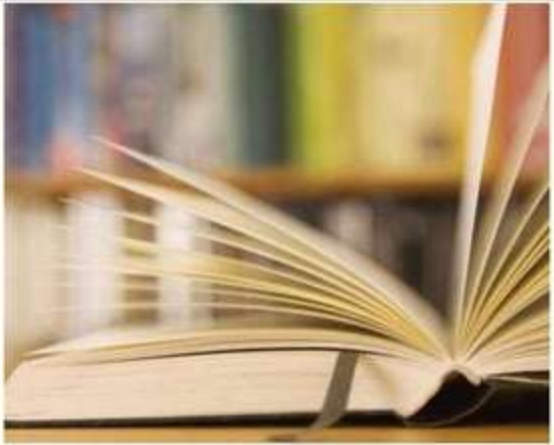
BACTERIOLOGY INTRODUCTION

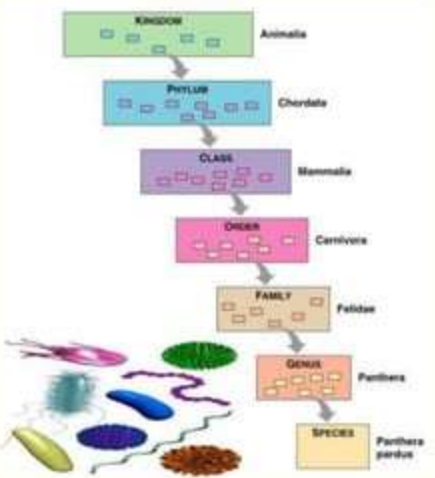
By: Leslie Millán
Medical Microbiologist online tutor



General Index in Bacteriology Studying section

1. Bacterial taxonomy
2. Bacterial structures or morphology
3. Stains
4. Diagnostics
5. Bacterial genetics
6. Immunity and Mechanism of action of bacteria
7. Introduction to the next content: Antibiotics.

Bacterias



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- **Microbial nomenclature**- naming microorganisms
- **Taxonomy**- classifying living things
- **Identification**- discovering and recording the traits of organisms so they can be named and classified

Bacterias

- Bacterias are unicellular microorganisms that live in the environment and in all living entities

Three domains

BACTERIA ⟷

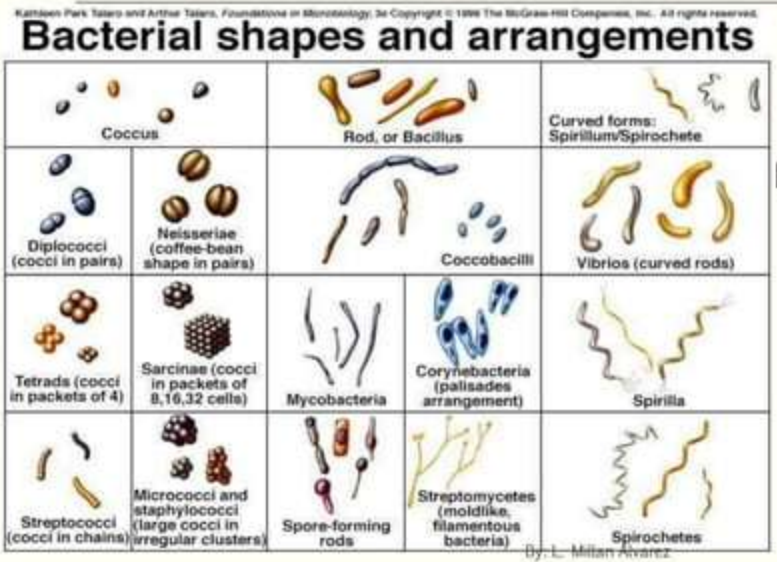
ARCHAEA

EUKARYA ⟷ Protista, fungi, plantae, animals

BACTERIAL FORMS

Morphology of Bacterias

Kathleen Park Talaro and Arthur Talaro, Foundations in Microbiology, 3e Copyright © 1999 The McGraw-Hill Companies, Inc. All rights reserved.



- Coccus
- Bacillus or rods
- Branching filaments
- Pleomorphic
- Spiral

BACTERIAL STRUCTURE

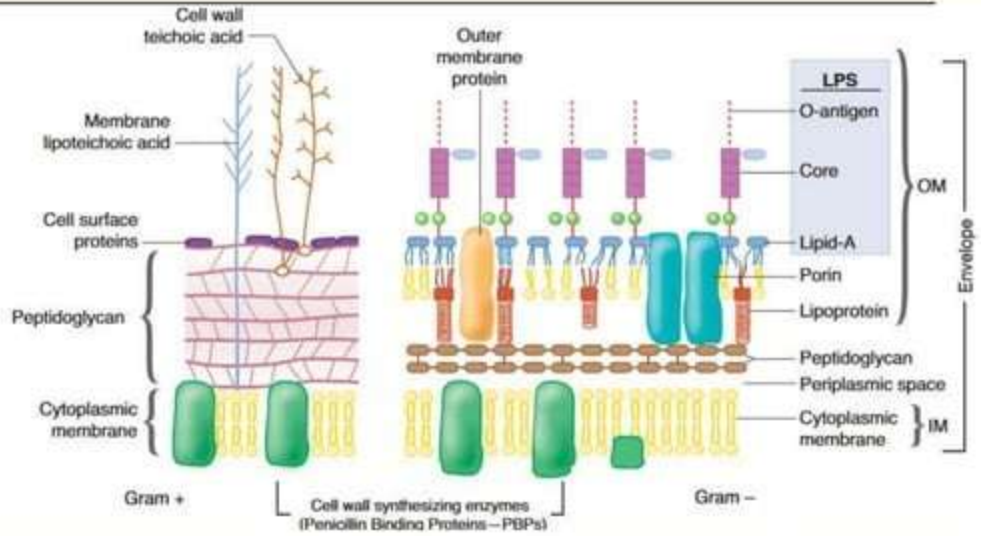
Both Gram-positive and Gram-negative cell envelopes have the following properties:.

- **Cytoplasmic membranes**, which contain transpeptidases and carboxy-peptidases that help construct the cell wall or peptidoglycan; they are also known as penicillin-binding proteins because they are targets for the β-lactam antibiotics
- **Peptidoglycan**, of which Gram-positives have a thick layer to protect it from osmotic damage, while Gram-negatives have a very thin layer; Gram stain reflects this difference

Gram-positive bacteria may utilize teichoic acid for attachment or lipoteichoic acid. Cell surface proteins are variable among the different genera but may include proteins such as the M protein found within the genus *Streptococcus*.

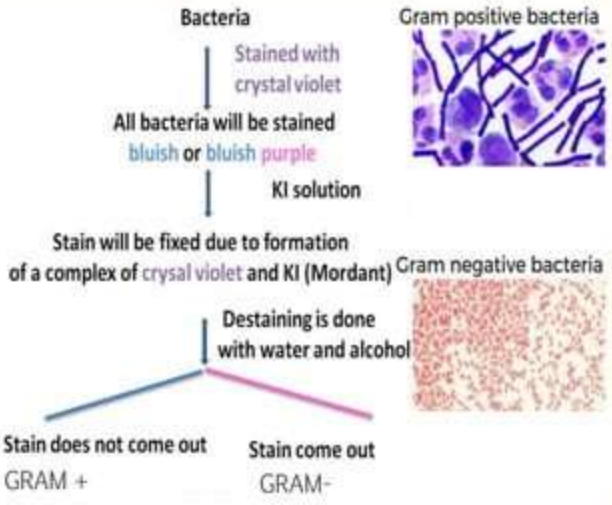
Gram-negative bacteria have an outer membrane covering the peptidoglycan. The outer membrane contains the endotoxin lipopolysaccharide (LPS).

Bacterial structure of the cell wall and membrane



Stains

- GRAM stain description



Other stains	FAST ACID Ziehl Neelsen
	India Ink
	GIEMSA
	Silver stain

TOXINS

Toxins may aid in invasiveness, damage cells, inhibit cellular processes, or trigger immune response and damage.

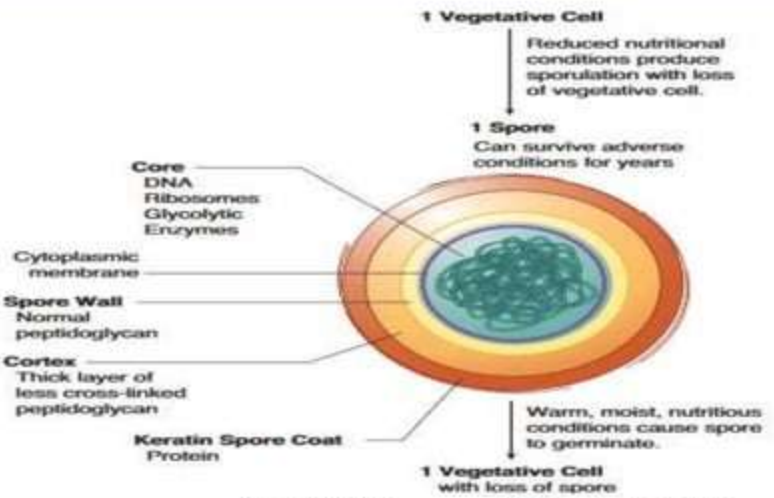
- Structural Toxins· Endotoxin (lipopolysaccharide LPS), EXOTOXINS

-Peptidoglycan

-Teichoic Acids

Endospore

- Bacillus
- Clostridium



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Bacterial growth and death

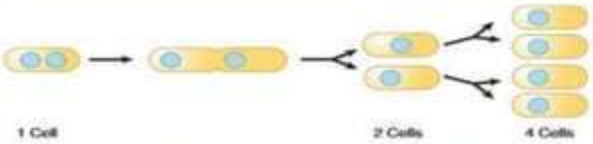
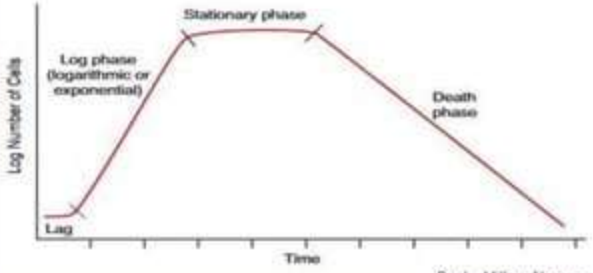


Figure II-1-6. Exponential Growth by Binary Fission



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Lag Phase

- Initial Phase (only 1 lag phase)
- Detoxifying medium
- Turning on enzymes to utilize medium
- For exam, number of cells at beginning equals number of cells at end of lag phase.

Log Phase

- Rapid exponential growth
- Generation time = time it takes one cell to divide into two. This is determined during log phase.

Stationary Phase

- Nutrients used up
- Toxic products like acids and alkali begin to accumulate.
- Number of new cells equals the number of dying cells.

DIAGNOSTIC METHODS

- Rapid
- Conventional

Or

Direct Method: detects Ag or pathogen

Undirect Method: Detects Abs or subproducts like ELISA

- Rapid are the diagnostics made in 24h like smears, frotis
- Conventional are all procedures that take more tan 24h to diagnose an infection and include: culturing, some PCR, antibiotic susceptibility and resistance
- reactive Abs to Ag
- Or Ag detection to Specific pathogen

DNA
(Deoxyribonucleic Acid)

- DNA is composed of Many Units of
  Adenine – Thymine A – T
  Guanine – Cytosine G - C

A+ T

G+C proportion differ for each species

DNA replicates first unwinding at one end to form a fork

Each strand of fork acting as template for the synthesis of complementary strand

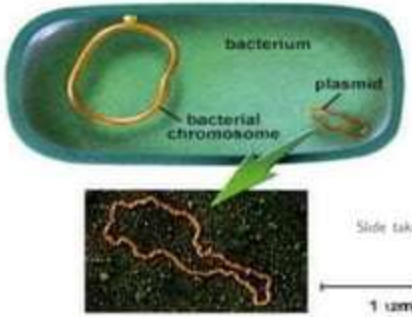
How RNA differs from DNA

- RNA contains - Sugar Ribose instead of Deoxyribose
- Uracil is present instead of Thymine
- Types of RNA
  Messenger RNA **mRNA**
  Ribosomal RNA **rRNA**
  Transfer RNA **tRNA**

Slides taken from Dr. TV Rao MD

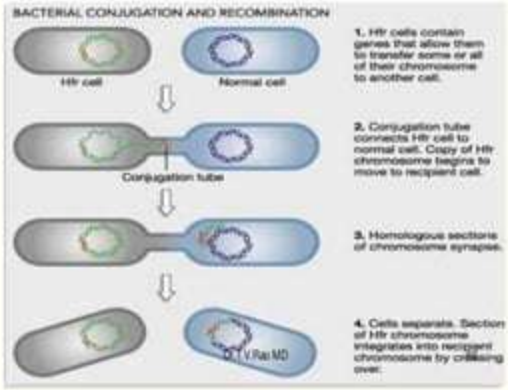
PLASMIDS

-Plasmids are circular DNA molecules present in the bacteria
-Autonomus Replication
-Conjugation: transfer plasmids from cell to cell
-Vector in Genetic Engineering

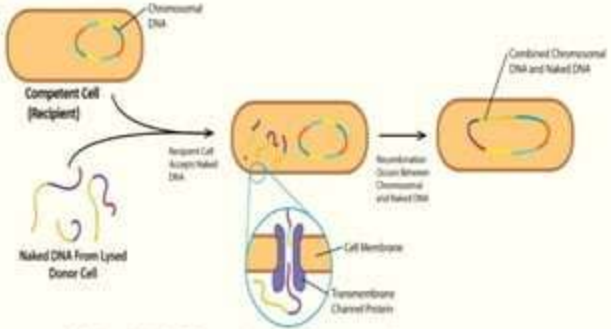


Slide taken from Dr. TV Rao MD

Conjugation

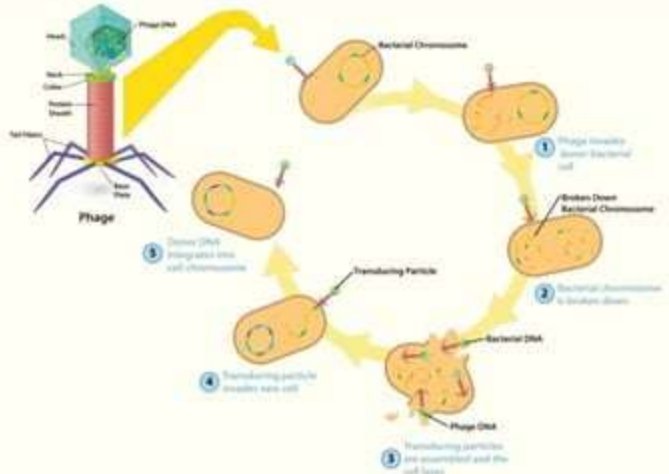


Transformation Summary



Microbial Genetics – General
Microbiologyopen.oregonstate.education

TRANSDUCTION



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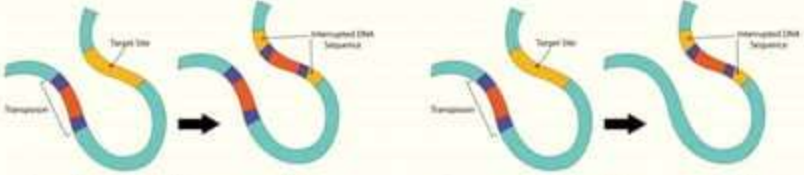
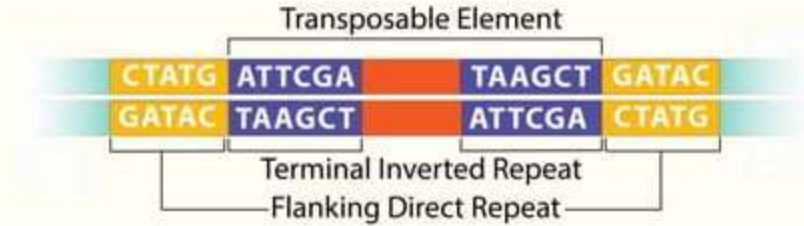
RECOMBINATION

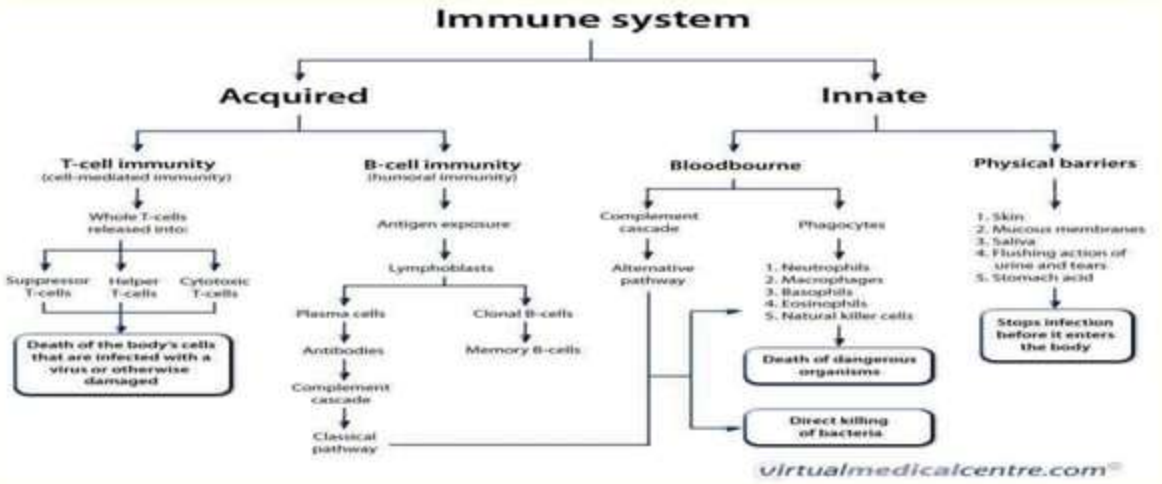




MUTATIONS

- Silent: no change in amino acids to conform a protein.
- Missense: Different amino acid in protein product.
- Nonsense: Stop codon, no protein synthesis.

IMMUNITY


Immune system
Acquired
Innate
T-cell immunity
(cell-mediated immunity)
Whole T-cells released into:
Suppressor T-cells
Helper T-cells
Cytotoxic T-cells
Death of the body's cells that are infected with a virus or otherwise damaged
B-cell immunity
(humoral immunity)
Antigen exposure
Lymphoblasts
Plasma cells
Clonal B-cells
Antibodies
Memory B-cells
Complement cascade
Classical pathway
Bloodbourne
Complement cascade
Alternative pathway
Phagocytes
1. Neutrophils
2. Macrophages
3. Basophils
4. Eosinophils
5. Natural killer cells
Death of dangerous organisms
Direct killing of bacteria
Physical barriers
1. Skin
2. Mucous membranes
3. Saliva
4. Flushing action of urine and tears
5. Stomach acid
Stops infection before it enters the body
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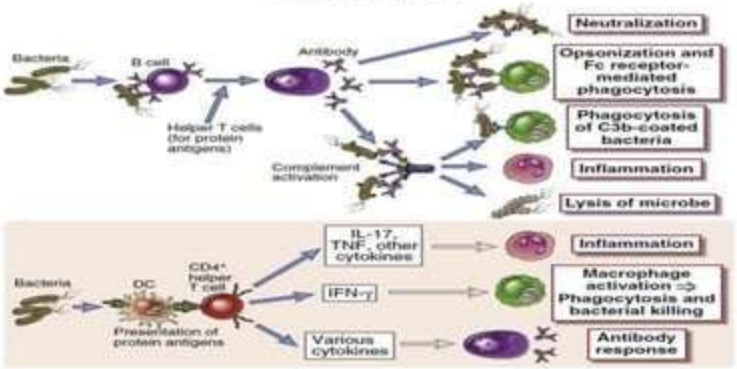
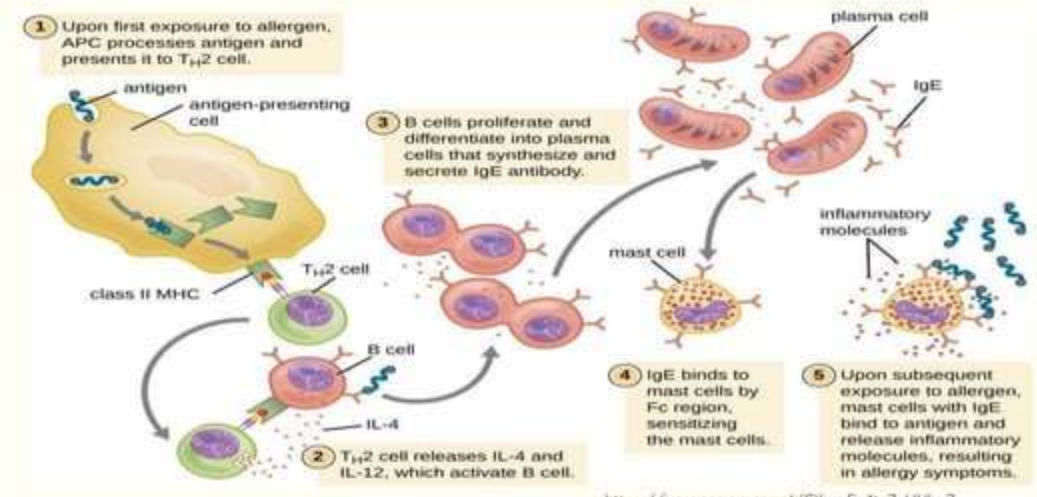
Adaptive Immunity to Extracellular Bacteria



HYPERSENTIVITY



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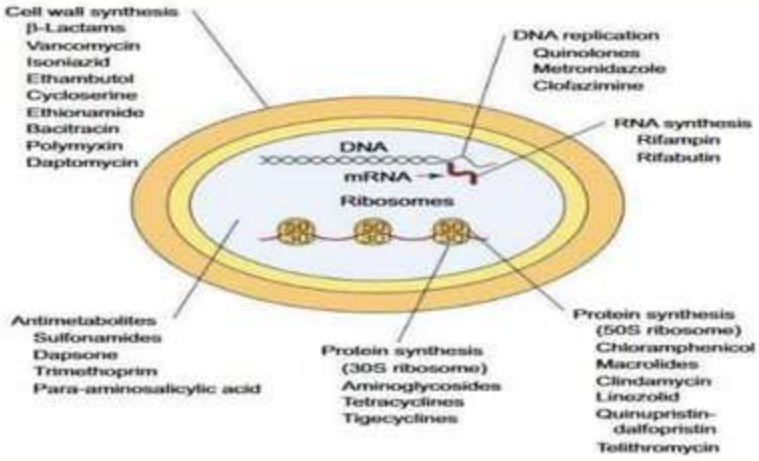
Mechanism of action of antibiotics



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