

Lecture 4



MICROBIOLOGY

Second Year
Passion Batch

Salam abu shanab

Sawsan Radi

Cell Structure and Taxonomy



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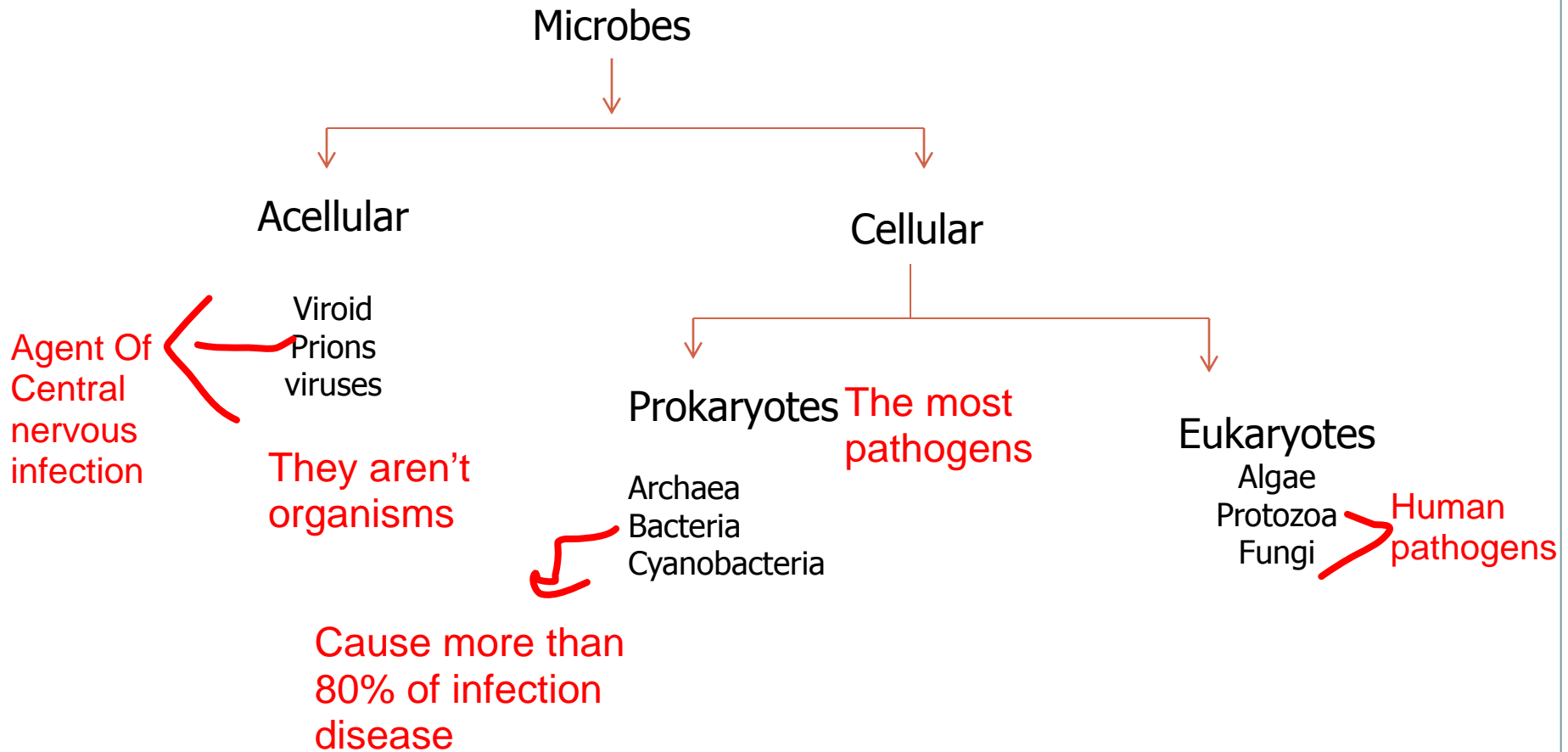
Introduction



- Two major categories of microbes:
- Acellular microbes (infectious particles) / agent: they cause major disease
- Cellular microbes (microorganisms).
Actual organisms

Organism : cell reproduce , and thats the difference between organism and agent .

* cell produce : that means they have complete genetic machinery.



Objectives



1. To learn about the structure of microorganisms
2. Discuss the ways in which microbes and their cells reproduce and how microorganisms are classified.

According to genetic (genotype) and physical (phenotype) analysis

(The origin of organism) الأصل

Contain the genetic material
(التي يحتاجها الكائن الحي)

Differentiate to Organs

- A cell is defined as the fundamental unit of any living organism
- Metabolism refers to all of the chemical reactions that occur within a cell

- Eukaryotic cells possess a true nucleus, whereas prokaryotic cells do not. The main difference is the presence of the plasmic organs within a cell
- Bacteria and Archaea, are called prokaryotes or prokaryotic cells.



****They use the genetic machinery of the host to reproductive**

- Viruses are composed of only a few genes protected by a protein coat, and sometimes may contain one or a few enzymes.
- Viruses depend on the energy and metabolic machinery of a host cell to reproduce.
- Because viruses are acellular (not composed of cells), they are placed in a completely separate category.

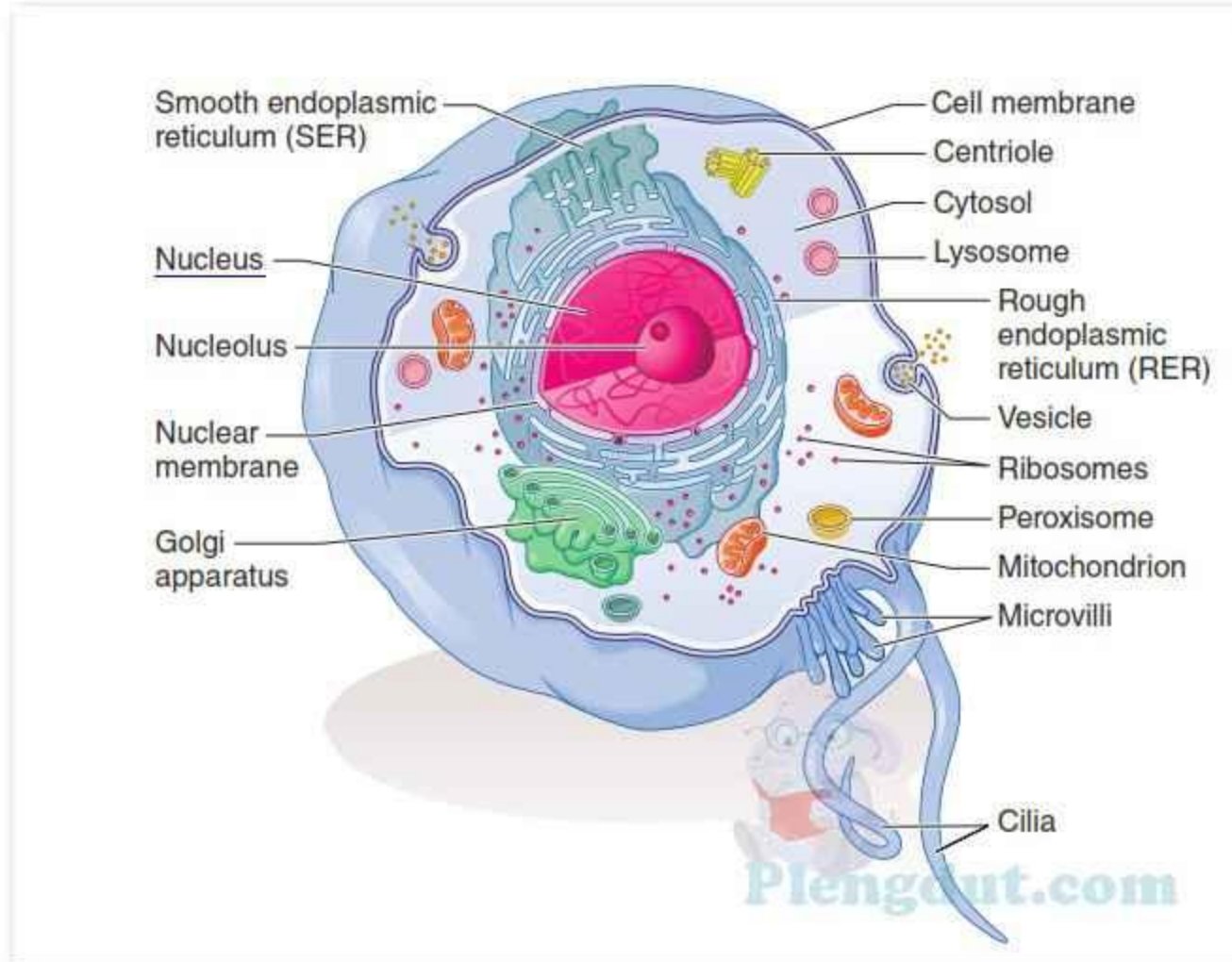
- Health care professionals, should learn differences in the structure of various cells to:
 1. identify organisms → To differentiate between types
 2. understand differences in their metabolism.
- ** So we can understand The way the treatment of disease which they cause
- These factors must be known before one can determine or explain why antimicrobial agents (drugs) attack and destroy pathogens, but do not harm human cells.

لما نعمل treatment لل fungus
 في تشابة مع الخلايا البشرية
 فلهيك ال antifungal treatment
 بميزش بيناتهم

For systemic disease

**The patient must be in-patient
 لهيك بنراقب المريض جوا المستشفى

Eukaryotic Cell Structure



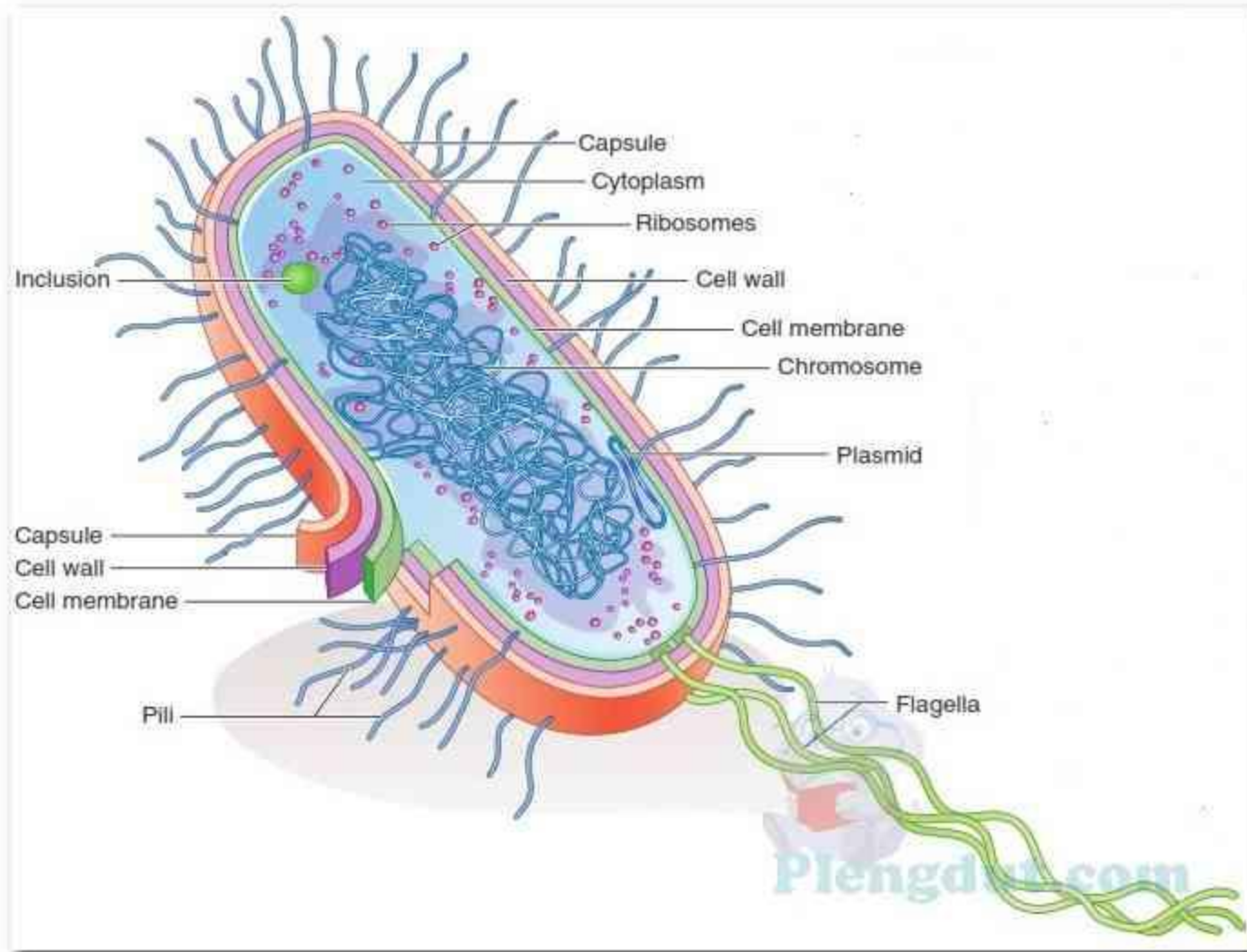
Cell wall



Prokaryotic Cell Structure



- Prokaryotic cells are about 10 times smaller than eukaryotic cells
- Reproduction of prokaryotic cells is by binary fission ↗ Split into the identical daughter cells
- All bacteria are prokaryotes
- Embedded within the cytoplasm of prokaryotic cells are a chromosome, ribosomes, and other cytoplasmic particles



- Unlike eukaryotic cells, the cytoplasm of prokaryotic cells is not filled with internal membranes. Which do the job to selective permeability
- The cytoplasm is surrounded by a cell membrane, a cell wall (usually), and sometimes a capsule or slime layer.

Cell Membrane



- Chemically, the cell membrane consists of proteins and phospholipids The ratio of proteins and phospholipids is different

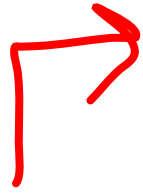
↓
**بنزيتها لحتى نزيد الحماية

- Selective permeability
** في الخلايا الي فيها cell wall يكون الـ cell membrane
More thickness To protect the enteral Organs
- Many enzymes are attached to the cell membrane, and various metabolic reactions take place there
- Mesosomes—are foldings of the cell membranes—where cellular respiration takes place in bacteria
هلا في بكتيريا بتكون cell wall less لهيك بتعمل على انها تخلي الـ cell membrane
اكثر سماكة عن طريق زيادة الـ Lipids لهيك بنلاقيها قريبة من الـ fats .

Chromosome



- The prokaryotic chromosome usually consists of a single, long, supercoiled, circular DNA molecule, which serves as the control center of the bacterial cell
Chromosomes in prokaryotic is circular and they disposed in cytoplasm as nucleoid
- The chromosome is suspended or embedded in the cytoplasm.
- The DNA-occupied space within a bacterial cell is sometimes referred to as the bacterial nucleoid



Extra chromosomal molecule have a size 10% of chromosome

- Plasmids = a small, circular molecules of double-stranded DNA that are not part of the chromosome may also be present in the cytoplasm of prokaryotic cells

It's function: to transfer traits from bacteria To another

anti-microbial resistance.  أهمها

أو مثلا بكتيريا nonpathogens بتتحول ل
pathogens عن طريق انتقال البلازميد من
بكتيريا لآخرى

Cytoplasm



- The cytoplasm of prokaryotic cells consists of water, enzymes, dissolved oxygen (in some bacteria), waste products, essential nutrients, proteins, carbohydrates, and lipids—a complex mixture of all the materials required by the cell for its metabolic functions. **Chemical reaction + reproduction**

Cytoplasmic Particles

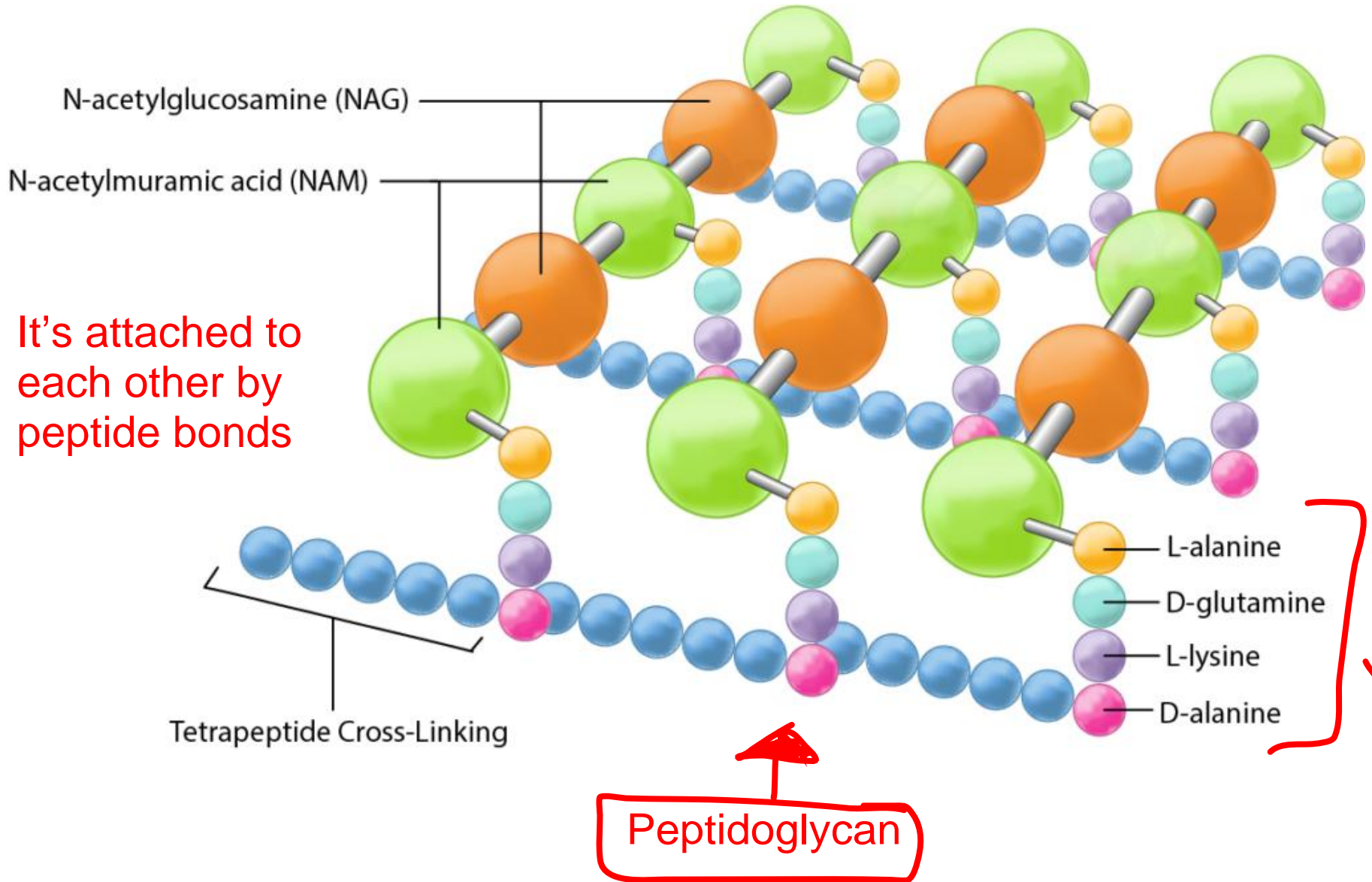


- Prokaryotic ribosomes are smaller than eukaryotic ribosomes, they are the sites of protein synthesis.
↳ The factory of protein
- A 70S prokaryotic ribosome is composed of a 30S subunit and a 50S subunit
** In eukaryotic 80S
- Cytoplasmic granules occur in certain species of bacteria.
- The granules may consist of starch, lipids, sulfur, iron, or other stored substances.

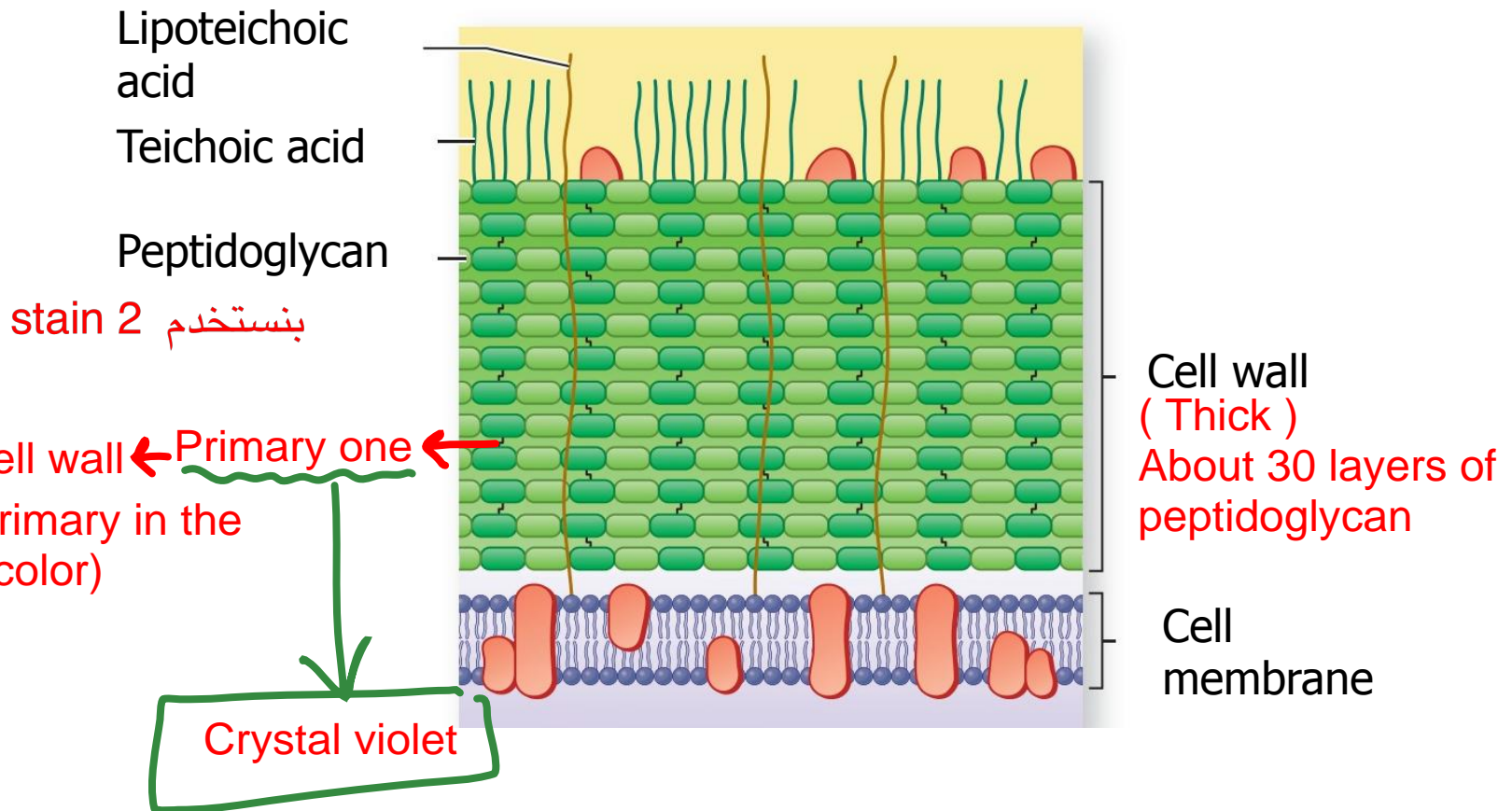
Bacterial Cell Wall



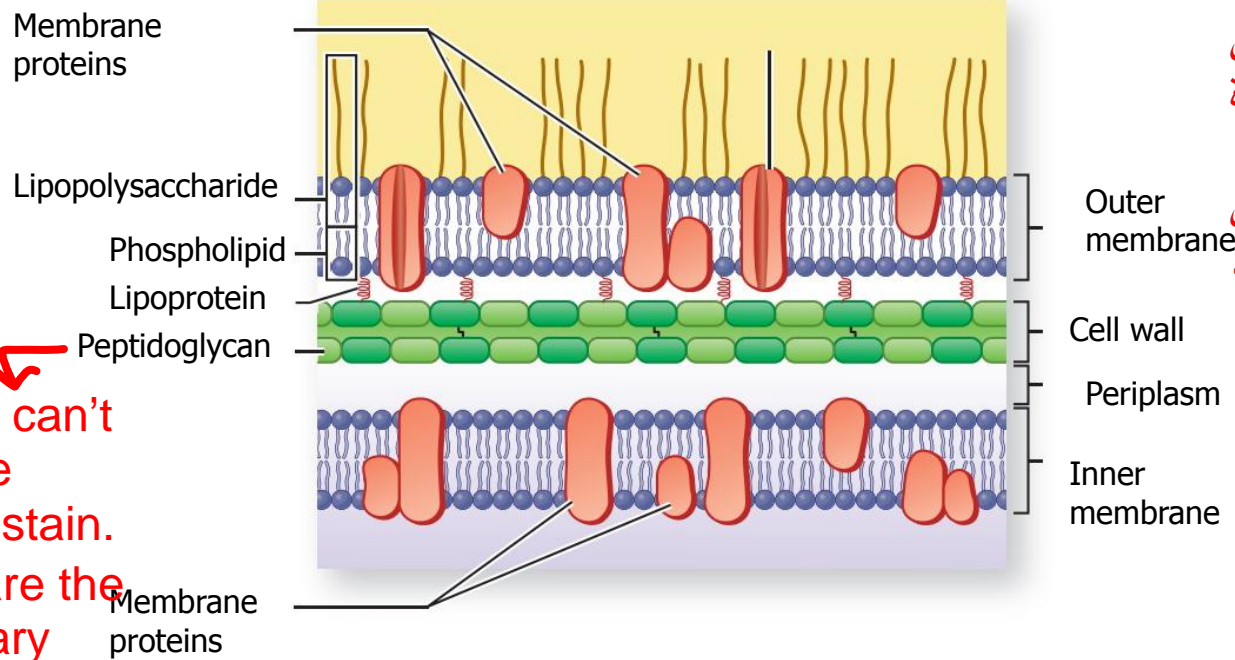
- The structure of bacterial cell walls is different from the eukaryotic cell walls
 - Functions—rigidity, strength, and protection
 - ↳ Determination of the (gram) reaction
 - Peptidoglycan is the major constituent of most bacterial cell walls (also known as murein)
 - Peptidoglycan is only found in bacteria.
 - The thickness of the cell wall and its exact composition vary with the species of bacteria
- Violet , thick cell wall
- Real , thin cell wall



Gram-positive bacteria have a thick layer of peptidoglycan combined with teichoic acid and lipoteichoic acid molecules



Gram-negative bacteria have a much thinner layer of peptidoglycan, but this layer is covered with a complex layer of lipid macromolecules, usually referred to as the outer membrane



إذا كان الـ cell wall
 يحتوي على lipids ممكن
 الـ lipids تذوب وتفوت المادة
 الكيماوية التي استخدمناها
 (Antimicrobial) ممكن
 تموت الخلية .



Thin so can't
 keep the
 primary stain.
 So we are the
 secondary
 Then the cell will
 take its color (red)

Glycocalyx (Slime Layers and Capsules)



- A thick layer of material located outside their cell wall

Slime layers easy to remove

Function to mask the receptor of the bacterial cell so the immune system can't recognize them

- Depending on the species, bacterial cells may or may not be surrounded by glycocalyx.

Capsule thicker and attach to cell strongly

- The two types of glycocalyx are slime layers and capsules.



Run away from phagocytosis

- Bacterial capsules serve an antiphagocytic function

** If we remove the capsules the new generation will be capsuled