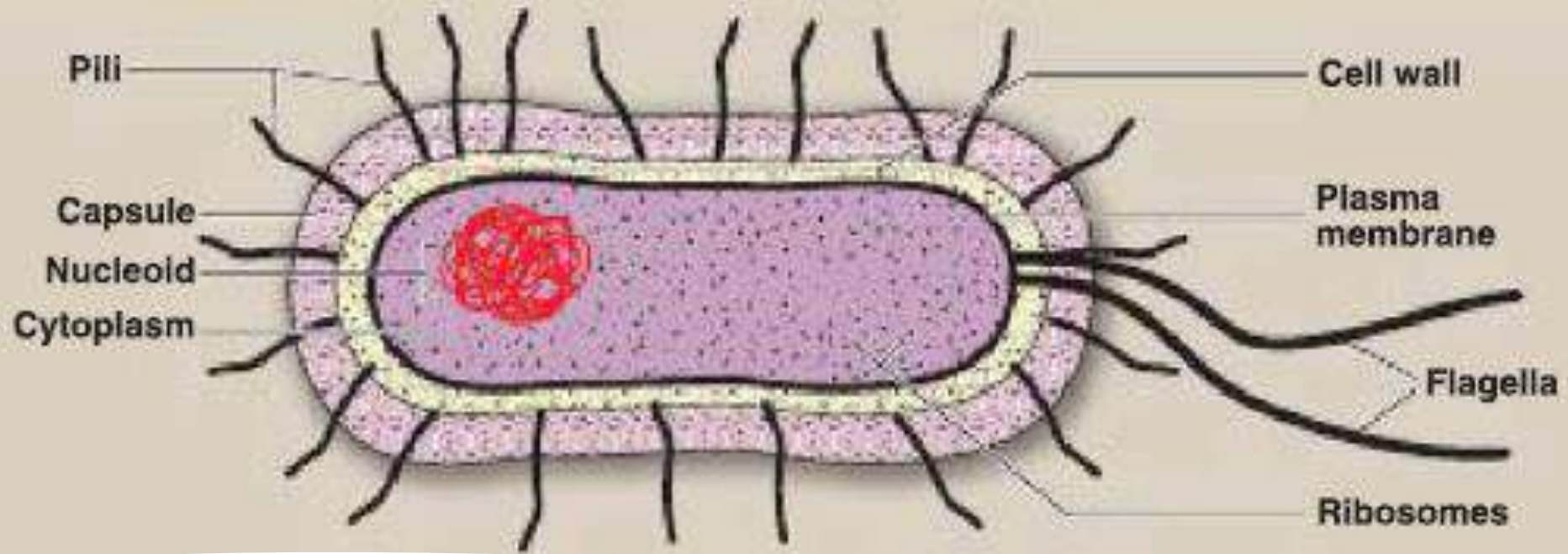


Bacteriology





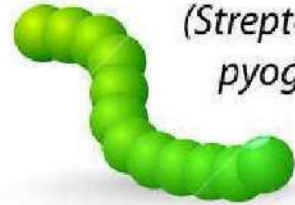
- The cellular world is divided into two major groups, based on whether or not the cells have a nucleus (ie, an internal membrane-enclosed region that contains the genetic material).
- Cells that have a well-defined nucleus are called eukaryotic, whereas cells that lack a nucleus are called prokaryotic.
- All bacteria are prokaryotes. In addition, bacterial DNA is not organized into the elaborate multichromosomal structures of the eukaryotes, but typically is a single double-stranded molecule of DNA, sometimes referred to as the nucleoid.
- Prokaryotes and eukaryotes employ very similar metabolic pathways to achieve cell growth and maintain viability.
- However, prokaryotes synthesize substances and structures that are unique to bacteria, for example, peptidoglycan

SHAPES OF BACTERIA

COCCI



Diplococci
(*Streptococcus pneumoniae*)



Streptococci
(*Streptococcus pyogenes*)

Tetrad

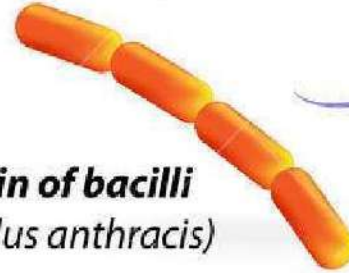


Staphylococci
(*Staphylococcus aureus*)

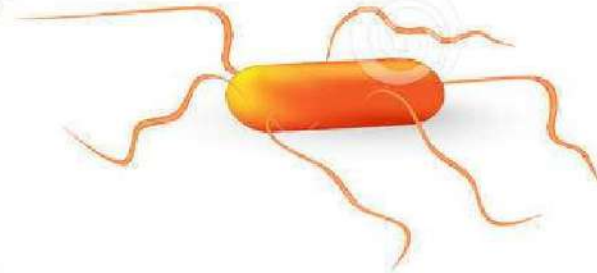


Sarcina
(*Sarcina ventriculi*)

BACILLI



Chain of bacilli
(*Bacillus anthracis*)



Flagellate rods
(*Salmonella typhi*)



Spore-former
(*Clostridium botulinum*)

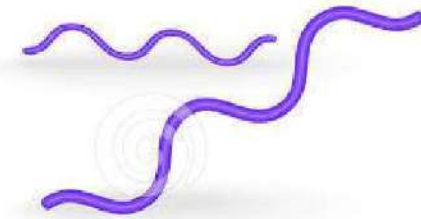
OTHERS



Vibrios
(*Vibrio cholerae*)



Spirilla
(*Helicobacter pylori*)



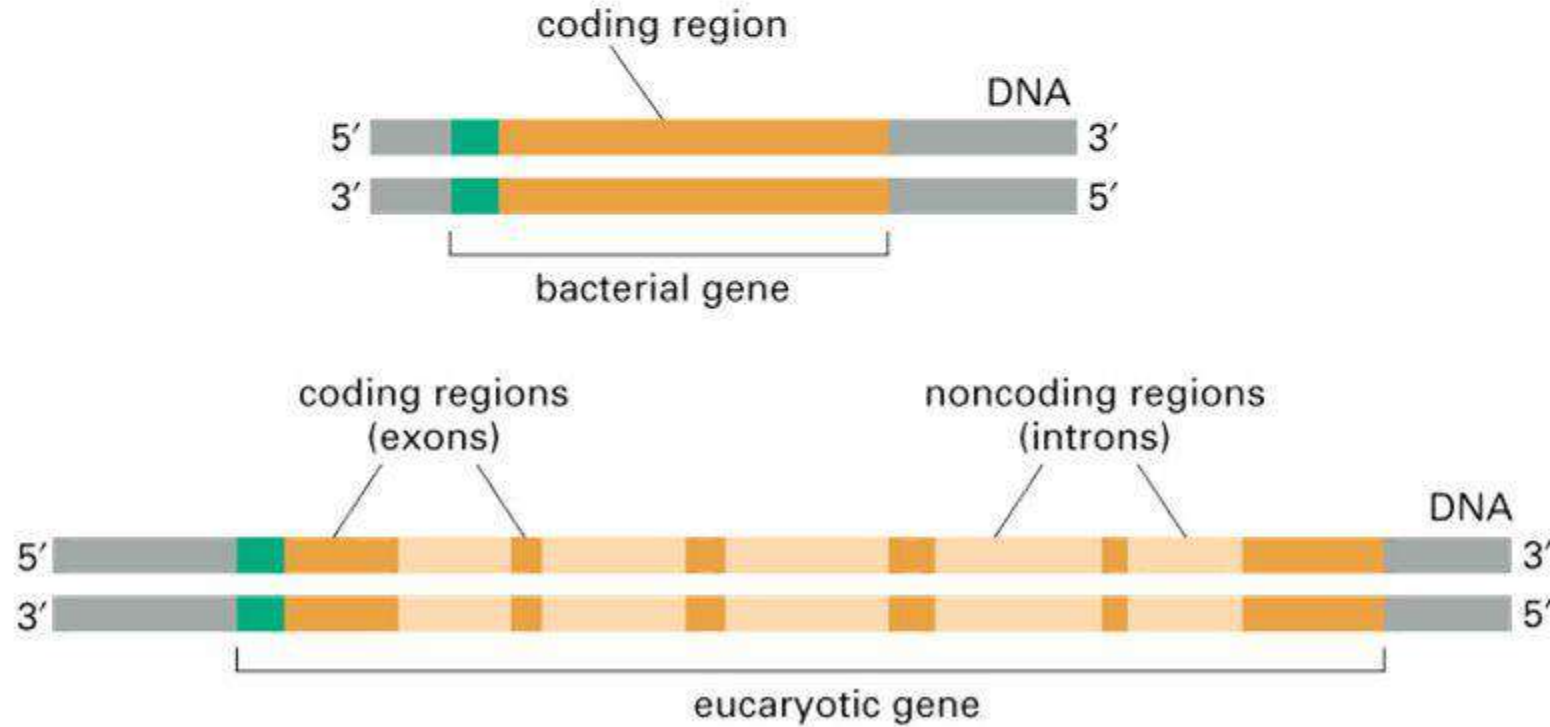
Spirochaetes
(*Treponema pallidum*)

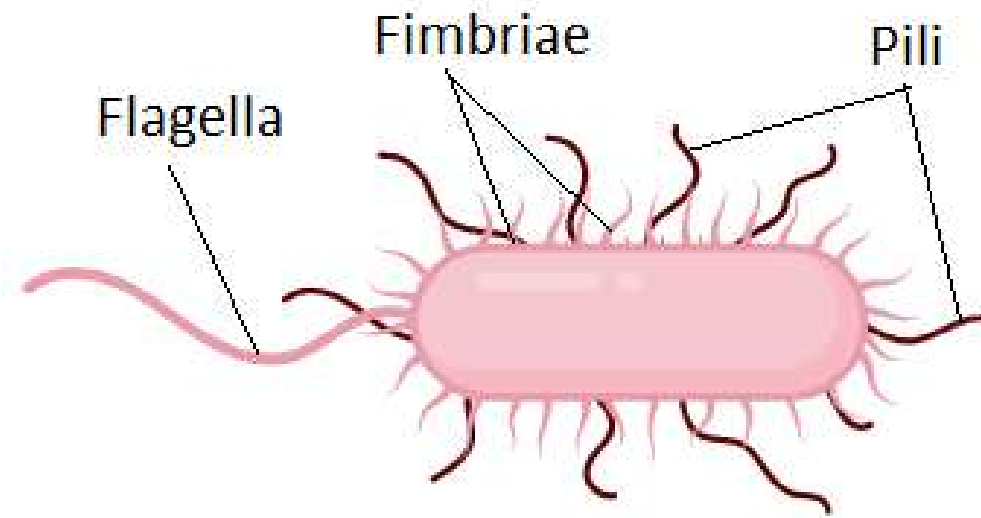
Definitions

Intron -- Non-coding intervening sequence

Exon -- Coding, or expressed, sequences

Bacterial genes don't have introns





Bacterial Cell

Pili are fibrous structures made of pilin protein which are used for the exchange of genetic material between bacterial cells. These are usually called sex pili as they help in the conjugation process of bacteria by transferring genetic information. They also help in the adhesion of two bacterial cells and also attachments to cell surfaces

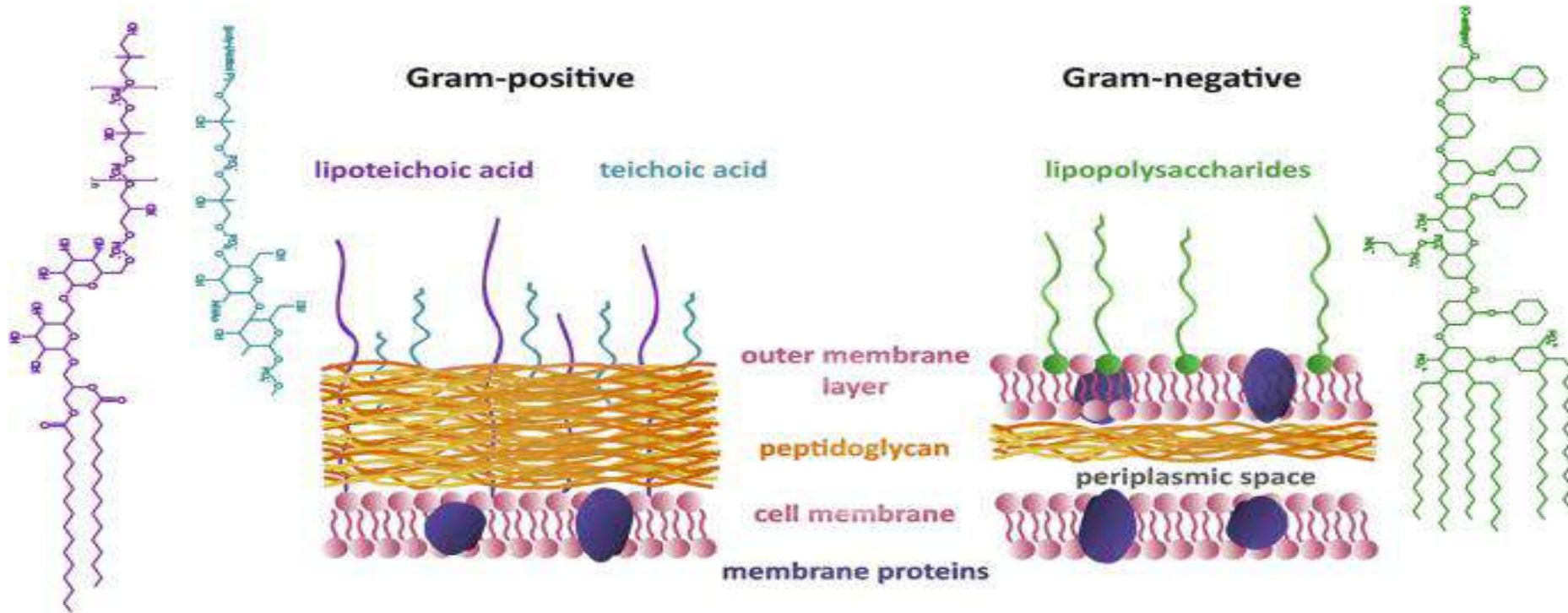
The **fimbriae** are a shorter version of pili. They are small appendages like structures present on the surface of the cell wall of many gram-negative bacteria. **Fimbriae help bacteria to attach to animal's skin or each other.** The attachment occurs through adhesins produced by fimbriae. **They are demonstrated by hemagglutination test.** *Actinomyces attaches to pellicle via fimbriae*

Flagella are tubular long structures present on the cell wall base of most of the bacterial cells and some of the unicellular eukaryotic cells (cells having a true nucleus). These are thin at the tip and a little broader at the base embedded in the upper layer of the cell wall. They are made of a cellular protein called flagellin. **These structures help in detecting nearby organisms and also help in locomotion. (stained by silver impregnation method)**

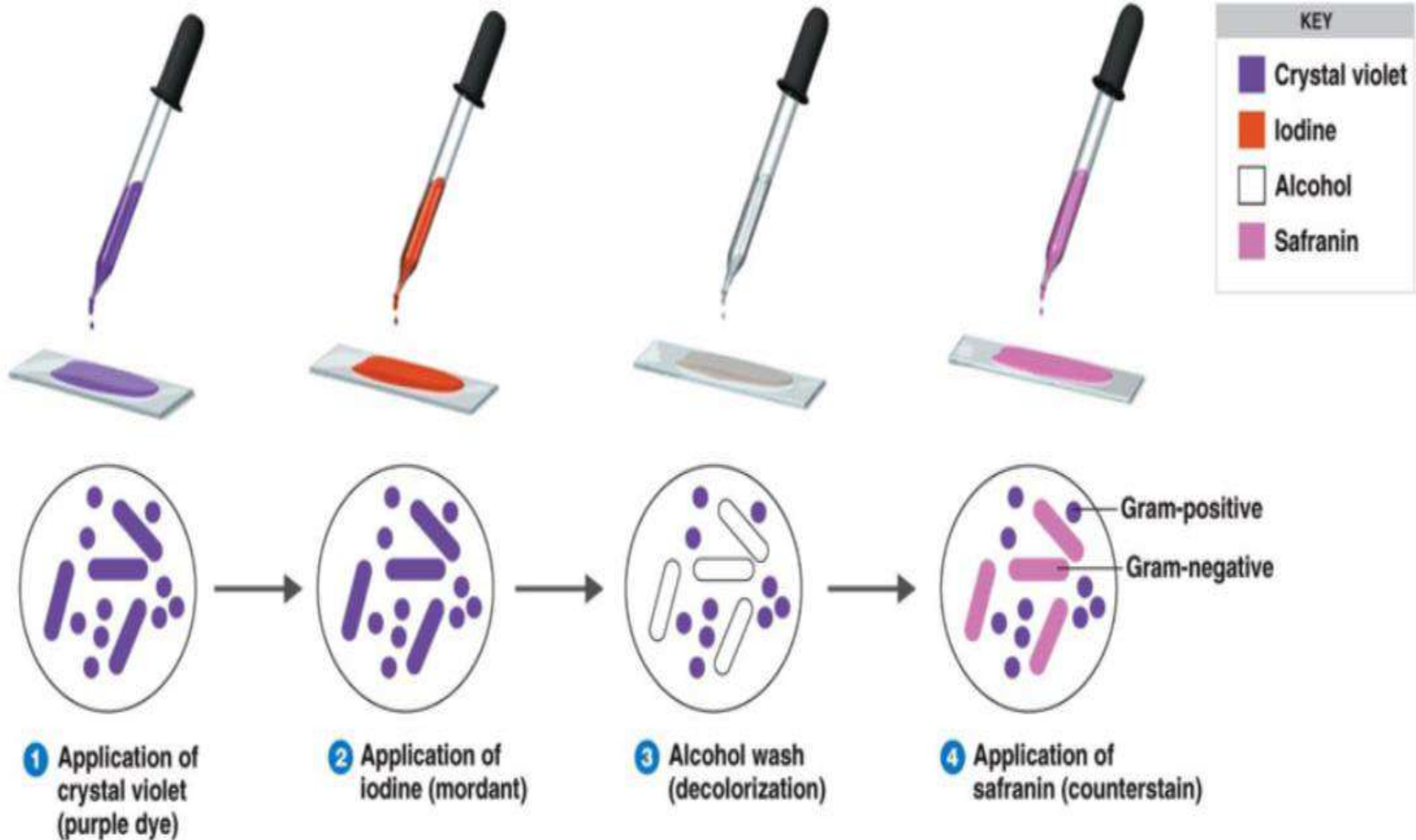
Cell wall

Gram positive bacteria

Gram negative bacteria



Teichoic acid is present in gram +ve bacteria, bacterial cell wall is a rigid structure not flexible, and is responsible for the shape of the bacteria. G - ve bacteria are responsible for nosocomial pneumonia in ICU

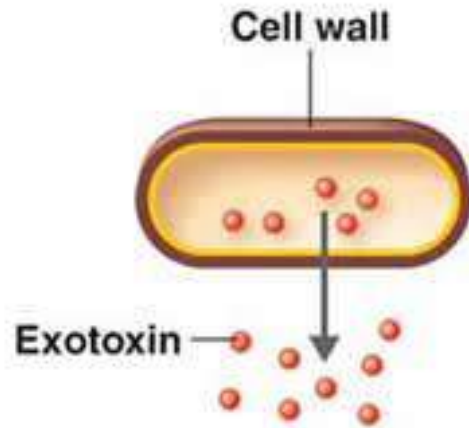


The gram reaction is mainly due to the difference in the permeability of bacterial cell wall. The cell wall of gram negative organisms permits the outflow of iodine dye complex during decolorization and turn pink or red after counterstaining with safranin. Gram-positive bacteria resist decolorisation and retain the purple stain.

PROTOPLASTS AND SPHEROPLASTS:

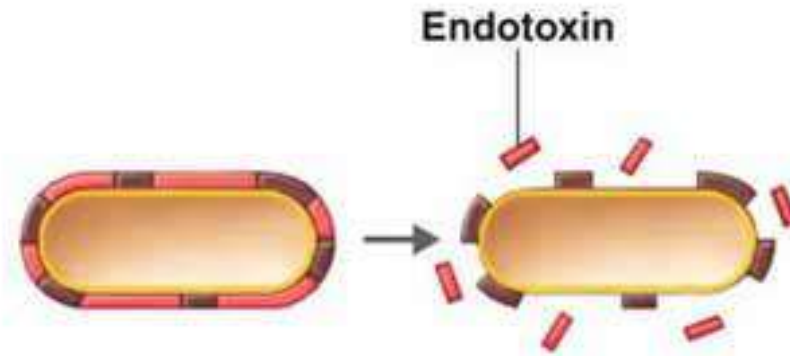
- When a cell is subjected to hydrolysis with lysozyme results in the removal of cell wall.
- If the media is osmotically protective it results in the liberation of protoplasts from Gram positive cells.
- Spheroplasts are produced by gram negative cells which retain their outer membrane.

Differences Between Exotoxins and Endotoxins



(a) Exotoxins are proteins produced inside pathogenic bacteria, most commonly gram-positive bacteria, as part of their growth and metabolism. The exotoxins are then secreted or released into the surrounding medium following lysis.

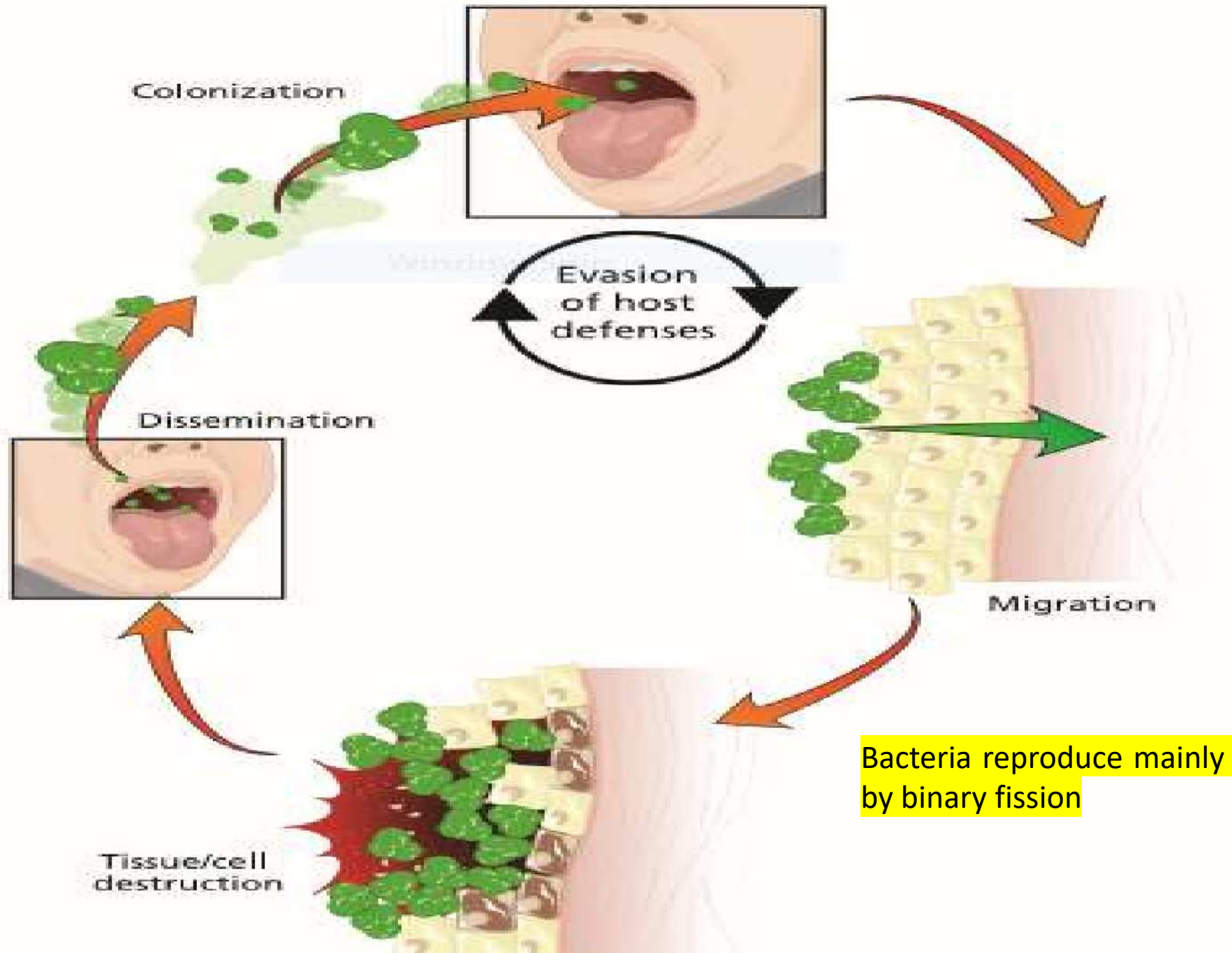
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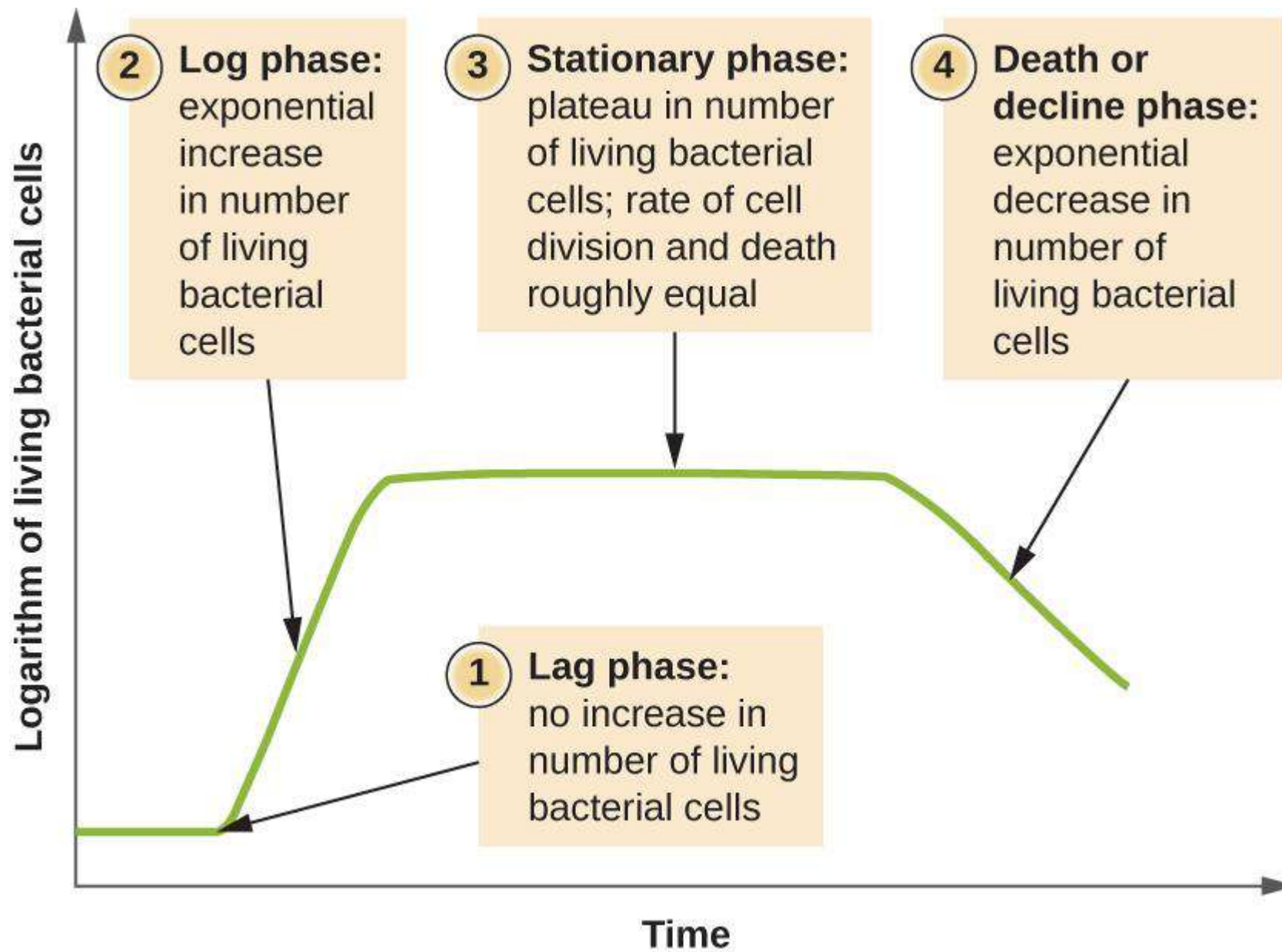


(b) Endotoxins are the lipid portions of lipopolysaccharides (LPSs) that are part of the outer membrane of the cell wall of gram-negative bacteria (lipid A; see Figure 4.13c). The endotoxins are liberated when the bacteria die and the cell wall breaks apart.

Vibrio cholerae discovered by Koch, produce enterotoxin called cholera toxin (CT) which is implicated in pathogenesis of cholera. They also produce endotoxin, like gram negative intestinal bacilli which has no role in the pathogenesis of cholera but is responsible for the immunity induced by killed vaccines. They can survive in extracellular environment as well. Cary Blair media is ideal for transport, and the selective thiosulfate–citrate–bile salts agar (TCBS) is ideal for isolation and identification. It causes ADP ribosylation of G regulatory protein in gut.

Lifecycle of a Pathogen in Its Host

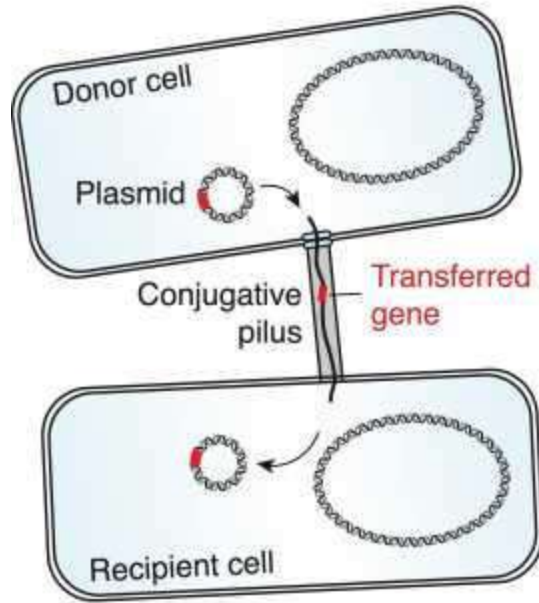




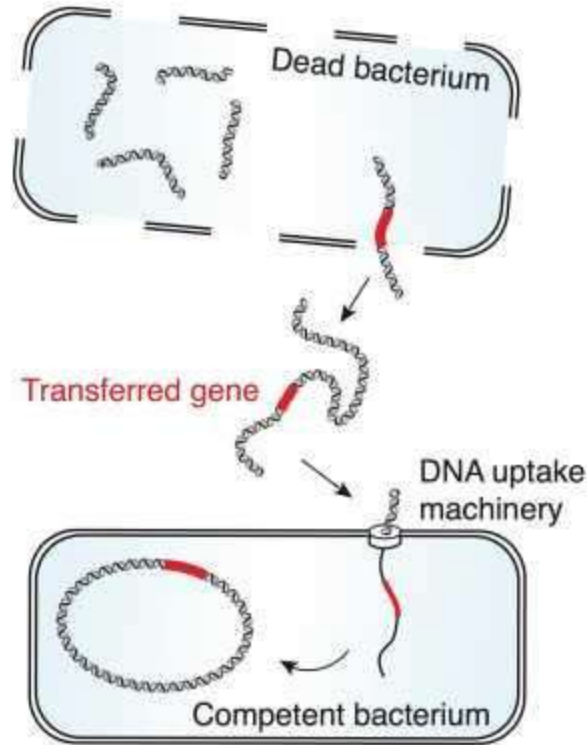
Bacterial cultures are studied in log phase because of uniform staining reaction, morphology and biochemical activity

Genetic transfer in bacteria

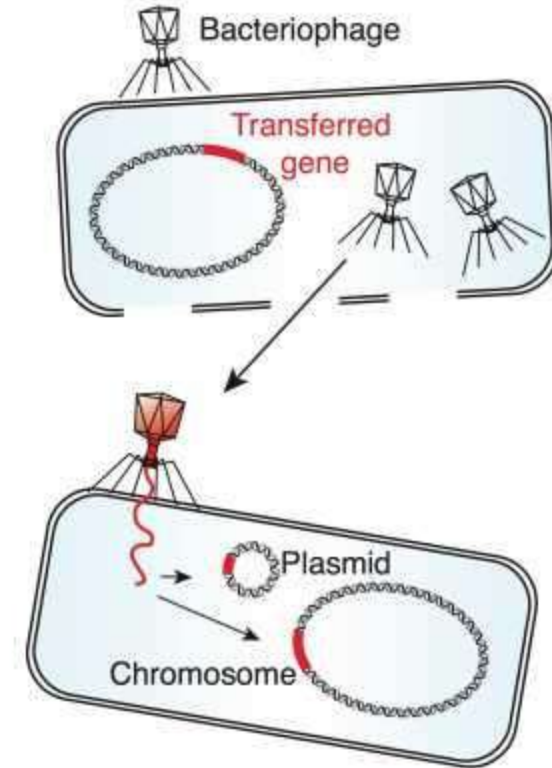
Conjugation



Natural Competence



Transduction



Conjugation is the most primitive method of gene transfer in bacteria