

Ministry education and Science of Republic of Kazakhstan
Karaganda State University named after academician Ye.A.
Buketov

Biological and geographical faculty

Botany Department

Course – Botany

Specialty - 5B011300 – «Biology»

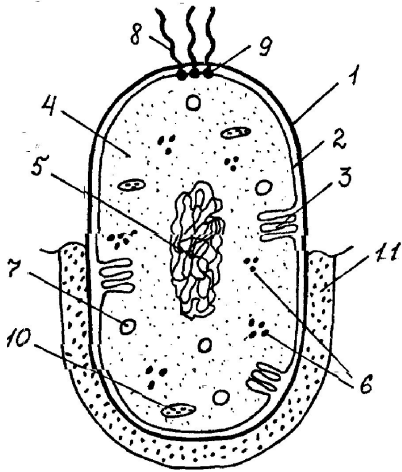
Lecture № 9

Viruses. Procaryotes. Cyanobacteria

(1 hour)

Lecturer: candidate of biological science, associated
professor

Ishmuratova Margarita Yulaevna



Plan of lecture:

- 1 Introduction into plant systematics.
- 2 Peculiarities of structures and life circle of viruses.
- 3 Prokaryotes: bacteria and cyan bacteria.

Main literatures:

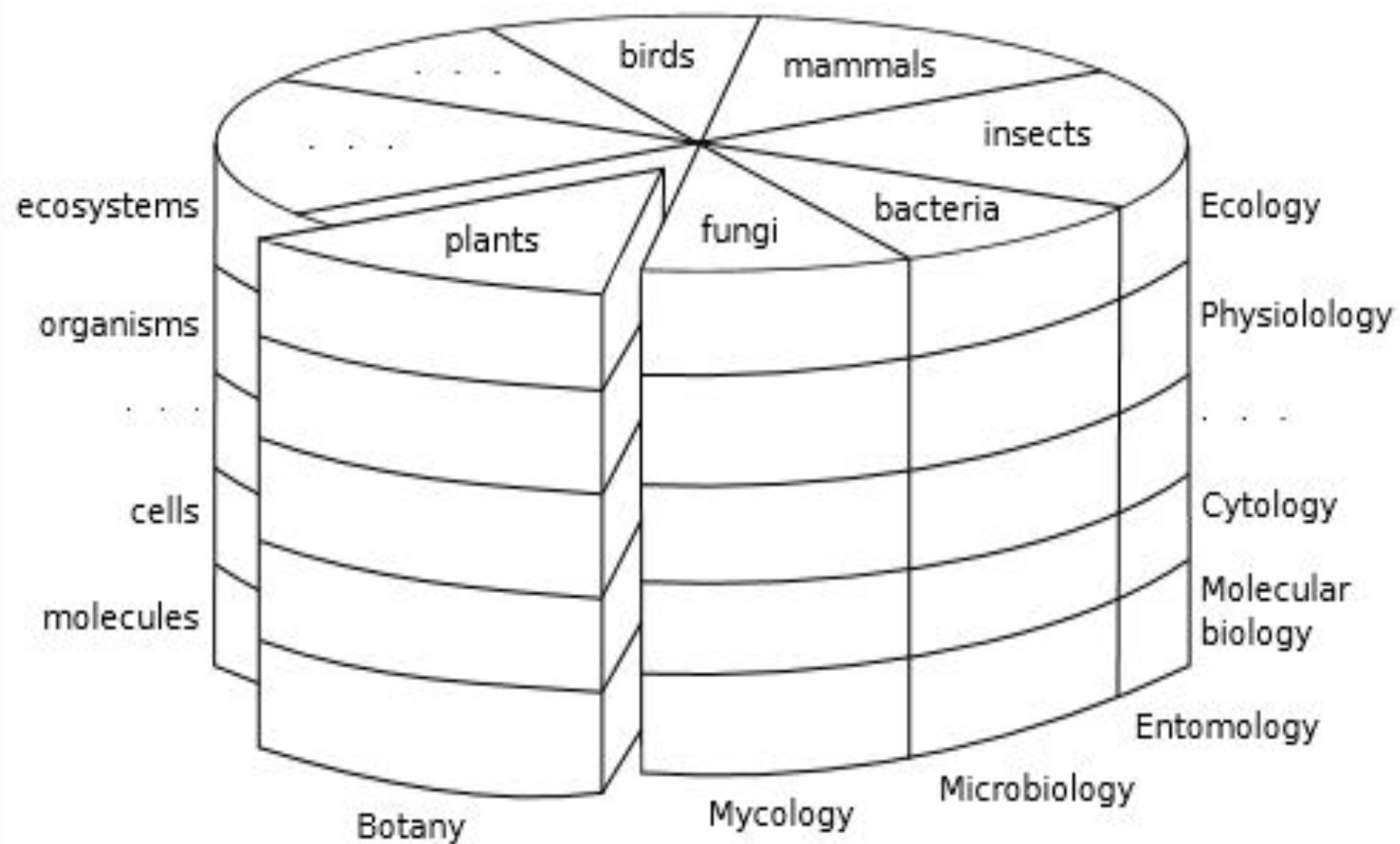
- 1 Еленевский А.Г., Соловьев М.П., Тихомиров В.Н. Ботаника: систематика высших, или наземных, растений. 2 изд. - М.: Academia, 2001. - 429 с.
- 2 Нестерова С.Г. Лабораторный практикум по систематике растений. - Алматы: Қазақ ун-ті, 2011. - 220 с.
- 3 Родман А.С. Ботаника. – М.: Колос, 2001. - 328 с.

Additional literatures:

- 1 Абдрахманов О.А. Систематика низших растений. – Караганда: Изд-во КарГУ, 2009. - 188 с.
- 2 Билич Г.Л., Крыжановский В.А. Биология. Т. 2: Ботаника. - М.: Оникс 21 век, 2002. - 543 с.
- 3 Абдрахманов О.А. Практические работы по систематике низших растений. Ч. 2. Грибы и водоросли. – Караганда: Изд-во КарГУ, 2001. - 144 с.
- 4 Абдрахманов О.А. Лабораторный практикум по бактериям и водорослям. Учебное пособие. - Алматы: Казакадем образование, 2000. - 130 с.

With at least 500,000 different kinds of plants in the world, it is necessary to organize this diversity into a classification scheme to be able to communicate with others. There are a variety of ways plants can be classified, such as alphabetically (hibiscus, hickory, hollyhock, hydrangea); by growth habit (herb, shrub, tree, or vine); by habitat (aquatic, terrestrial, aerial); or by shared characteristics (white flowers, opposite leaves, edible fruits). However, the classification system that has been most useful to botanists is one that groups related plants together into a series of hierarchical categories, so that very closely allied plants are placed together in the system, plants that are somewhat related are grouped near each other, while plants that have very little in common are placed far from each other.

The classification scheme used for plants has the following categories:



Taxons in plant classification

The diagram illustrates the hierarchy of plant classification taxons. The terms are arranged in a descending staircase pattern from top-left to bottom-right. The ranks are: Division, Class, Order, Family, Genus, Species, Subspecies, Variety, and Form. Additionally, the rank [Cultivar] is shown below Species, positioned between Species and Subspecies.

Division
Class
Order
Family
Genus
Species
Subspecies
Variety
Form
[Cultivar]

Impair Noncellulata. Only one kingdom - *Virae*.

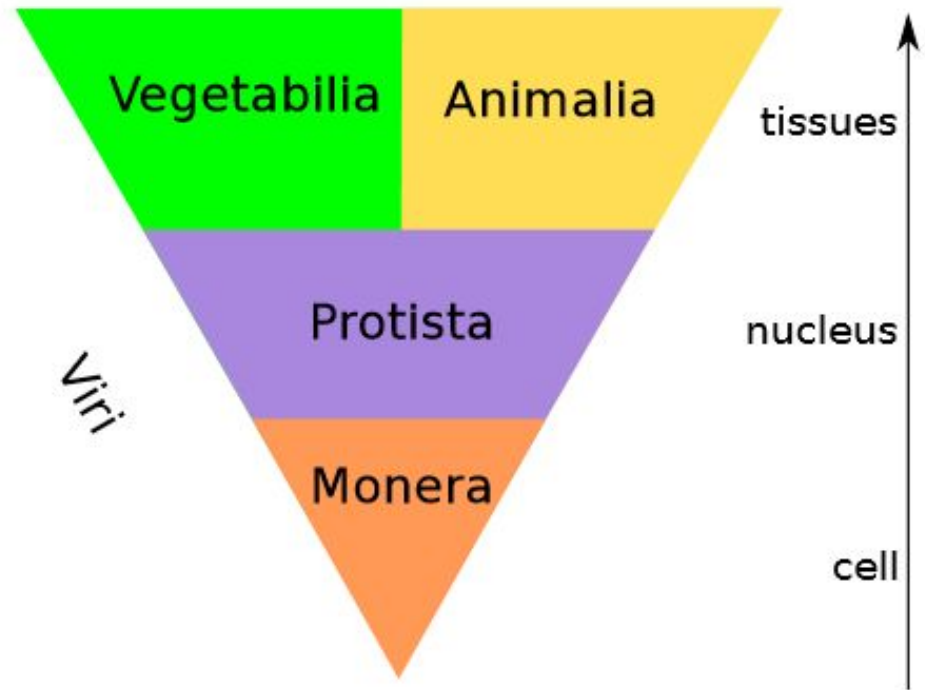
Impair Cellulata.

1. Sub-impair Procaryota – cells without nucleus. They separated into 2 kingdom:

- a) Kingdom *Archaeobacteria*;
- б) Kingdom *Eubacteria*.

2. Sub-impair Eucaryota – cells with nucleus:

- a) Kingdom *Protoctista*; include seaweeds and mushroom-shaped organism
- б) Kingdom *Animalia*.
- в) Kingdom *Fungi (Mycota)*;
- г) Kingdom *Plantae*.

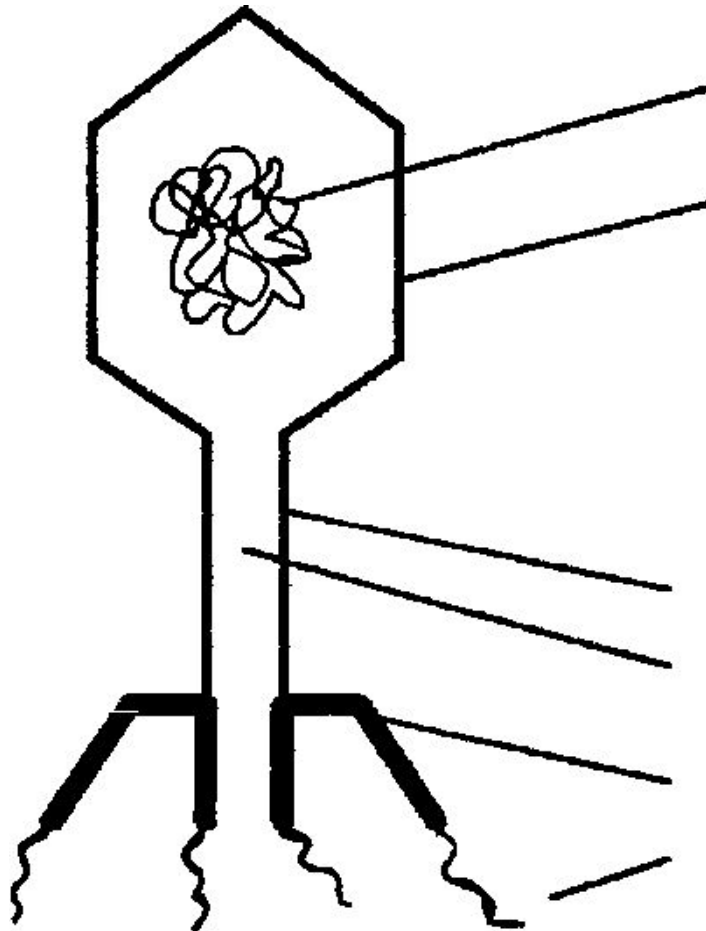


Basic taxonomic range for systematic of vascular plants

Range	Exsample of taxon	Ending in name of taxon
Kingdom	Plantae	-
Division	Magnoliophyta	-phyta
Class	Magnoliopsida	-opsida
Sub-class	Ranunculidae	-idae
Order	Ranunculales	-ales
Family	Ranunculaceae	-aceae
Genus	Ranunculus	-
Species	Ranunculus repens L.	-

Viruses – are biological organisms with non cellular structure and without self metabolism. All viruses are intra-cellular parasites. They are active outside of living cells; they can reproduce only inside of cells.

Structure of bacteria phage



DNA

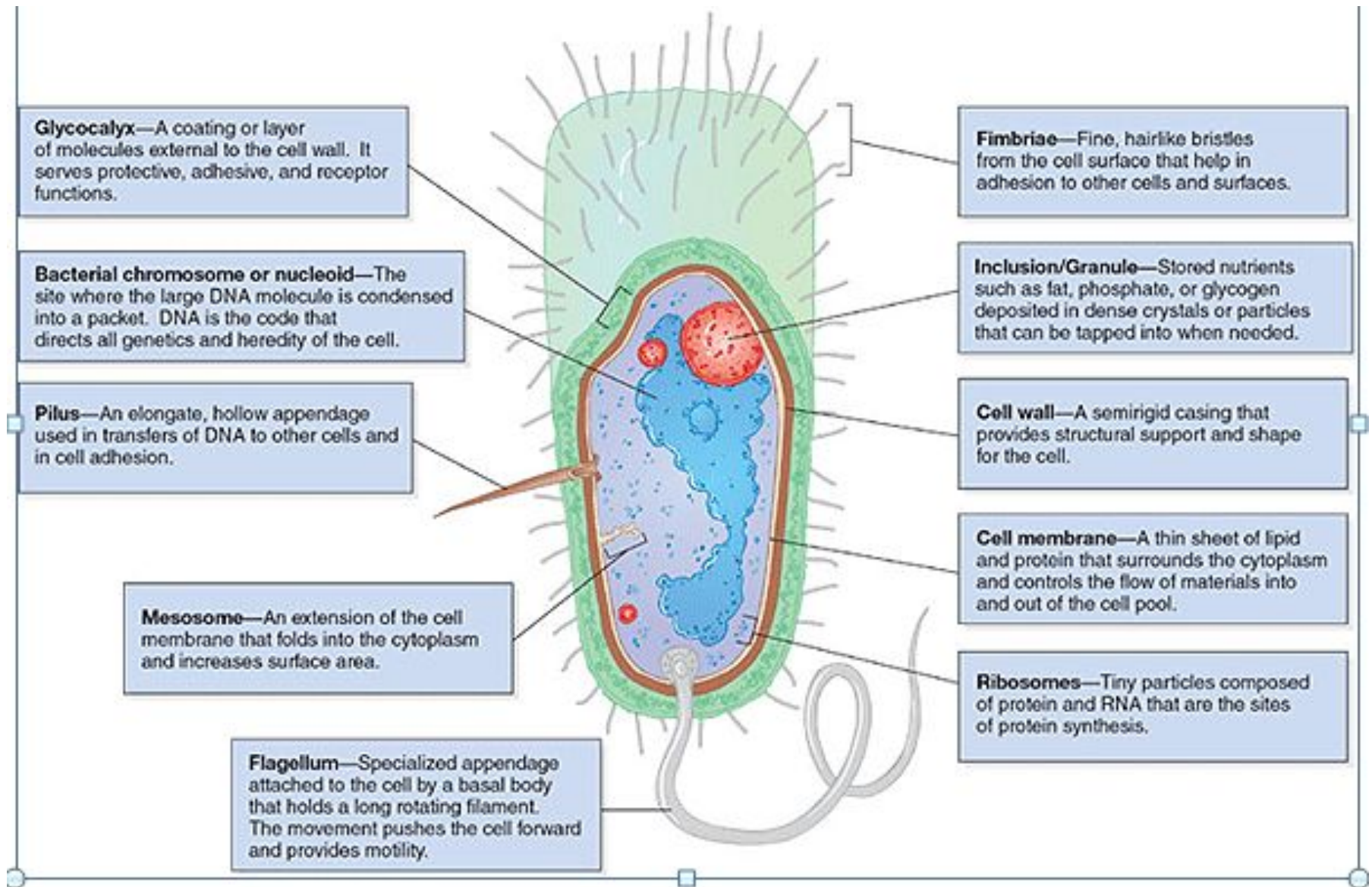
Head

Neck

Basal sheet

Additions

Peculiarities of bacteria cell

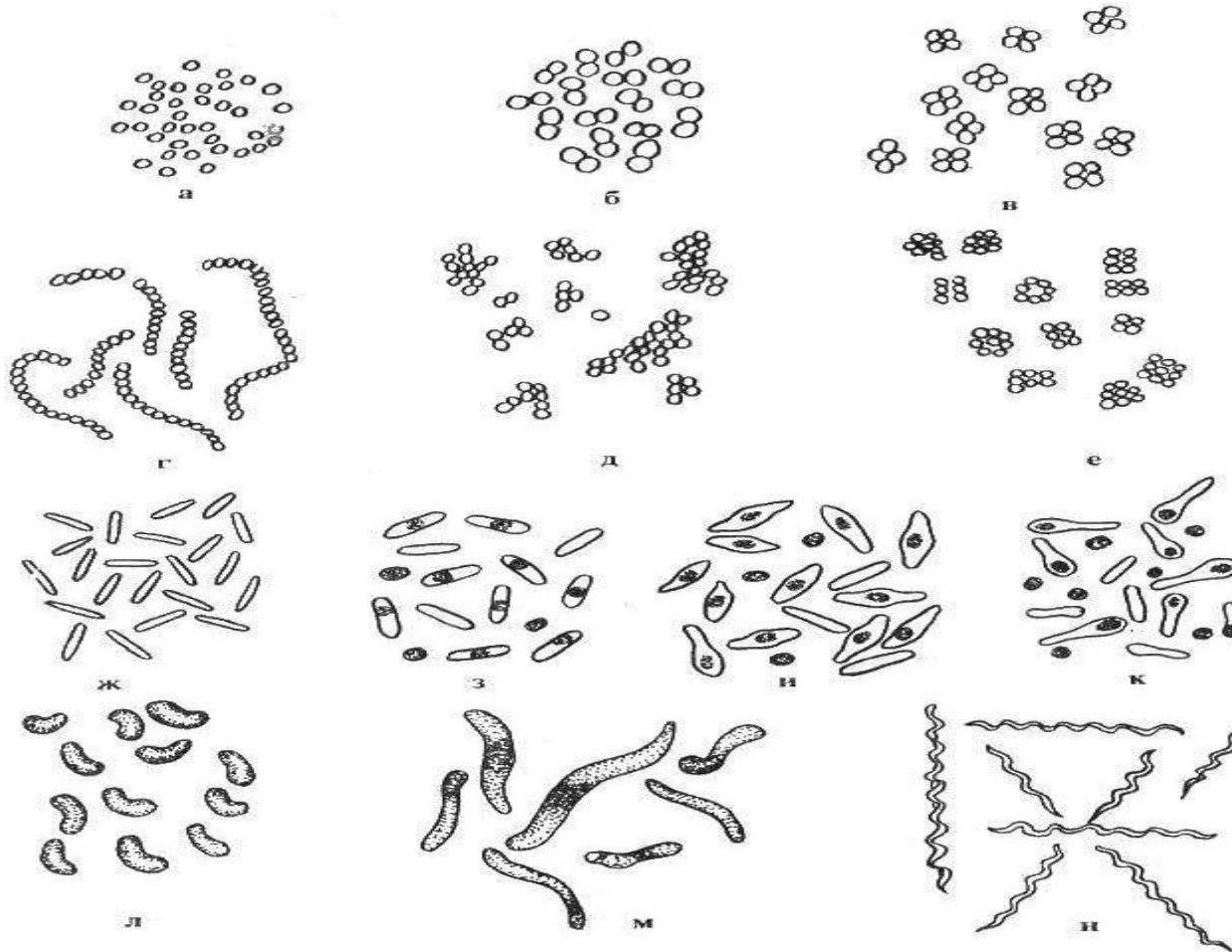


Prokaryotes are distinguished from eukaryotes by their smaller size (0.2-10 μ m), their lack of internal organelles (e.g., mitochondria), the presence of a cell wall and their cell division by binary fission rather than mitosis. They lack introns, are not capable of endo/exocytosis and have single-stranded circular DNA rather than multiple discrete chromosomes.

Bacteria share a number of common structures that are briefly described below.

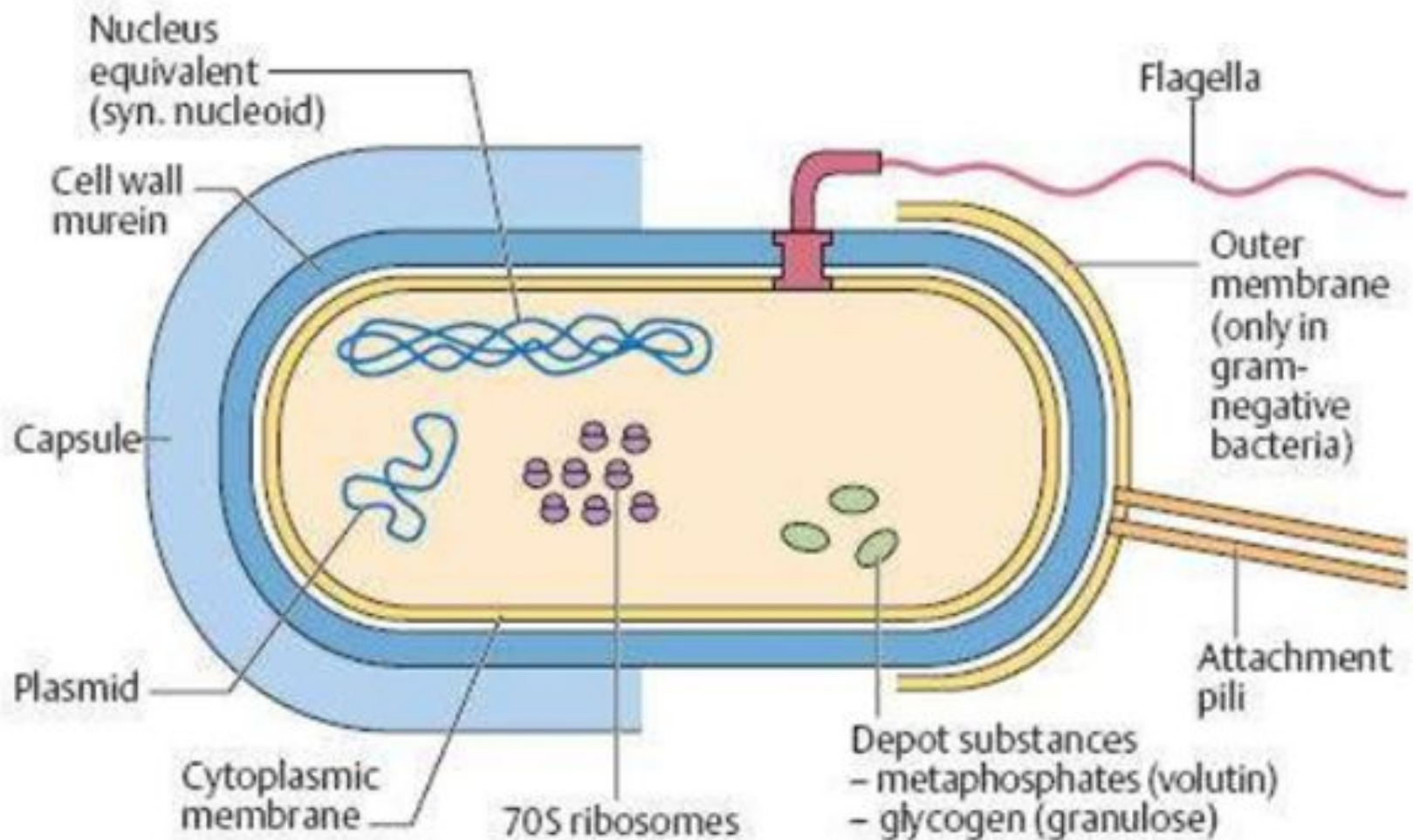
- 1) Slime (extracellular polysaccharide): This is extracellular material, loosely associated with the bacteria, that is elaborated by some bacterial species that facilitates colonization of smooth, prosthetic surfaces such as intravascular catheters.
- 2) Capsule: This polysaccharide outer coating of the bacterial surface often plays a role in preventing phagocytosis of bacteria.
- 3) Peptidoglycan (cell wall) Provides bacterial shape and rigidity. The cell wall consists of alternating units of N-acetylglucosamine and N-acetylmuramic acid. The polysaccharide chains are cross-linked by a peptide bridge. It is a primary target of antimicrobial therapy – because it is specific to prokaryotes.

Forms of bacteria

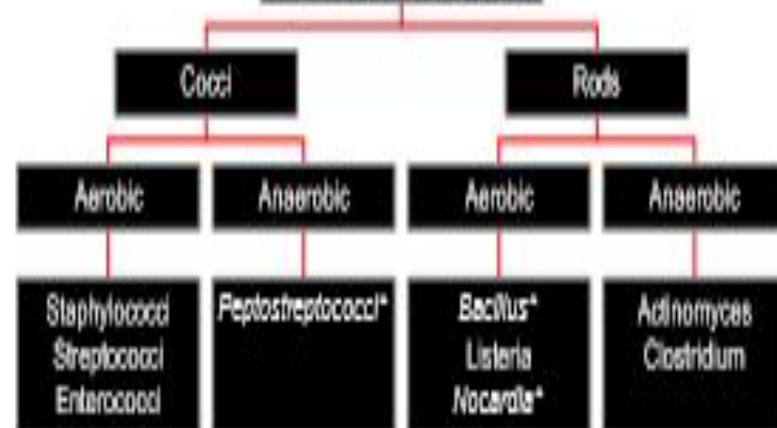


Coccus (а – micrococcus; б – diplococcus; в – tetracoccus; г – streptococcus; д – staphylococcus; е – sarcines); rods (ж – non spore forming; з, и, к – spore forming); filamentous (л – vibrio; м – spirillas; н – spirochetes)

Scheme of structure of bacterial cell



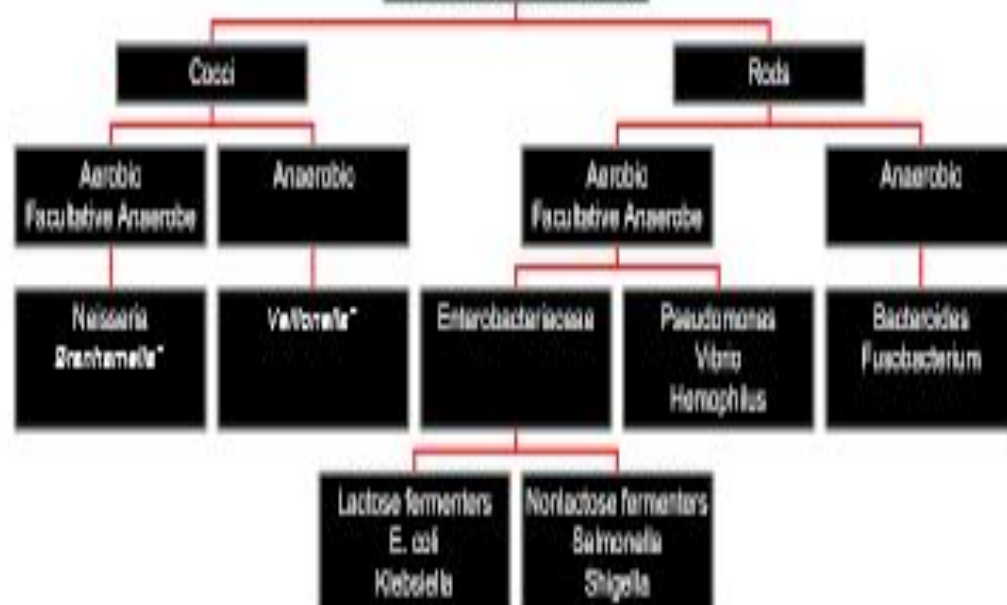
Gram Positive Bacteria



Miscellaneous / Poorly Staining Species



Gram Negative Bacteria



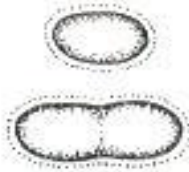
Gram Positive Bacteria

Name	Morphology	O ₂ Requirements	Commensal	Reservoirs / Sites of colonization, Transmission	Types of Infections
Staphylococci	Cocci in grape-like clusters	facultative anaerobe	Yes	Skin, nares / endogenous, direct contact, aerosol	Soft tissue, bone, joint, endocarditis, food poisoning
Streptococci	Cocci in pairs, chains	facultative anaerobe	Some species	Oropharynx, skin / endogenous, direct contact, aerosol	Skin, pharyngitis, endocarditis, toxic shock
Pneumococci	Diplococci, lancet shaped	facultative anaerobe	±	Oropharynx, sinus / aerosol	Pneumonia, otitis, sinusitis, meningitis
Enterococci	Cocci in pairs, chains	facultative anaerobe	Yes	GI tract / endogenous, direct contact	UTI, GI, catheter-related infections
Bacilli	Rods, spore-forming	aerobic	±	Soil, air, water, animals / aerosol, contact	Anthrax, food poisoning, catheter-related infections
Clostridia	Rods, spore formers	anaerobic	Some species	GI tract, soil / Breach of skin, endogenous, ingestion	Tetanus, diarrhea, gas gangrene, botulism
Corynebacterium	Rods, nonspore forming	facultative anaerobe	Some species	Skin	Catheter-related infections, diphtheria
Listeria	Rods, nonspore formers	facultative anaerobe	No	Animals, food products / Ingestion	Meningitis
Actinomyces	Irregular, filamentous, form sulfur granules	anaerobic	Yes	GI tract / endogenous	Skin, soft tissue

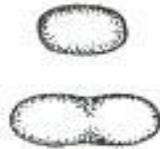
Gram Negative Bacteria

Name	Morphology	O ₂ Requirements	Commensal	Reservoirs / Sites of colonization, Transmission	Types of Infections
Enterobacteriaceae (<i>E. coli</i> , klebsiella, salmonella, shigella)	Rods	facultative anaerobe	Some species	GI tract, animals / Endogenous, fecal-oral	Diarrhea, urinary tract, food poisoning, sepsis
Bacteroides	Rods	anaerobic	Yes	GI tract / Endogenous	Abscesses, intraabdominal infections
Pseudomonas	Rods	aerobic	No	Water, soil / Endogenous, breach of skin barrier	Infections in immunocompromised hosts, Cystic Fibrosis
Vibrio (cholera)	Rods, curved shape	microaerophilic	No	Water / Contaminated food, water	Diarrhea
Campylobacter	Rods, curved shape	microaerophilic	No	Food / Ingestion of contaminated food	Diarrhea, Bacteremia
Legionella	Rods, poorly stained	microaerophilic	No	Water / Inhalation of aerosol	Pneumonia, febrile illness
Neisseria	Cocci, kidney-bean shaped	Microaerophilic	No (<i>N. meningitidis</i> sometimes)	Humans / Sexual, aerosol	Meningitis, pelvic inflammatory disease
Hemophilus	Coccobacillary - pleomorphic	facultative anaerobe	Some species	Respiratory tract / Endogenous, aerosol	Respiratory, sinusitis, otitis meningitis
Bartonella	Small, pleomorphic rods	aerobic / microaerophilic	No	Cats, fleas, lice / cat bites, lice or fleas?	Cat scratch disease, endocarditis, bacillary angiomatosis

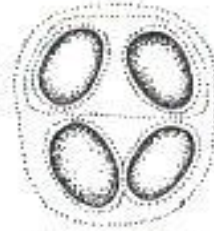
Schemes of some cyan bacteria



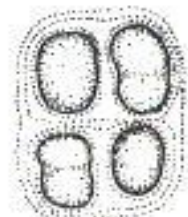
Gloeobacter



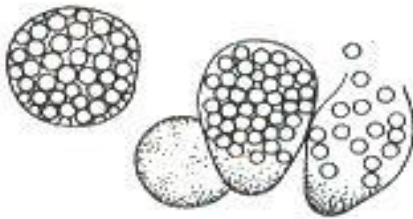
Synechococcus



Gloeotheca



Gloeocapsa



Dermocarpa



Anabaena



Nostoc



Cylandrospermum



Calothrix



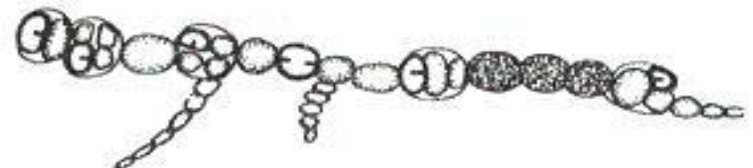
Spirulina



Oscillatoria



Lyngbya



Fischerella

Control questions:

- 1 Take the definition - taxon. Make a scheme of basic taxons for Kingdom Plantae.
- 2 Who at the first time did used double nomenclature for classification of living organisms?
- 3 Which organelles are absent in prokaryotes cells?
- 4 Make a schemes of morphological classification of bacteria.
- 5 How do people use bacteria and cyan bacteria?
- 6 Who opened the viruses?
- 7 Why viruses were separated to individual impair?

Test questions:

Type of nutrition for prokaryotes:

- A) auto phototrophic
- B) auto chemotrophic
- C) heterotrophic
- Д) photosynthesis
- E) full circle of digestion
- F) fermentation

Non cellular form of life:

- A) plants
- B) animals
- C) seaweed
- Д) bacteria
- E) virus