

MICROBIOLOGY AND SOCIETY



MCB 104

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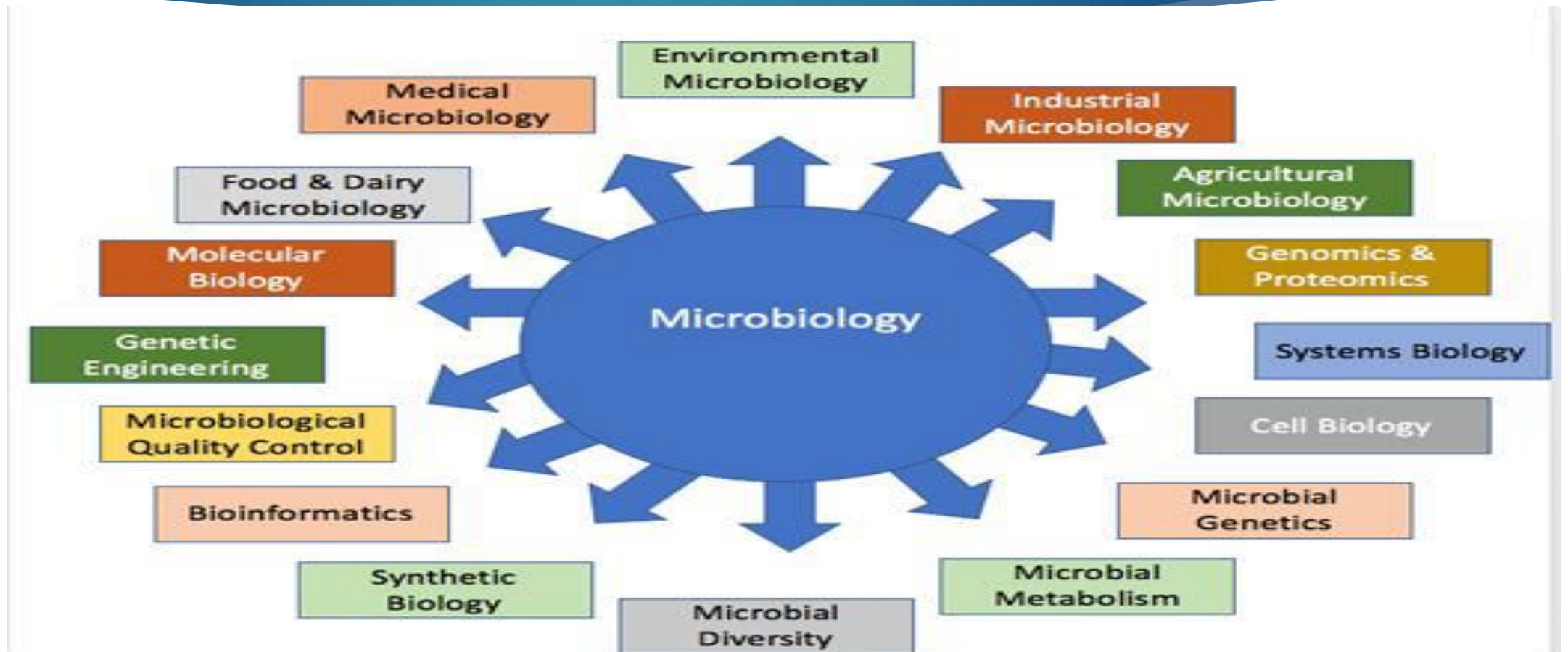
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SCOPE OF MICROBIOLOGY

- ▶ Microbiology is the study of living organisms that are so tiny such that they cannot be seen with the unaided eyes. They require the use of the microscope.
- ▶ Microorganisms are divided into five parts namely:
 - a. Bacteriology: the study of bacteria
 - b. Mycology: the study of fungi
 - c. Virology: the study of viruses
 - d. Phycology: the study of algae
 - e. Protozoology: the study of protozoans

BRANCHES OF MICROBIOLOGY



The Applications of Microbiology in Various fields

▶ **Microorganisms in the food industry:**

- ▶ □ Lactic acid bacteria, such as *Lactobacillus*, *Lactococcus*, and *Leuconostoc*, are used to ferment dairy products.
- ▶ □ Vinegar is the result of bacteria in the *Acetobacter* genus converting ethyl alcohol to acetic acid.
- ▶ □ In the creation of wine, beer, and other alcoholic beverages, yeasts (*Saccharomyces cerevisiae*) are the primary fermenters and alcohol producers. Yeast converts sugars from various sources, including grapes for wine and barley for beer, into alcohol and carbon dioxide.
- ▶ □ Wine is prepared from grapes or other types of fruit. The yeasts employed to ferment the fruit form a coating on the surface. *Saccharomyces cerevisiae* strains that have been cultivated are frequently used. Malic acid, which is found naturally in grape juice, can be transformed to lactic acid by lactic acid bacteria found in wineries or chemically added.

Microorganisms in the health industry

- ▶ □ Microorganisms are used in the production of:
- ▶ i. Vaccines that induces the immune system to recognise agents as foreign, destroy it, and “remember” it so that the immune system can recognise and eliminate any of these germs it encounters in the future.
- ▶ li. Antibiotics (microorganisms’ secondary metabolites) such as penicillin
- ▶ □ Other than these, microorganisms are used in the production of enzymes, vitamins, amino acids, steroids, etc., in the health industry.

Microorganisms in the agricultural industry

- ▶ The importance of different plant-associated microorganisms is well understood, for example, the legume–rhizobium interaction and the significance of mycorrhiza in plant growth promotion.
- ▶ Microorganisms play an important role in the nitrogen cycle by the process of nitrogen fixation, ammonification, nitrification, and denitrification.

Microorganisms in the biofuel industry

- ▶ Microbial biofuel generation is mostly accomplished by yeast fermentation of sugars to produce ethanol. In industry, *Saccharomyces cerevisiae* is predominantly used.
- ▶ A defined culture of a fermenter and/or syntrophy in conjunction with an aceticlastic (acetate degrading) and hydrogenotrophic (hydrogen-consuming) methanogen could produce biogas. The inoculum for biogas production comprises microorganisms found in cow dung or wastewater sludge.
- ▶ Hydrogen has long been recognised as a side product of photosynthesis or as a final end product of fermentation in a variety of microbes.
- ▶ Biohydrogen is produced by photosynthetic microorganisms, such as cyanobacteria and green algae.

Microorganisms in the mining industry

- ▶ *Acidithiobacillus ferrooxidans* is increasingly being employed to extract important metals, particularly copper, from low-grade ores that would otherwise be unworkable using traditional methods.
- ▶ Other metals, such as uranium and gold, are also extracted by bacteria; the methods differ slightly, but they all entail the conversion of an insoluble compound to a soluble one.

Microorganisms in the water industry

- ▶ For the treatment and purification of dirty water, biological wastewater treatment employs a variety of bacteria and other microorganisms.
- ▶ Larger protozoans are removed with filters, and bacteria and other tiny pathogens are killed by chemical or UV disinfection. The water self-purification principle is used in this process, in which microorganisms (bacteria, protozoa, and metazoa) consume organic substances in the water to change and eliminate them.

Microorganisms in the cosmetic industry

- ▶ Fatty acids, enzymes, peptides, vitamins, lipopolysaccharides, and pigments found in microbes have favourable cosmetic effects.
- ▶ Microbes produce unique compounds, such as ceramides, mycosporine-like amino acids, carotenoids, and fatty acids, like omega-3, 6, and 9, which have a wide range of applications in the cosmetic business.