An Introduction to Medical Microbiology

Microbiology is a subject which deals with living organisms that are individually too small to be seen with the naked eye. It considers the microscopic forms of life and deals about their reproduction, physiology, and participation in the process of nature, helpful and harmful relationship with other living things, and significance in science and industry. All ecosystems contain microorganisms. Billions of them populate the healthy human body and some of them may be recorded as participants in bodily functions. One of the classical example that the bacteria play a role in the degradation of intestinal contents. Microbes in Our Lives 1. Living things too small to be seen with the unaided eye are called microorganisms. 2. Microorganisms are important in maintaining Earth’s ecological balance. 3. Some microorganisms live in humans and other animals and are needed to maintain good health. 4. Some microorganisms are used to produce foods and chemicals. 5. Some microorganisms cause disease. Comparing Prokaryotic and Eukaryotic Cells: An Overview The world of living things is classified in the three domains bacteria, archaea, and eucarya. In this system, each domain is subdivided intokingdoms. Pathogenic microorganisms are found in the domains bacteria and eucarya. Prokaryotes and eukaryotes both contain nucleic acids, proteins, lipids, and carbohydrates. They use the same kinds of chemical reactions to metabolize

food, build proteins, and store energy. It is primarily the structure of cell walls and membranes, and the absence of organelles (specialized cellular structures that have specific functions), that distinguish prokaryotes from eukaryotes. The chief distinguishing characteristics of prokaryotes (from the Greek words meaning prenucleus) are as follows:

1. Typically their DNA is not enclosed within a membrane and is usually a singular, circularly arranged chromosome. Gemma obscuriglobus has a double membrane around its nucleus. (Some bacteria, such as Vibrio cholerae, have two chromosomes, and some bacteria have a linearly arranged chromosome.) 2. Their DNA is not associated with histones (special chromosomal proteins found in eukaryotes); other proteins are associated with the DNA. 3. They generally lack organelles. Advances in microscopy reveal a few membrane-enclosed organelles (for example, some inclusions). However, prokaryotes lack other membraneenclosed organelles such as nuclei, mitochondria, and chloroplasts. 4. Their cell walls almost always contain the complex polysaccharide peptidoglycan. 5. They usually divide by binary fission, where DNA is copied, and the cell splits into two cells. This involves fewer structures and processes than eukaryotic cell division

**Eukaryotes** (from the Greek words meaning true nucleus) have the following distinguishing characteristics:

1. Their DNA is found in the cell’s nucleus, which is separated from the cytoplasm by a nuclear membrane, and the DNA is found in multiple chromosomes

Some Branches of Microbiology Bacteriology: Small single-celled prokaryotic organisms. Mycology: The fungi, a group of eukaryotes that includes both microscopic eukaryotes (molds and yeasts) and larger organisms (mushrooms, puffballs) Protozoology:The protozoa—animal-like and mostly single-celled eukaryotes. Virology: Viruses—minute, noncellular particles that parasitize cells. Parasitology: Parasitism and parasitic organisms—traditionally including pathogenic protozoa, helminth worms, and certain insects. Microbial Taxonomy

‘Systematics’ is the term used to define the study of the diversity of life and their relationships. ‘taxonomy’ tends to be restricted to the theory and practice of classifying organisms. Classification attempts to group organisms according to their similarity. TAXON:- A group or category of related organisms. There are two key characteristics of taxa are: 1-Members of lower level taxa (e.g. Species) are more similar to each other than are members of higher level taxa (eg. Kingdom or domain). 2-Member of specific taxa are more similar to each other than any are to members of different specific taxa found at the same hierarchical متسلسل level (eg. Humans are more similar to apes, i.e., comparison between species, than either is similar to, for example, Escherichia coli). Thus once you know that two individuals are member of the same taxon, you can inter certain similarities between the two organisms. BINOMIAL NOMENCLATURE - Organisms are named using binomial nomenclature ( viruses are exceptions) - Binomial nomenclature employs the names of the two level taxa, genus and species, to name a specie. Binomial nomenclature includes: i. Genus comes before species (e.g., Escherichia coli) ii. Genus name is always capitalized (e.g., Escherichia) iii. Species name is never capitalized (e.g., coli) iv. Both names are always either italicized or underlined ( e.g Escherichia coli ) v. The genus name may be used alone, but not the species name (i.e saying or writing “Escherichia “ alone is legitimate while saying or writing “ coli” is not)