# CYANOPHYTA AND THEIR ELIMINATION IN STAGNANT WATERS

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**Abstract**

Presented article deals with phenomenon of cyanobacteria and their occurance in stagnant waters. First part deals with cyanobacteria description, then detailed cellule is analyzed. Subsequently, types of cyanobacteria are presented and ways of their elimination.

**Key words:** cyanophyta, classification, elimination

## INTRODUCTION

Cyanobacteria are photosynthetic gram-negative eubacteria of cell size usually 1-10 micrometers. Botanists, which are interested in cyanobacteria, call them cyanoprokaryofyta, ecologists, toxicologists and microbiologists call them cyanobacteria. Botanists are interested in them because it is the oldest group of organisms capable of photosynthetic assimilation as well as developmentally younger eukaryotic algae and plants. Individual taxons of cyanobacteria create either unicellular, colonial or filamentous cell arrangement.

Except vegetative cells, we can see heterocytes at of filamentous cyanobacteria (which serve to fix molecular nitrogen) and arthrospores (akinetes), which serve as bacterial spores to overcome adverse conditions.

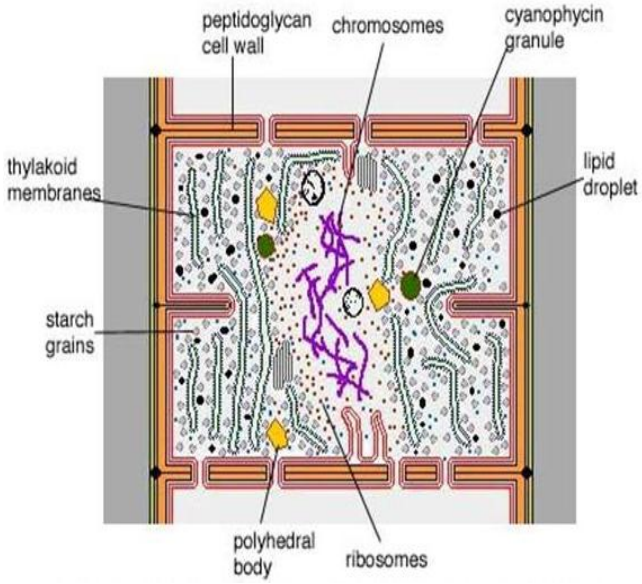
According to fossil findings cyanobacteria had significant share in creation of oxygen atmosphere on Earth, appeared in Precambrian from 3 to 2.5 billion years and before 2 billion years became dominant group of organisms on Earth. Custom development of cyanobacteria is associated with anaerobic photosyntetisant bacteria (chlorobacteria and purple bacteria), which are considered as their ancestors. Cyanobacteria itself, however, are blind evolutionary branch.

Unicellular and colonial algae reproduce by cell dividing, fibrous by hormogonias or akinetes. Asexual reproduction is generally recognized, although there is indirect evidence of recombination of genes in parasexual process. Cyanobacteria are able to survive under all conditions. They are able to adopt organic substances such as heterotroph bacteria, live from the light and mineral nutrients as plants. This fact is very negative especially when thinking about their suppression.

## CELL STRUCTURE

Construction of cyanobacteria cell is very simple, they have no nucleus or mitochondria, Golgi apparatus, endoplasmic reticulum, vacuoles, etc. Most remarkable department within cyanobacteria cell are thylacoids - flat pockets with photosynthetic apparatus. In the membrane of thylakoid chlorophyll, α-and β-carotene and xanthophylls (echinenon, myxoxanthofyl, zeaxanthin) and contained. On the surface of thylakoidal pocket are phycobilisomes. These are small units that contain specific dyes, called phycobylines (phycobyliproteines). There are 3 - two of them are blue pigments (c-phycocyanine and allophycocyanine) and one is red (c-phycoerythrin). They perform the function of light-collecting antenna. Considerable sensitivity of this type enables the photosynthesis of cyanobacteria in very low light level - far below the water surface in the soil inside the stones, in caves ...

Cyanobacteria cell wall is quite solid, layered and shows gram-negative reaction. There are still present carboxysomes, which are small particles in the shape of polyhedron, observable in transmission electron microscopy (TEM). They contain an ensyme called RuBisCo which is also responsible for the fixation of CO2 in Calvin cycle.




Picture 1 Cyanobacteria cell structure [10]

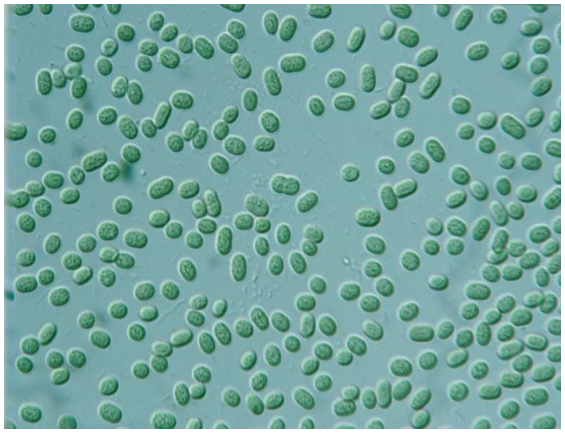
## CYANOBACTERIA CLASSIFICATION

Cyanobacteria are divided into four orders:

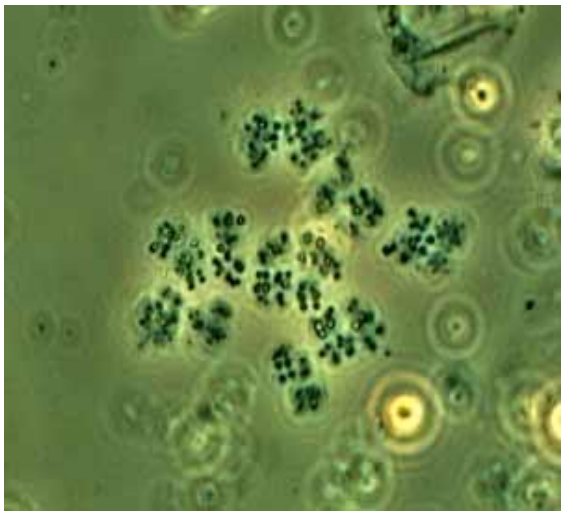
- Chroococcales
- Chamaesiphonales
- Nostocales
- Stigonemales

**Chroococcales order - Aphanothece, Chroococcus, Holopedia, Merismopedia, Microcystis**

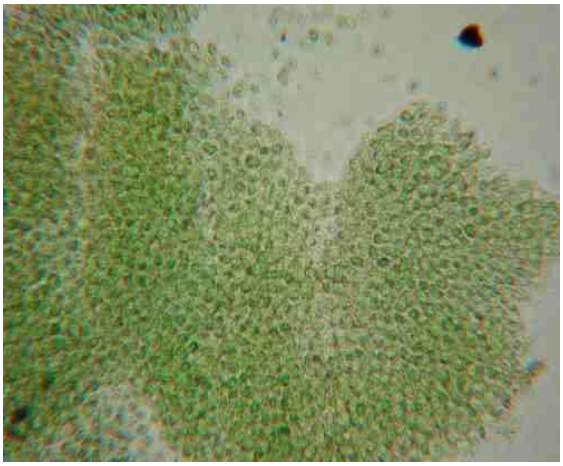
It is an order of cyanobacteria, which includes single-cell living alone or in colonies. Chroococcales have spherical or ellipsoidal ovoid cells. They reproduce by traditional cell division, most frequently in one or two planes, but rarely, in three. Other type of reproduction is creation of exocytes and beocytes.



Picture 2 Aphanothece cyanobacteria [9]



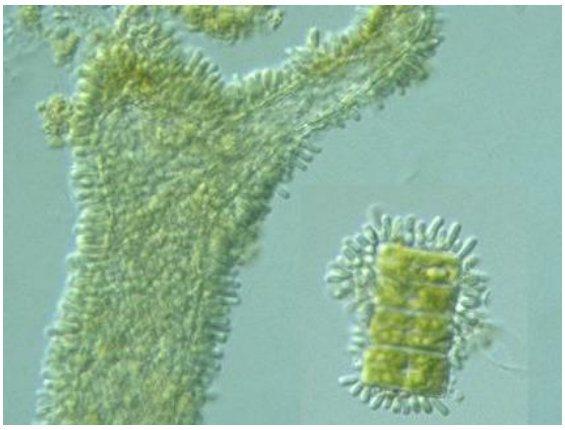
Picture 3 Chroococcales cyanobacteria [8]



Picture 4 Microcystis cyanobacteria [7]

**Chamaesiphonales order - Chamaesiphon**

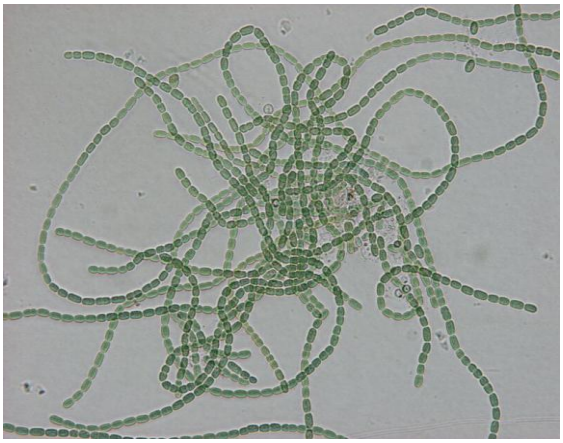
They are single-cell reproducing by baeocythes (multiple division of protoplast and release of daughter cells after cell wall rip of parent cell). In this order cells are orange or brownish colour.



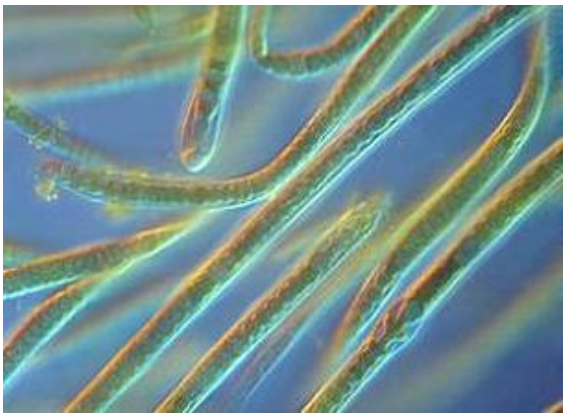
Picture 5 Chamaesiphon cyanobacteria [9]

**Nostocales order - Aphanizomenon, Anabaena, Calothrix, Cylindrospermum, Lyngbya, Nostoc, Oscillatoria, Phormidium, Rivularis, Richelia, Spirulina, Symploca, Tylopothrix, Trichodesmium**

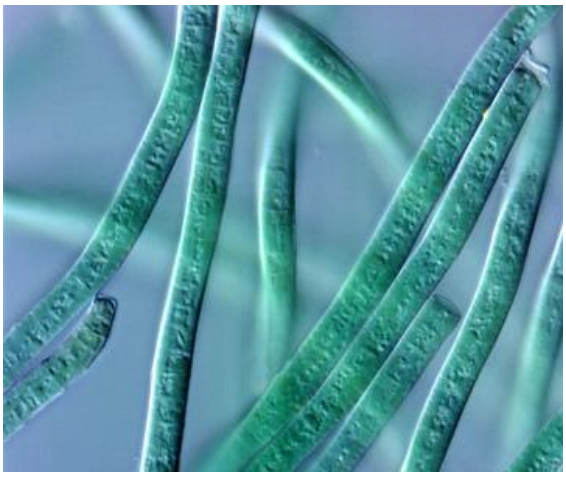
Nostocales is an order of cyanobacteria with unbranched or wrongly branched fibrous insole, usually containing special cells called. heterocythes, which serve to biological fixation of atmospheric nitrogen. They also contain akinetes and slime is often located around the fibers.



Picture 6 Aphanizomenon cyanobacteria [6]



Picture 7 Calothrix cyanobacteria [5]



Picture 8 Phormidium cyanophyta [6]

**Stigonemales order - Stigonema**

Stigonematales is an order, which consists of families with fibrous lining with right branching. Usually they produce also heterocythes and they multiply by hormogonies, thus fiber fragments. Fibers are slimy (bold sheath coated in several layers) and usually stained brown.

Picture 9 Stigomena cyanobacteria [5]

**TECHNOLOGY OF REMOVING CYANOBACTERIA FROM LAKES, PONDS, AND DAMS**

**1. Cyanobacteria follection from water level**

Cyanobacteria are organisms able to survive under all conditions, whether in fresh water, polluted or contaminated tanks. They become strikingly visible when multiplied over and then create a continuous surface layer, which is also called blue-green bacteria. Cyanobacteria always rise to the surface at specific time and it creates favorable conditions for them to be collected. By mechanical removal of cyanobacteria we can reduce concentration of nutrients in water and prevent mass reproduction and by repeating this process we can achieve a balance in environment. However to ensure further action to prevent flow of nutrients into water such as building sewage treatment plants. Collection of cyanobacteria is the best to begin in spring, whereas only a small part survives the winter period and it should continue until the end of summer.

**2. Removal of sediment from bottom of lakes, ponds, water bodies and dams**

The origin of organic matter in water is very diverse. Organic pollution of natural waters on natural level of lead leachate from soil and sediment, natural products activity of plant and animal organisms living in water. Most authors considered phosphorus as a major limiting nutrient for aquatic organisms in tanks loaded with phosphorus is necessary to take into account the so-called. internal supply of sediment coming from his own bed. One method to remove nutrient and rehabilitation measures are at the bottom of the tanks. Removing sediment from bottom of lakes, ponds, water bodies and dams is one of more expensive ways to fight cyanobacteria. The technical solution involves deploying floating

mechanism for dust removing on surface water area respectively suction dredgers. Sediment is pumped to a location on the shore, where it is dried and transported to an incinerator or can be used to produce fertilizers. In the case of dams where the water draining out option appears preferable variant - the deployment of ground arrangements - excavators and trucks to transport sediment.

### 3. Liquidation on biological basis

The growing incidence of cyanobacteria in Slovakia is making more and more problems of water policy and operators of recreational facilities for swimming, whereas proliferation of cyanobacteria causes natural swimming pools closed. It is therefore necessary to find a way to improve the quality of surface water, which would address the situation with long-term proliferation of cyanobacteria and be also environmentally friendly. Lately it seems very promising means of disposal on the biological basis, deploying bioculture in tanks or ponds, which removes food from cyanobacteria and thus prevent their further growth and reproduction. The biggest advantage of these biological products is greater efficiency and especially environmental friendliness. Importantly, especially for larger water bodies preparations must be applied preventively, before mass proliferation of cyanobacteria and algae.

## CONCLUSION

Cyanobacteria are important primary producers and number of other organisms depends on them. Cyanobacteria produce a wide range of substances, which are able to influence their surroundings, such as oligosaccharides, organic acids, peptides, hormones, enzymes, antibiotics, polysaccharides, and not least odors, bad tastes and toxic substances. The last three named groups of substances most restrict water use for farming, water or other purposes. When we realize the importance and also hazards of cyanobacteria, we will be able to tackle this problem and find a constructive solution.

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