long enough to be transmitted to another host.

Some are hardy and can survive for several weeks before a new host is found.

There are others that survive in animal reservoirs or require direct contact because they are fragile.

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

There are three basic ways of gene transmission:

Transformation

uptake and retention of external DNA molecules

Conjugation

direct transfer of DNA from one bacterium to another

Transduction

the transfer of DNA between bacteria by a virus

1: Transformation:

Under the right conditions, bacteria can “take in” external DNA fragments (or plasmids) by transformation.

DNA binding proteins transfer external DNA across cell envelope
homologous recombination can then occur

bacterial cells capable of transformation are referred to as competent

2: Bacterial Conjugation

Requires an F factor plasmid

has all “conjugation genes”

directs formation of a sex pilus

single DNA strand produced by DNA replication is transferred to F- cell
through the sex pilus, recipient produces 2nd strand

3: Transduction .

A virus (phage) particle can transfer DNA fragments from one host cell to another followed by recombination

requires a virus to be packaged with bacterial DNA “by mistake”

Plasmids:

A genetic structure in a cell that can replicate independently of the chromosomes, typically a small circular DNA strand in the cytoplasm of a bacterium or protozoan.

Plasmids are much used in the laboratory manipulation of genes.

Chromosome:

A chromosome is a DNA (deoxyribonucleic acid) molecule with part or all of the genetic material (genome) of an organism.

Most eukaryotic chromosomes include packaging proteins which, aided by chaperone proteins, bind to and condense the DNA molecule to prevent it from becoming an unmanageable tangle.

Q5: Write short notes on the following:

1: Symbiotic relationship.

Symbiotic relationships are a special type of interaction between species. Sometimes beneficial, sometimes harmful, these relationships are essential to many organisms and ecosystems, and they provide a balance that can only be achieved by working together.

2: Antimicrobial drug.

A drug used to treat a microbial infection. "Antimicrobial" is a general term that refers to a group of drugs that includes antibiotics, antifungals, antiprotozoals, and antivirals. There are mainly two classes of antimicrobial drugs: those obtained from natural sources antibiotic (such as penicillins, cephalosporins) or protein synthesis inhibitors (such as aminoglycosides, macrolides, tetracyclines, chloramphenicol, polypeptides); and synthetic agents.

3: 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”. As a result, the medicines become ineffective and infections persist in the body, increasing the risk of spread to others. New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases, resulting in prolonged illness, disability, and death.

4: 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. Probiotics may contain a variety of microorganisms. The most common are bacteria that belong to groups called *Lactobacillus* and *Bifidobacterium*. Other bacteria may also be used as probiotics, and so may yeasts such as *Saccharomyces boulardii*.

5: Prebiotic.

Prebiotics are compounds in food that induce the growth or activity of beneficial microorganisms such as bacteria and fungi. The most common example is in the gastrointestinal tract, where prebiotics can alter the composition of organisms in the gut microbiome. 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.