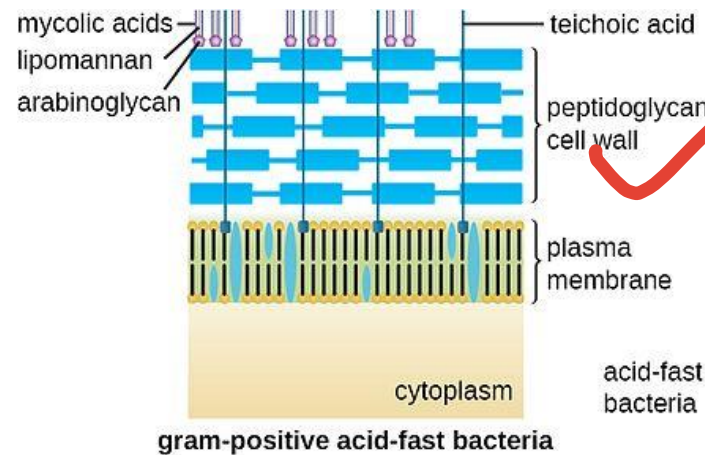


Acid-Fast Bacteria

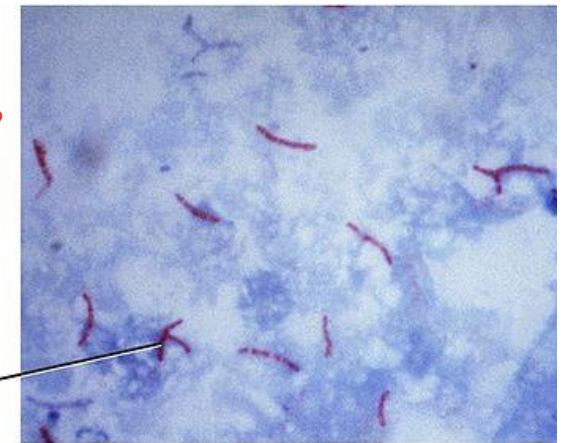
- Acid-fast cells contain a large amount of lipids and waxes in their cell walls

primarily mycolic acid.

- Acid fast bacteria are usually members of the genus *Mycobacterium* or *Nocardia*



(a)



(b)

مختلف عن الجرام وبيحتوي
- extra layer of mycolic acid
- lipid waxy layer covered with peptidoglycan
it has cpecific rule in gram

بيرتبط مع المايكولييك اسيد وبيكون مركب 1- carbol fushin stain
معقد.

والحرارة هون ضرورية

لانه هاد النوع من البكتيريا مش سهل تروح
الصبغة منه .

3- لو كان اسيد فاست رح تظهرلي صبغة لونها زهري
ولو ما كانت البكتيريا من هاد النوع رح يظهرلي
صبغة لونها أزرق

لومثلا واحد عنده maningatis

وهي مرض بالعين ممكن يكون بكتيري او فايروسي
او مايكروبيكتيريال او فنقل وبيعرفوا عن طريق عينة csf
او انه اختبر العينات باختبارات الالوان وبلش بالاسيد فاست
وبكون غسيلها من اللون الزهري اسهل من ال non microbacteria
والى nonmicro هاي اسهل اني اصبغها بال methylene blue

Ziehl-Neelsen staining

- It is used to stain species of *Mycobacterium tuberculosis* that do not stain with the standard laboratory staining procedures like Gram staining.



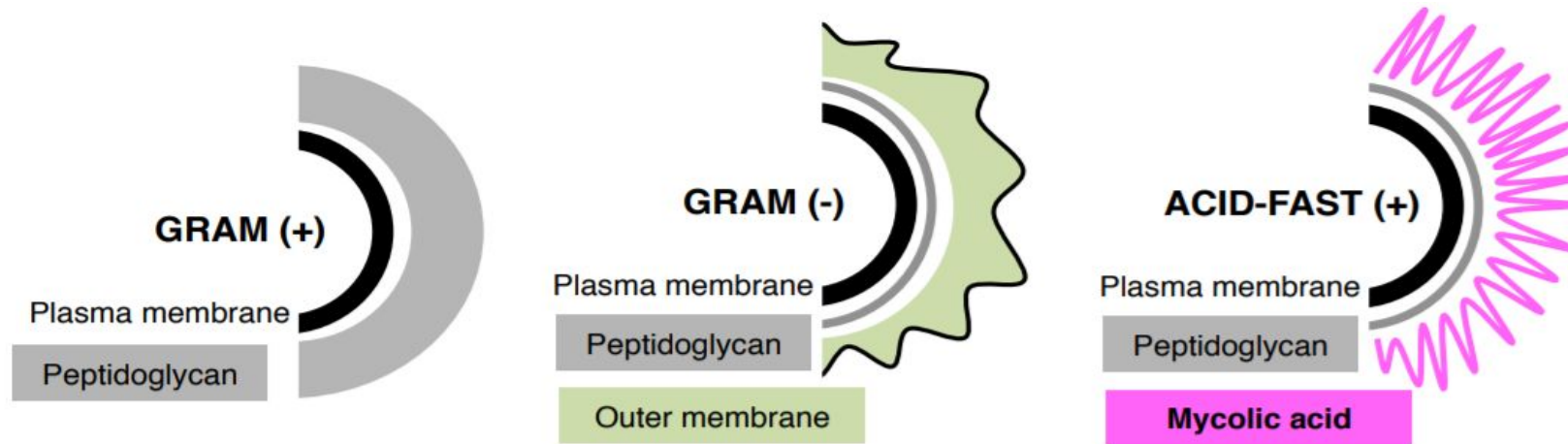
- The stains used are the red colored Carbol fuchsin that stains the bacteria and a counter stain like Methylene blue



هاد الموضوع حكيئا عنه بالتفريغ الماضي

Acid- fast bacteria staining

- Primary stain binds cell wall mycolic acids
- Intense decolorization does not release primary stain from the cell wall of AFB
- Color of AFB-based on primary stain
- Counterstain provides contrasting background

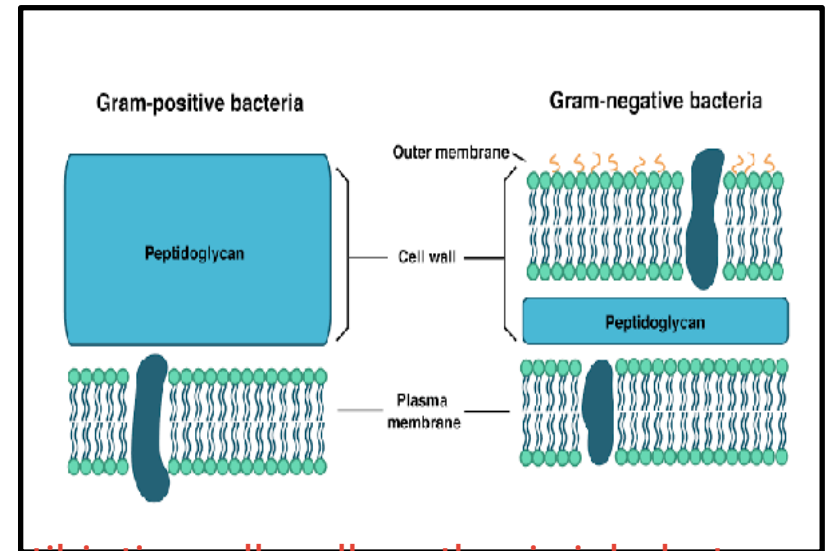


<i>Mycobacterium</i>	non-myco	
		1. All bacteria are transparent prior to staining
		2. Steam is used to force the CARBOL FUCHSIN into all the bacteria
		3. Decolorization with acid removes the CARBOL FUCHSIN from the bacteria that do not have mycolic acid
		4. Methylene blue is the counterstain

Outer membrane

- The **outer membrane**, found primarily in **Gram-negative bacteria**, is a bilayer membrane.
- It is attached to peptidoglycan by **lipoproteins**
- Acts as a **coarse sieve** & has little control on movement of substances in & out of cells

gram positive bacteria is most susceptible to affected by antibiotic because the presence of outer membrane in g neg make the penetration of antibiotic more difficult



antibiotic: cell wall synthesis inhibitor like penicillin

coarse sieve: يعني زي المنخل
وهي مهمة مهمة جدا لمرور البروتينات

Structure of Bacterial Cells

- **Lipopolysaccharide (LPS)**, also called **endotoxin**, is an important part of the outer membrane and can be used to identify Gram-negative bacteria. It is an integral part of the cell wall and is not released until the cell walls of **dead bacteria** are broken down.
endotoxin: once they are released they induce severe adverse reaction (induce toxicity)
- LPS consists of polysaccharides and **lipid A**.
- It is these repeating units that are used to identify different Gram-negative bacteria. The lipid A portion is responsible for the toxic properties that make any Gram negative infection a potentially serious medical problem

Periplasmic Space

- is most easily observed by electron microscopy of Gram-negative bacteria.
- It represents a very active area of cell metabolism.
- This space contains not only the cell wall peptidoglycan but also many digestive enzymes and transport proteins that destroy potentially harmful substances and transport metabolites into the bacterial cytoplasm.

مكونات ال space

نقل البروتينات في الخلية

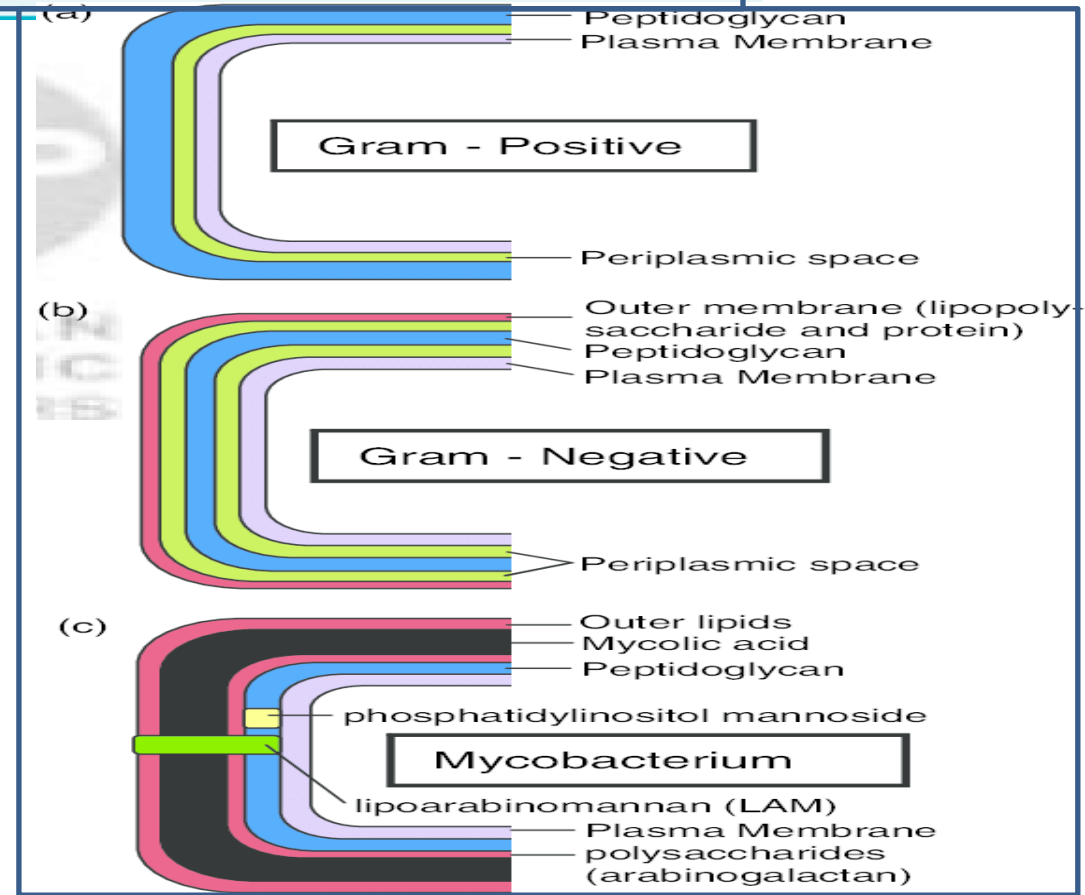
TABLE 4.2 Characteristics of the Cell Walls of Gram-Positive, Gram-Negative, and Acid-Fast Bacteria

Characteristic	Gram-Positive Bacteria	Gram-Negative Bacteria	Acid-Fast Bacteria
Peptidoglycan	Thick layer	Thin layer	Relatively small amount
Teichoic acid	Often present	Absent	Absent
Lipids	Very little present	Lipopolysaccharide	Mycolic acid and other waxes and glycolipids
Outer membrane	Absent	Present	Absent
Periplasmic space	Absent	Present	Absent
Cell shape	Always rigid	Rigid or flexible	Rigid or flexible
Results of enzyme digestion	Protoplast	Spheroplast	Difficult to digest
Sensitivity to dyes and antibiotics	Most sensitive	Moderately sensitive	Least sensitive
Examples	<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>	<i>Mycobacterium tuberculosis</i>

الجدول مهم
ما شرحتها
enzyme digestion
ومو مطلوبة

Summary

acid fast bac: treated by antimicrobial medications



Cytoplasmic (Plasma) membrane

- Thin layer 5-10 nm, separates cell wall from cytoplasm تعريف
- Acts as a semipermeable membrane: controls the **inflow and outflow** of metabolites.
- Composed of lipoproteins with small amounts of carbohydrates. مكوناته :
- The main function of the cell membrane **is to regulate the movement of materials into and out of a cell by transport mechanisms.** وظائفه ال ٦ : It synthesizes cell wall components, assists with DNA replication, secretes proteins, carries on respiration, and captures energy as ATP. It also contains bases of appendages called *flagella*

Other Cytoplasmic Components

1. **Ribosomes** : Are of RNA and protein. often grouped in long chains called **polyribosomes** and their main action is **protein synthesis**. وظيفته الأساسية:

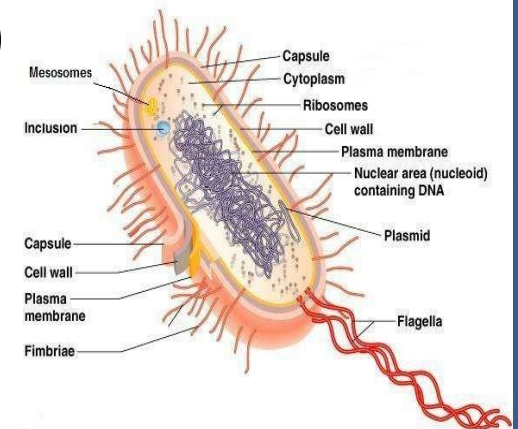
2. **Nuclear Region** :

- **No nucleolus- No nuclear membrane**

- **single, circular double stranded DNA** in cytoplasm

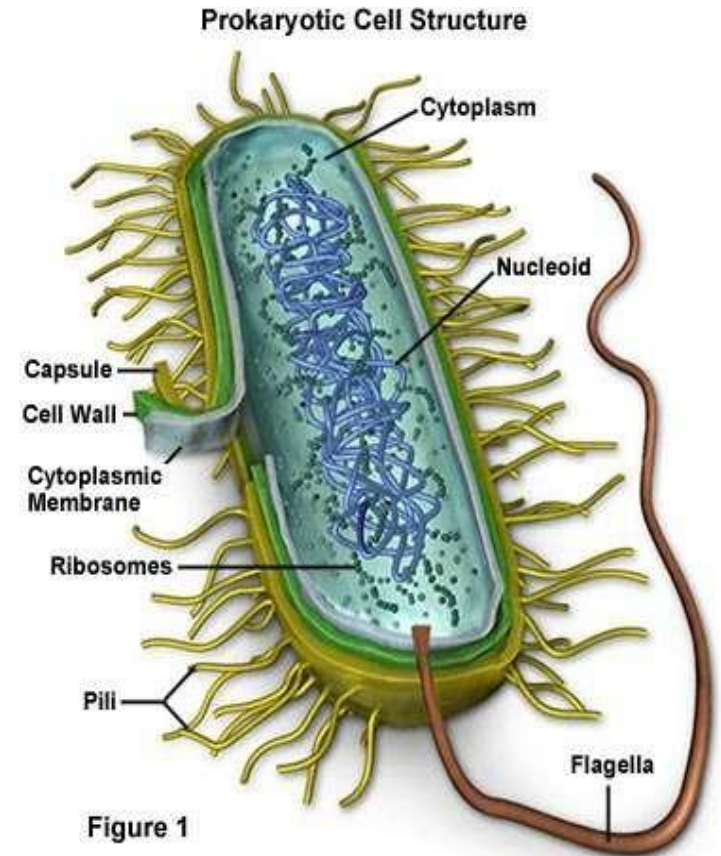
- Many bacteria exchange genetic information carried on **plasmids**
(small, specialized genetic elements capable of self-replication)

للجينات transmission دوره كثير مهم لعملية ال plasmids:



External Structure

- Bacteria also often have these features:
- **flagella-----movement**
- **pili----- attachment not** أهداب للاتصاق involved in movement.
- **capsule-----** Protects bacteria from lytic enzymes and Inhibits phagocytosis extra protection



Types of pili

الأهداب مهمة لعملية ال pathogenicity (انتقال المرض)

1. Conjugation-pili: long pili, found in some groups of bacteria, attach 2 bacteria & DNA is transferred through them, a process called conjugation (like sexual reproduction). Results in transfer of **antibiotic resistance among bacteria**.

ومهمة لنقل ال resistance genes من بكتيريا للتاتية

2. Attachment pili or fimbriae: short, attach bacteria to surfaces or air-water interface. Contributes to the **pathogenicity** of certain bacteria-ability to produce disease-by enhancing colonization on surface of cells of other organisms

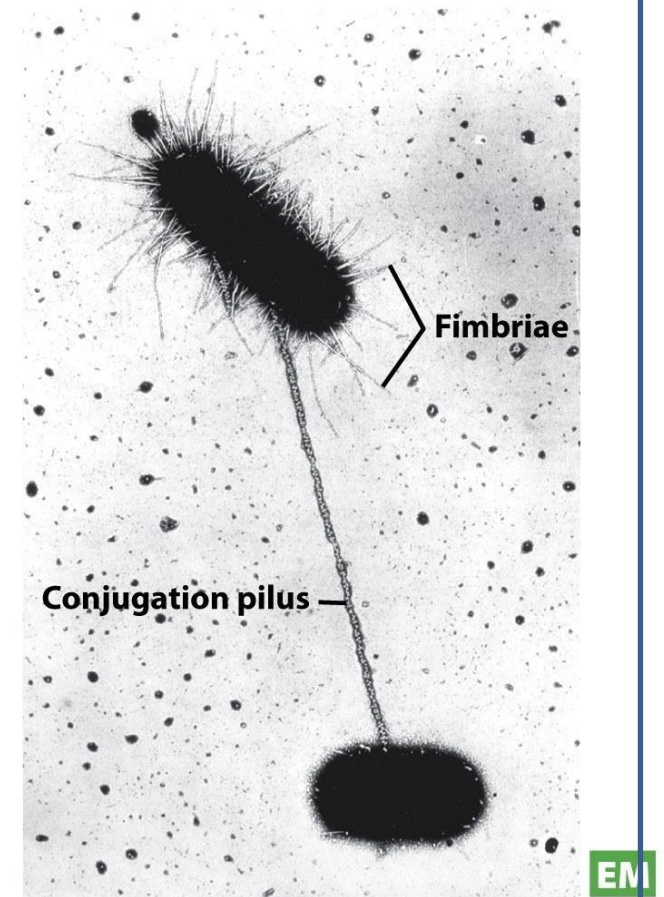


Figure 4-16 Microbiology, 7/e
Courtesy Charles C. Brinton, Jr., and Judith Carnahan

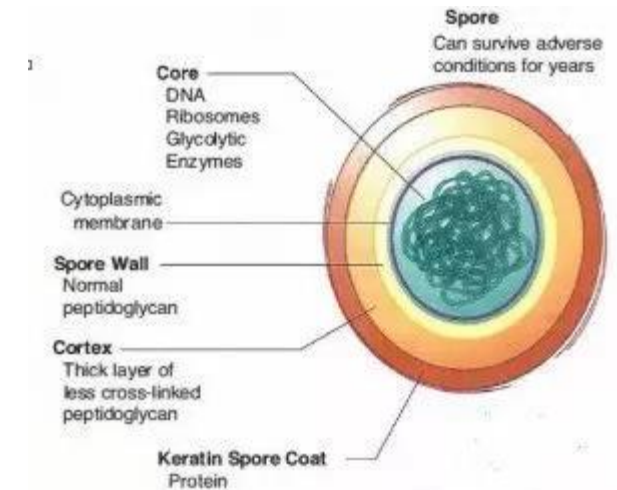
Structure of Bacterial Cells: SPORES

- To enhance survival during periods of environmental hostility some gram-positive rods form of a dormant cell called an endospore inside the original cell.
- Endospores can be released from the original cell as free spores.

السبورز مهمة لحماية البكتيريا
وهي زي الكبسولات

- Spores are the most resistant life forms known.

- Sporulation: a process where bacteria prepare for the possibility of future adverse conditions



لو حست البكتيريا بخطر بتفرز
السبورز، ولما يروح الخطر
بترجع بتنقل الجينات

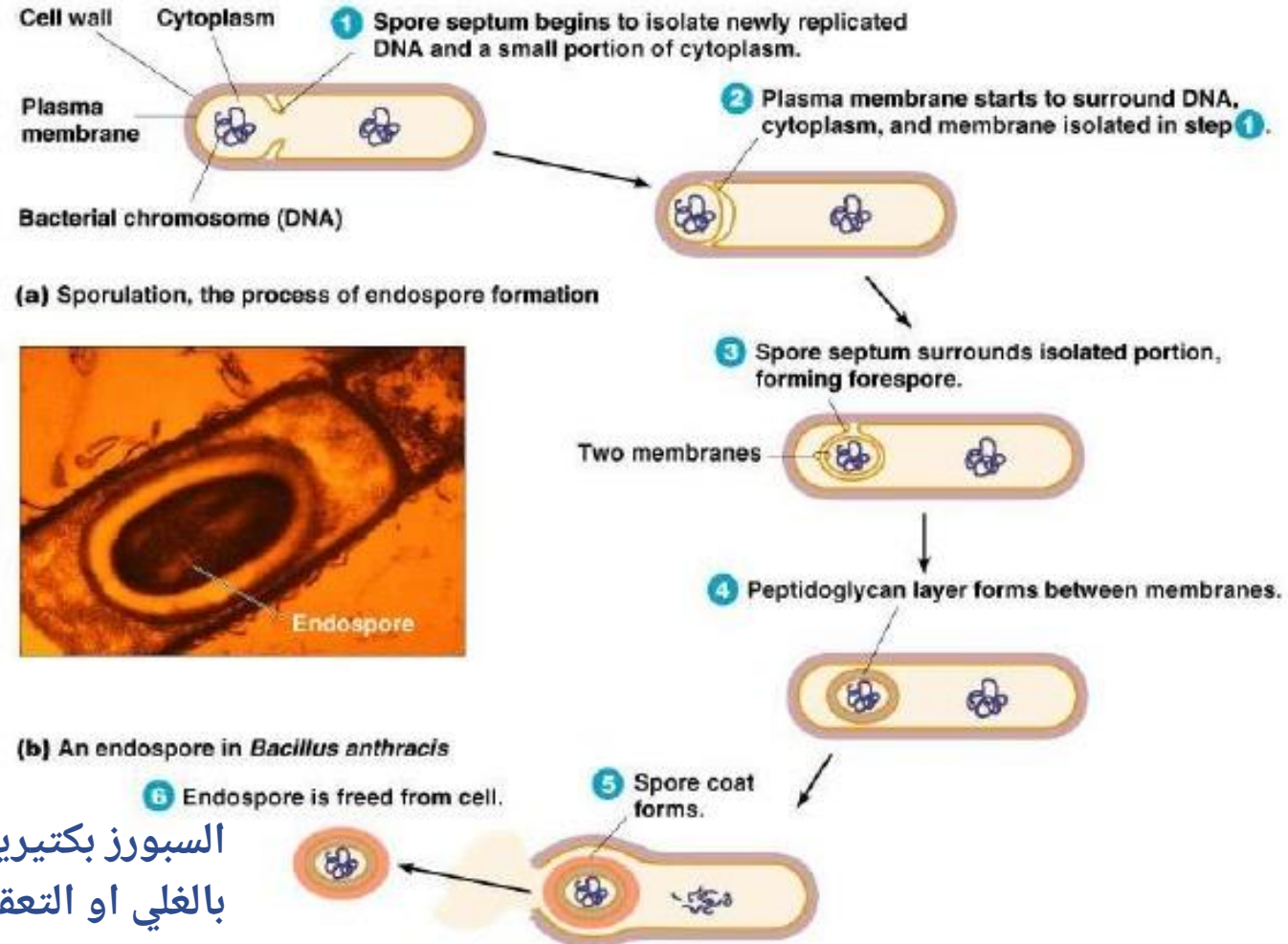
Sporulation Process

Examples of Spore forming Bacteria-

Spores formed by only two genera of Gram-positive rods are of medical importance.

Bacillus spp

Clostridium spp



Copyright © 2004 Pearson Education, Inc., publishing as Benjamin Cummings.

السبورز بكتيريا موجدة اكثر اشي بالتراب وما بتروح
بالغلي او التعقيم

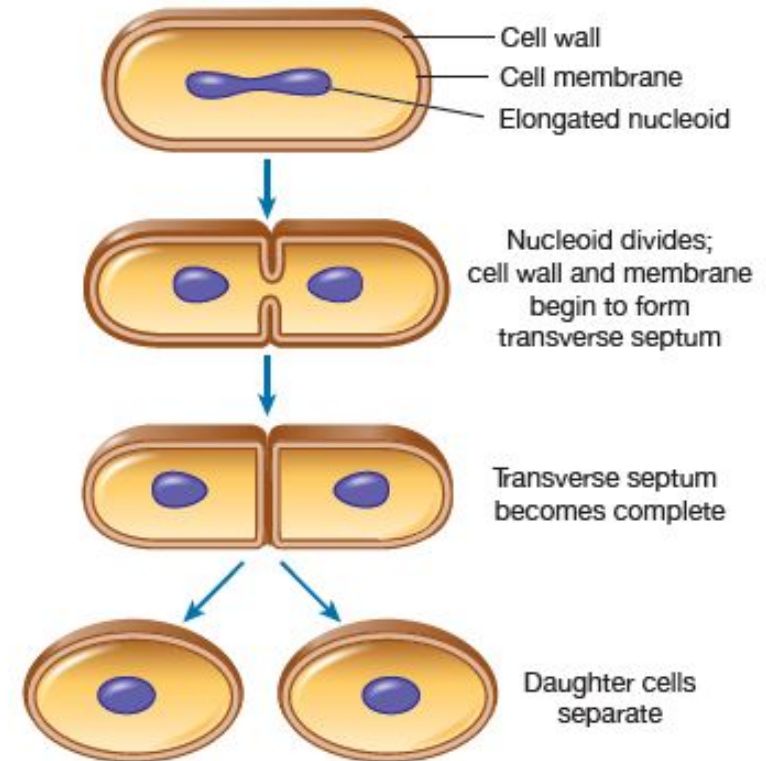
Medical significance of sporulation

- Spores can survive for many years in soil and other inanimate objects.
- Wound contaminated with soils can be infected with spores and cause diseases such as tetanus, gas gangrene.
- Spores are highly resistant to many chemicals, including most disinfectants and antibiotics.
- Only solution designated as sporicidal will kill spores.
- Spores of these organisms can remain viable for many years and are generally not killed by boiling, but they can be killed by autoclaving (that is, subjecting the spores to temperatures above 120°C at elevated pressure).

Cell Division

neither mitoses and mioses

- In **binary fission**, a cell **duplicates its components** and divides into two cells.
- In continuously dividing cells, DNA synthesis also is continuous and replicates the bacterial chromosome shortly before the cell divides.



Types of bacteria

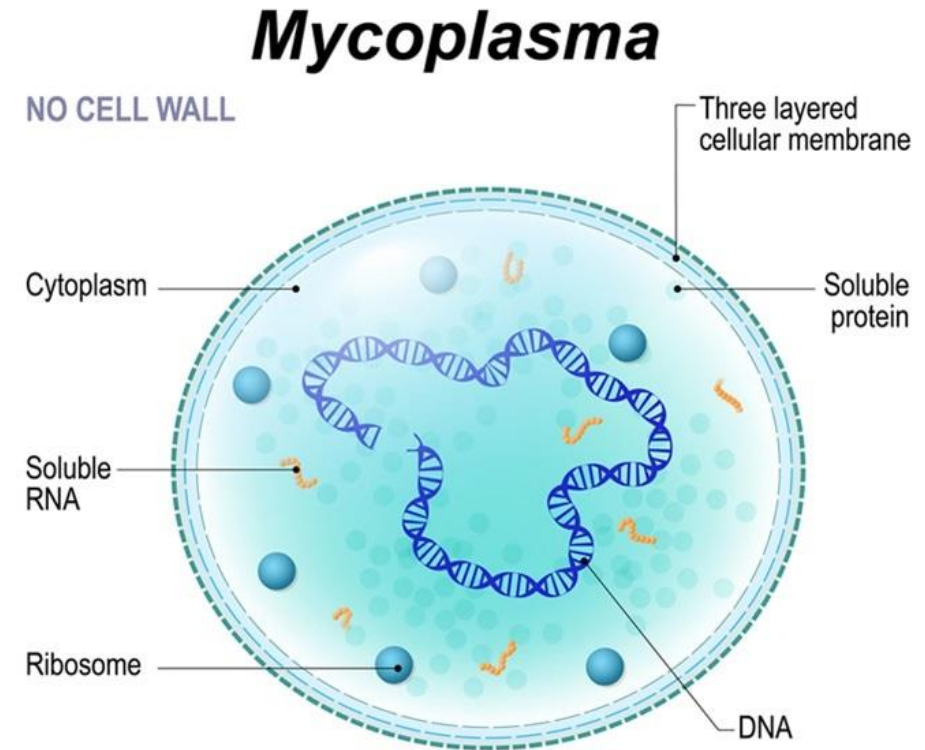
A. Typical bacteria

بقدر اشوفها بال gram staine وعندها cell wall

B. Atypical bacteria:

include groups of organisms such as Mycoplasma, Chlamydia, and Rickettsia that, although prokaryotic, lack significant characteristic structural components or metabolic capabilities that separate them from the larger group of typical bacteria

ما عندها cell wall ولا بقدر بالجرام اعرفها



Types of bacteria –energy production

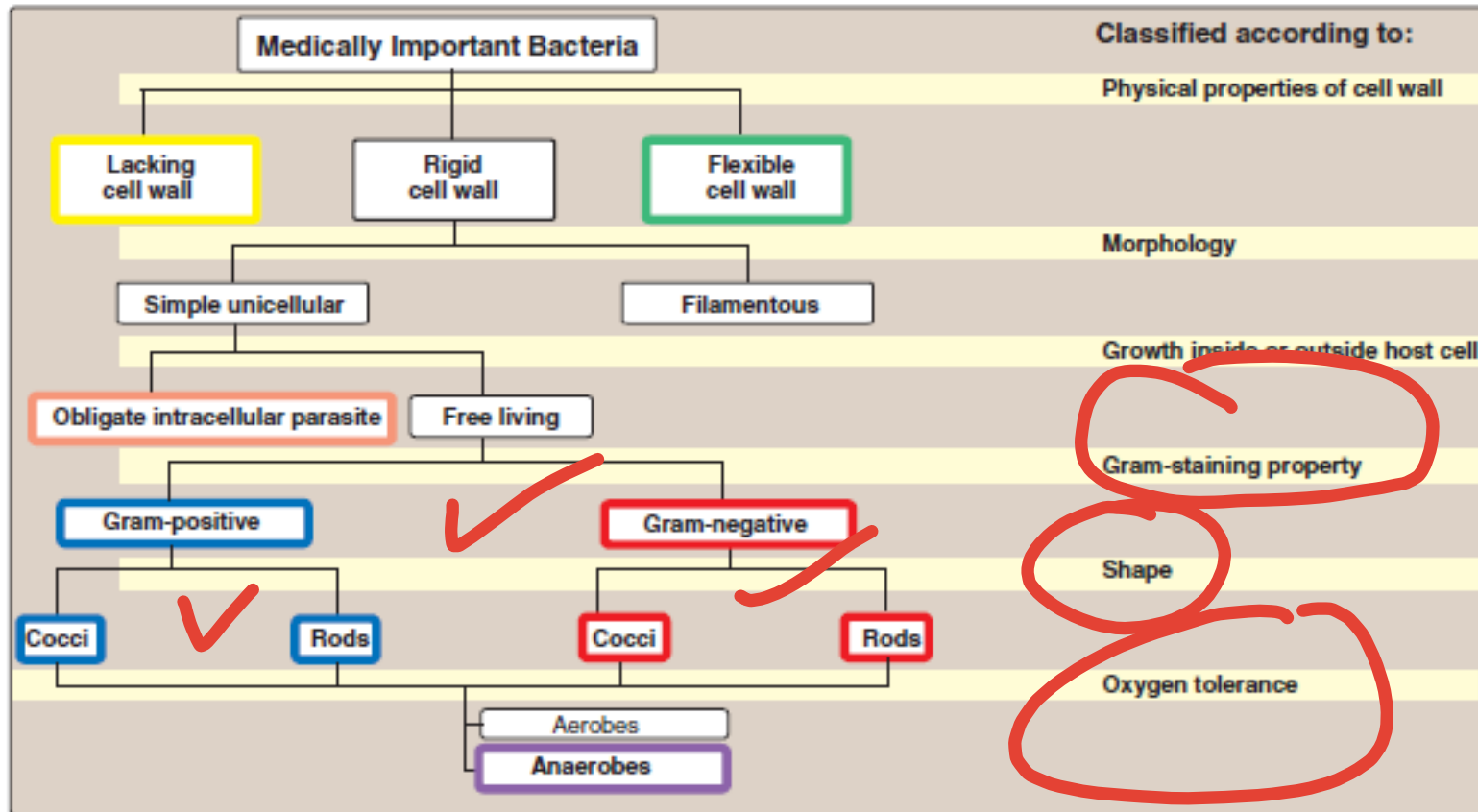
- **Aerobic bacteria:** needs oxygen for **survival and energy production.**

Example: *Pseudomonas aeruginosa*.

- **Anaerobic bacteria:** **cannot live in the presence of oxygen.**

Example: *Clostridium tetani*

Hierarchical classification of clinically important bacteria according to six distinguishing characteristics.



Classification of Microbes:

Classification of Bacteria:

Medically important Bacteria are divided into three groups:

1-Lacking Cell Walls: Example: *Mycoplasma*

2-Flexible (have Cell Walls):

Example: *Spirochetes (Treponema)*.

3-Rigid Cell Walls:

A- Filamentous bacteria: (antibiotic producers).

Example: *Streptomyces*.

B- Simple Unicellular:

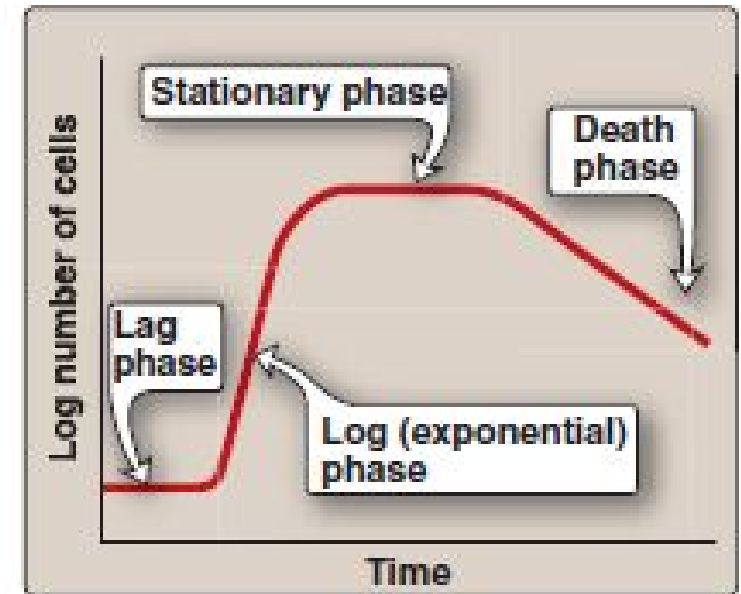
1-Obligate intracellular parasite:

Example: (*Rickettsia , Chlamydia*).

2-Free-living bacteria:

Stages of the bacterial growth cycle

- **Because bacteria reproduce** by binary fission (one becomes two, two become four, four become eight, etc.), the number of cells increases exponentially with time (the exponential, or log, phase of growth).
- Eventually, growth slows and ceases entirely (stationary Phase) as nutrients are depleted, and toxic waste products accumulate. Most cells in a stationary phase are not dead





Artery Academy

Done by Sara Khader