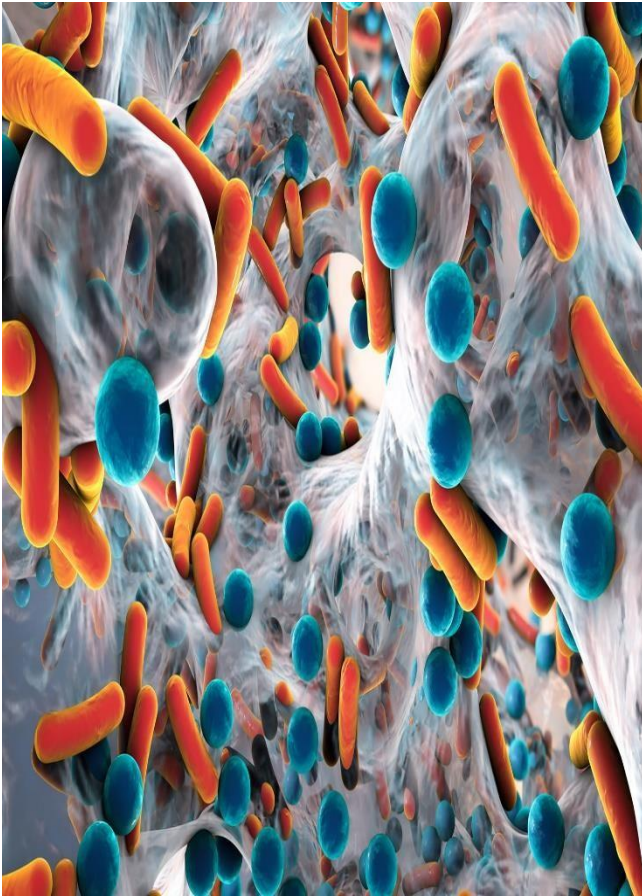


PASSION BATCH

SECOND YEAR



Microbiology

LECTURE 7

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Razan Ahmad

Biochemical and Metabolic Activities



- Bacteria can produce many waste products and secretions enable them to invade their host and cause disease.
And this waste product is also used for the diagnosis of bacteria and as a pathogenic factor (valence factor) which we call them enzyme
- The pathogenic strains like staphylococci and streptococci, can be tentatively identified by the enzymes they secrete.
Bacteria species can be differentiated depending on the chemical byproduct(enzyme) they secrete
Many of these by products are valence factors, because these enzymes could be the soul that caused this infection
- Some bacteria are characterized by the production of certain gases, such as carbon dioxide, hydrogen sulfide, oxygen, or methane
Every gas is distinctive to a certain species of bacteria and it is also used as a diagnostic tool

Pathogenicity



- Pathogens = capsules, pili, or endotoxins, exotoxins and exoenzymes

97% of bacteria is = non pathogenic
And 3% = is pathogenic

Capsules is used as anti phagocytic activity = نشاط مضاد للخلايا
And act as a mask for the receptors.

Pili is used for the pathogeinsity attachment

If we remove any of these weapons like the capsules the bacteria is going to be converted from pathogenic to nonpathigenic bacteria

Endotoxins : this type of toxins is (built in toxins)
And this toxin is not toxic until its is released from the structure of the bacteria then it becomes toxic, and it is nonspecific toxin

Exotoxins : one of the important characteristics of this toxins that it is a specific toxins, this means that it can exert toxicity to specific parts of the cell for ex: it goes to the mitochondria and do toxicity to the mitochondria.

Genetic Composition



- Molecular diagnostic procedures = Identification = analyzes the organism's DNA or RNA

This DNA sequence let us do what is known as intra species similarity

يعني بخلينا نميز الانواع المختلفة من البكتيريا اعتمادا على ال DNA sequence of bacteria

- The composition of the genetic material (DNA) of an organism is unique to each species.

طبعاً هذا الموضوع يعتمد على the specificity of the diagnostic tool

ولكن بعض هذه الادوات حساس للغاية بحيث ان لديه القدرة على تحديد single point of mutation

- 16S rRNA sequencing can determine the degree of relatedness between two different bacteria.

Unique Bacteria



(Miscellaneous Pathogenic
Bacteria)

- Rickettsias, chlamydias, and mycoplasmas are bacteria, but they do not possess all the attributes of typical bacterial cells.
- Rickettsias and chlamydias are bacteria with a Gram-negative– type cell wall.
- Rickettsias and chlamydias are obligate intracellular pathogens that cause diseases in humans and other animals

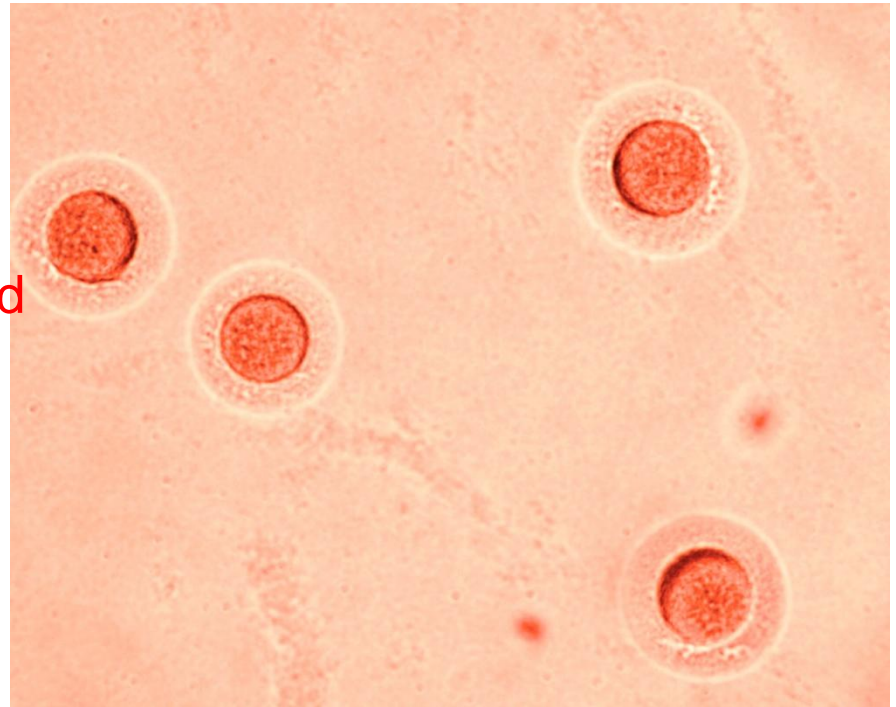
Rickettsias and chlamydias are similar to viruses because they cannot live outside the cell they must live inside the host cell and reproduce there

Mycoplasmas



- Mycoplasmas are the smallest of the cellular microbes.
The smallest self replicating bacteria or organism
- Because Mycoplasma spp. do not possess cell walls, they are pleomorphic.
They look like fried egg appearance

This is a Jordanian bacteria called Irbid strain and its scientific name is micro plasma petrophasen



Especially Large and Especially Small Bacteria



- Most bacteria are microscopic
- Coccus (e.g., a *Staphylococcus aureus* cell) is 1 μm in diameter.
- A typical bacillus (e.g., an *E. coli* cell) is about 1.0 μm wide \times 3.0 μm long
- Some bacilli are long thin filaments—up to about 12 μm in length or even longer—but still only about 1 μm wide
If the bacteria is or larger than 12 μm it is classified as giant bacteria

- The largest of all — *Thiomargarita namibiensis*, a colorless, marine, sulfide-oxidizing bacterium.
- Single spherical cells of *T. namibiensis* are 100 to 300 μm , but may be as large as 750 μm (0.75 mm)

This type of bacteria can be seen with the naked eye

The nanobacteria is comparable to the size of virus

- Nanobacteria. Their sizes are expressed in nanometers less than 1 μm in diameter
- Nanobacteria have been found in soil, minerals, ocean water, human and animal blood, human dental calculus (plaque), arterial plaque, and even rocks (meteorites) of (الفلح) extraterrestrial origin.

And the (plaque) is the thing that covers the canine

Photosynthetic Bacteria



- Photosynthetic bacteria include purple bacteria, green bacteria, and cyanobacteria (blue-green algae)
- Capable of converting light energy into chemical energy.
- Cyanobacteria are examples of photosynthetic bacteria.
- Cyanobacteria played a major part in the oxygenation of the atmosphere

The most important feature of photosynthetic bacteria is the oxygenation and it can produce oxygen more than the plants

- Cyanobacteria can overgrow, creating a water bloom—a “pond scum” that resembles a thick layer of bluish green (turquoise) oil paint.
- Convert nitrogen gas (N_2) from the air into ammonium ions (NH_4) in the soil or water; this process is known as nitrogen fixation
- Some cyanobacteria produce toxins (called cyanotoxins)= neurotoxin and hepatotoxin **And these toxins are specific**
- Global warming will lead to increases in cyanobacterial populations and concurrent increases in cyanotoxins.

Archaea



- Archae means “ancient,”

This prokaryotic microorganism lives in extreme conditions

- Archaea vary widely in shape = cocci, bacilli, and long filaments

- All archaea possess cell walls, their cell walls contain no peptidoglycan.

And because there is no peptidoglycan we use it as a marker to differ it from bacteria

- Some live at the bottom of the ocean in and near thermal vents, where, in addition to heat and salinity, there is extreme pressure.
- Other archaea, called methanogens, produce methane
- Many archaea are extremophiles = live in extreme environments

e.g., environments that are extremely hot, dry, or salty.