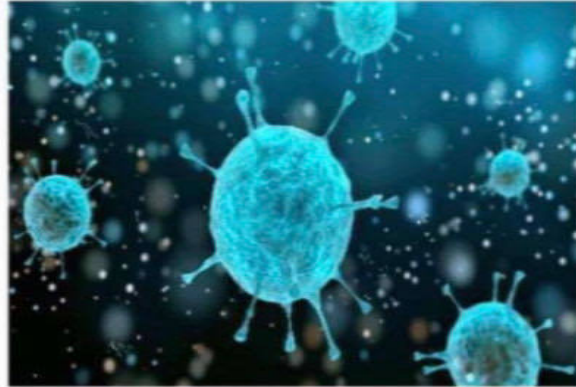


Lecture 5



MICROBIOLOGY

Second Year
Passion Batch

Abdullah Abdulmonem
Manar titi
Zainab Akram

Flagella

flagella is the locomotive part of bacteria



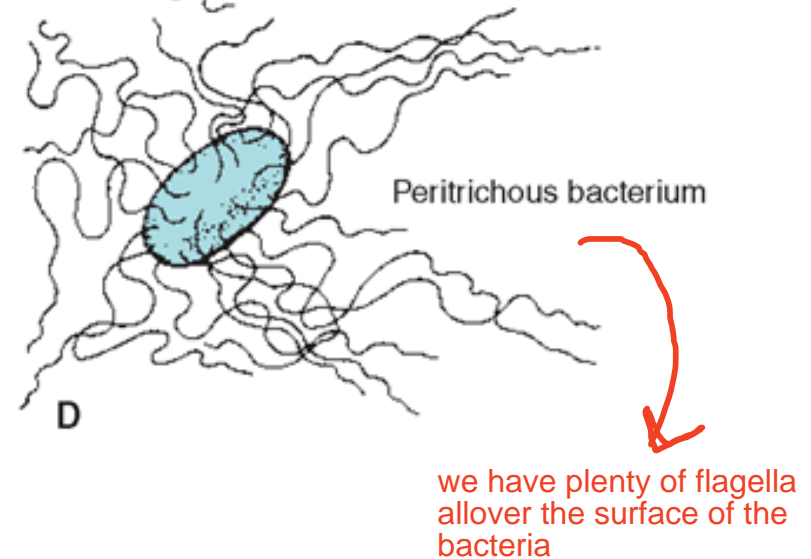
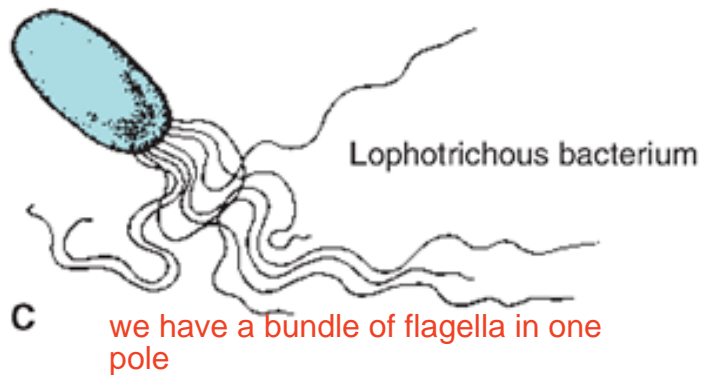
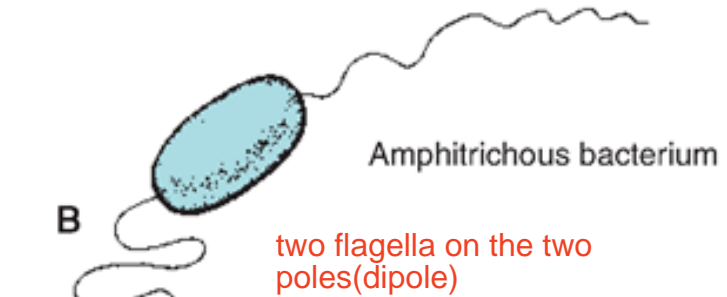
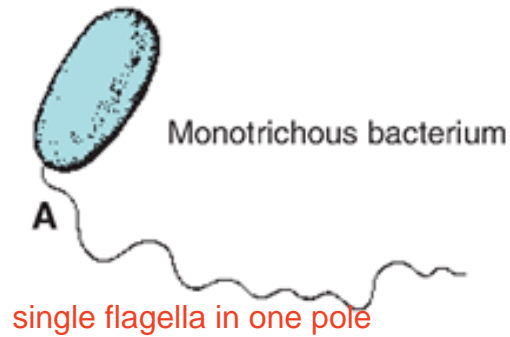
- Motile bacteria usually possess flagella.
bacteria species differs in their motility(different in locomotion)
- Bacteria never possess cilia.
- The number and arrangement of flagella possessed by a certain species of bacterium are characteristic of that species

flagella has different power:some strong and some is weak

distinctive feature of flagella:

all flagella moves in the same direction at the same time (the net movement is zero)
إذا مش بعض لكل واحد راح يصير فيه حركة باتجاه معين)
centrifugation(called brownian motion)

some bacteria is classified according to the number and arrangement of flagella (4 types)



we use flagella as a diagnostic tool for bacteria identification

Pili (Fimbriae)



- Pili or fimbriae are hair-like structures, most often observed on Gram-negative bacteria composed of a protein called pilin

the short one is called fimbriae and the long one is called pili (sex pili)

- There are two types of pili:

- One type merely enables bacteria to adhere or attach to surfaces

fimbriae (they are a lot, more than 200 covering the body of cell) the main function of fimbriae is to enable bacteria to attach to host cell

- The other type (called a sex pilus) facilitates transfer of genetic material

the long pili

sex pilus number is 2-6, they are very long and wide and very low number

Spores (Endospores)

there are two bacterial groups that can sporulate



- Sporulation is the process by which the spores are formed

spores contains part of the genetic material

- Spores are resistant to heat, cold, drying, and most chemicals.

when bacteria need to sporulate? when the surrounding medium is inappropriate for survival (its going to die)
this phase called the decline phase

- Spores have been shown to survive for many years in soil or dust, and some are quite resistant to disinfectants and boiling

in decline phase (when the cell is gonna die it forms) as a defense mechanism it sporulates

سؤال من ال دفعه)

how to remove spores even they are resistant to many factors

(using high temp and autoclating (sterilization that completes killing of bacteria



A

presence of filmbria is important(why?)if the bacteria didn't make an adhesion to the host cell,the bacterial cell cannt initiate an influence

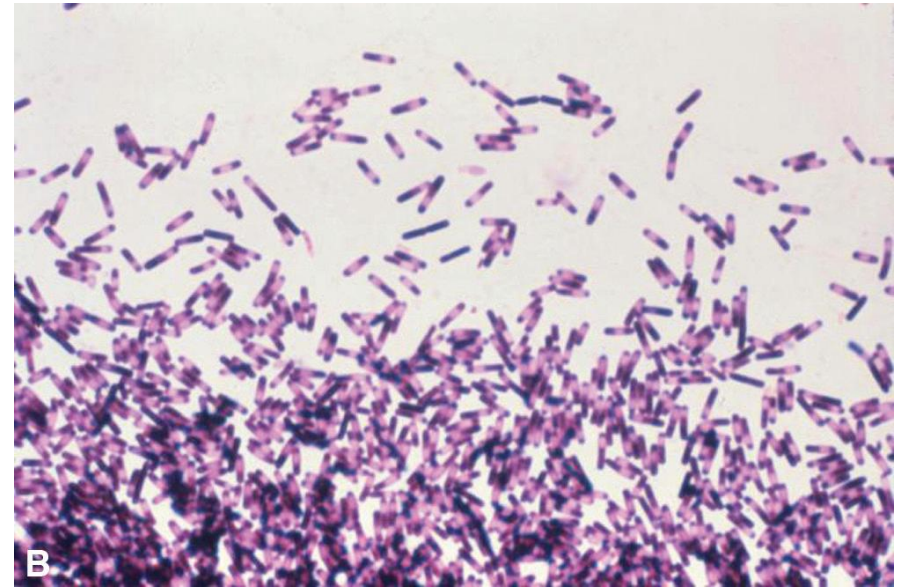
اشكال الخلية البكتيرية

spore form
(inactive)

vegetative form

active form

خلية حية نائمة يعني في وقت من
الاقوات راح ترجع من طور
التبرعم



B

Summary of Structural Differences between Prokaryotic and Eukaryotic Cells



- Eukaryotic cells contain numerous membranes and membrane-bound structures.
- The only membrane possessed by a prokaryotic cell is its cell membrane.

Prokaryotes	Eukaryotes
Circular DNA (in cytosol)	Linear DNA (in nucleus)
No organelles	Several membrane bound organelles
Nucleoid (not membrane bound)	Nucleus (membrane bound)
Single chromosome	Several chromosomes
Plasma membrane typically lacks receptors	Plasma membrane with receptors (sterols and carbohydrates)
Chemically complex cell wall (may contain peptidoglycan)	Chemically simple cell walls (cellulose (plants) and chitin (fungi))
DNA transcription and mRNA translation occurs simultaneously (in cytosol)	DNA transcription in nucleus, and mRNA translation in cytosol
Flagellum (if present) Simple, built from two proteins	Flagellum (if present) Complex, built from microtubules
May have pili and fimbriae	May have cilia
Haploid genome (only one copy of each gene)	Diploid genome (more than one copy of each gene)
May have plasmids (DNA outside chromosome)	Plasmid DNA not common
Compact genome (little repetitive DNA)	Usually large amounts of non-coding and repetitive DNA
May have a glycocalyx cover	Glycocalyx only if no cell wall
Small ribosomes	Large ribosomes in cytosol/nucleus small ribosomes in organelles
No histones in chromosome	DNA "wound" around histones
Lacks cytoskeleton	Cytoskeleton (actin, microtubules)
Mycolaginous capsule	No mycolaginous capsule
Cell size range 0.5–100 μm	Cell size range 10–150 μm
Asexual reproduction (binary fission)	Sexual reproduction (meiosis and mitosis)

Prokaryotic Cell Reproduction



- Prokaryotic cells reproduce by a process known as binary fission *bacterial cell duplicates and splits into two identical cells*
- Chromosome must be duplicated (a process known as DNA replication)
- The length of time it takes for one bacterial cell to split into two cells is referred to as the organism's **generation time**.
slow grow bacteria(long Generation time)like mycobacterium TB(18-20hrs)
fast growing bacteria(short generation time)like E.coli(20min)

two fold division system=binary fission
1>2>4>8>16>32

Taxonomy



- Taxonomy = classification of living organisms into groups

classification may be according to DNA sequence (genotype = the best method) also on physical (phenotype), genetic (genotype)

- Consists of three separate but interrelated areas: classification, nomenclature, and identification.

- Classification is the arrangement of organisms into taxonomic groups (known as taxa) on the basis of similarities or relationships

- **Nomenclature** is the **assignment** of names to the various taxa according to **international rules**.

بتعنى انه كيف بنسمى البكتيريا
means that there is system in the naming process

- **Identification** is the **process** of determining whether an **isolate** belongs to one of the established, named taxa or represents a previously unidentified species.

genus is according to discoverer while specie sis according to the site of isolation(وي ن بع عمل مرض)
E.coli:genus=scientist name,coli:species name according to the site of infection which is colon

- An organism's complete collection of genes is referred to as the organism's **Genotype or genome**.
- An organism's complete collection of physical characteristics is known as the organism's phenotype. الوان, اشكال, احجام
زي الكثير من افروق الموجودة بينا البشر

Microbial Classification



- In the **binomial** system of nomenclature, the first name (e.g., *Escherichia*) is the **genus**, and the second **name** (e.g., *coli*) is the specific epithet.

different in causative agent and clinical picture

ناتج عن بكتيريا اسمها pneumonia زي ال

streptococcus pneumoniae or *chlamydophila pneumoniae*

لتهاب الرئوي الناتج عن اي من البكتيريا اعلاه بخلاف عن اصابة رئوية جاية من فطريات

- When used together, the first and second names (e.g., *Escherichia coli*) are referred to as a species.

Bacterium

Bacillus anthracis

Chlamydophila pneumoniae

Chlamydophila psittaci

Chlamydia trachomatis

Clostridium botulinum

Clostridium tetani

Corynebacterium

diphtheriae

لاحظ اسماء الامراض مرتبطة

باسم ال species

every bacteria has

distinctive clinical

picture (اعراض مختلفة)

Disease

Anthrax

Pneumonia

Psittacosis ("parrot fever")

Trachoma

Botulism

Tetanus

Diphtheria

- In 1969, Robert H. Whittaker proposed a Five-Kingdom System of Classification, in which all organisms are placed into five kingdoms:
- Bacteria and archaea are in the Kingdom Prokaryotae (or Monera)
- Algae and protozoa are in the Kingdom Protista (organisms in this kingdom are referred to as **protists**)
- Fungi are in the Kingdom Fungi
- Plants are in the Kingdom Plantae
- Animals are in the Kingdom Animalia

prokaryote=bacteria and
archae
protista=protozoa and
algae

fungi,planta,animelia,protista(protozoa&algae),prokayote(
bacteria &archae)

- Viruses are not included in the Five-Kingdom System of Classification because they are not living cells
- Archaea comes from archae, meaning “ancient.”
- archaea are so different from bacteria
- Bacteria have, been referred to as eubacteria, meaning “true” bacteria, but are now usually referred to simply as bacteria
- The Domain Eukarya is divided into four kingdoms:
- Kingdom Protista or Protoctista (algae and protozoa); Kingdom Plantae; Kingdom Fungi; Kingdom Animalia.

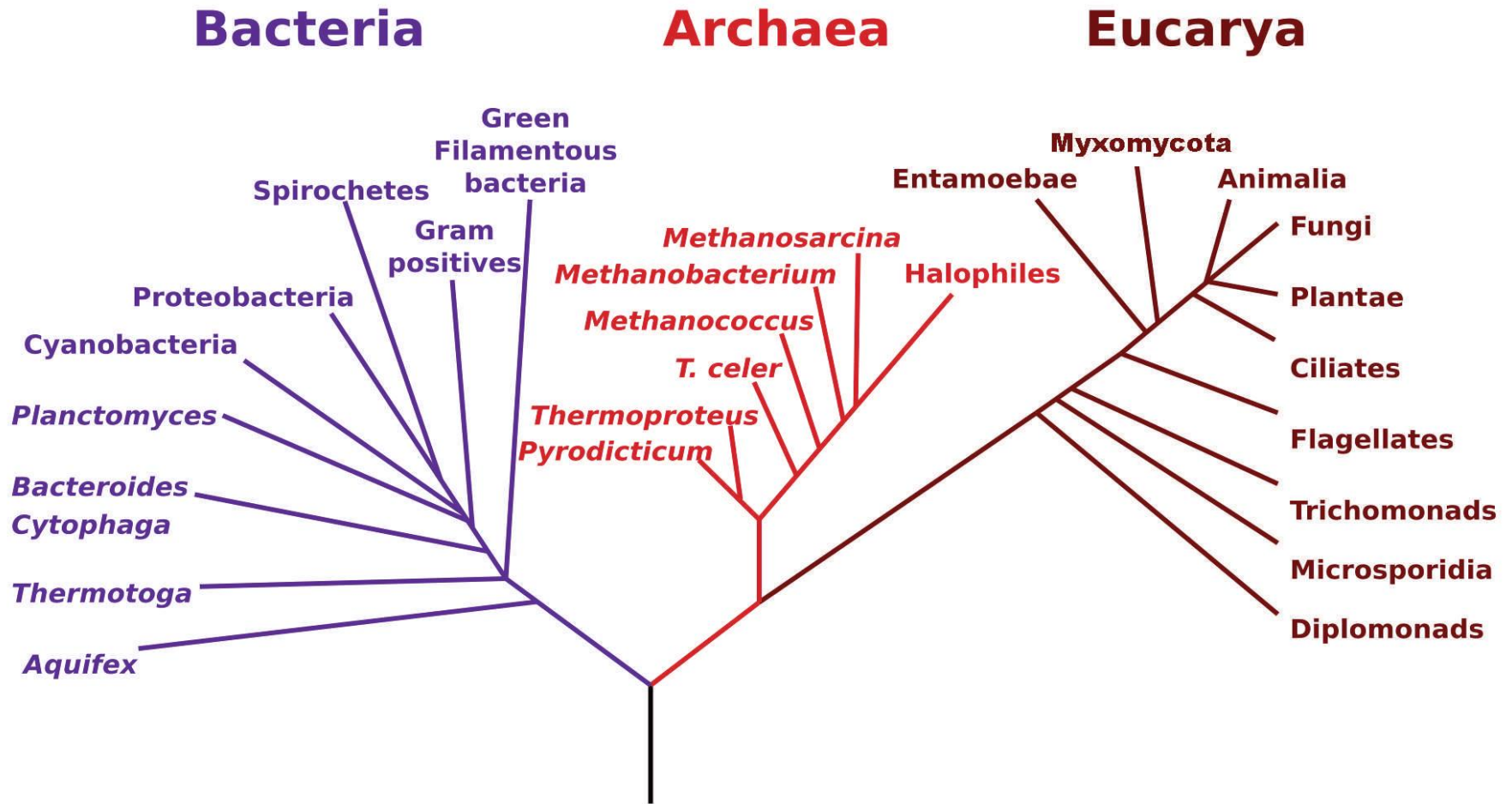
Evolution and the Tree of Life



- Prokaryotes inhabited Earth from approximately 3 to 4 billion years ago, and eukaryotic cells emerged between 1.6 and 2.7 billion years ago

3-4
1.6-2.7

Phylogenetic Tree of Life



Determining Relatedness among Organisms



rRNA sequencing

- The most widely used technique for gauging diversity or relatedness
- rRNA can be used not only for taxonomic purposes, but also in the clinical microbiology laboratory to identify pathogens.