

Cytotoxins (Blue-green toxins)

The toxic compounds produced by blue-green algae were divided into the following groups:

I. Hepatotoxins

Hepatotoxins are peptide in nature with low molecular weight and its effect is slower than the alkaloids toxins (**Neurotoxins**) because they attack the liver and cause liver failure or hepatic coma, and death occurs within hours or a few days. Hepatotoxins species that have been isolated and identified includes:

1. **Microcystin.** It is a polypeptide in nature and consists of several peptides that consisting of ten amino acids and produced by the strain of *Microcystis aeruginosa*. **Microcystin** called a rapid death factor. The lowest dose causing death is 0.5 mg / 1 kg of body weight.
2. **Nodularin.** It is produced by *Nodularina spumigina*, and also consists of peptides with cyclic amino acids.
3. **Cyanoginosin.** It is consists of 2 amino acids and also produced by *Microcystis aeruginosa*.

Generally, Hepatotoxins cause general weakness, vomiting, diarrhea and sometimes death.

II. Neurotoxins

It is an alkaloid with a low molecular weight and contains nitrogen, and its effects are faster because it works directly on the neuromuscular system and include:

1. **Anatoxin.** It is a group of toxins produced by the strain of *Anabaena flos-aquae* and has six types, all are alkaloids with low.
2. **Aphantoxin.** This toxin is produced by algae *Aphanizomenon flos-aquae*, which is a mixture of similar toxins (20% Newsakstokcine and 80% Sakstokcine), which is an alkaloid with a low molecular weight and high toxic effects. The lethal dose of this poison is 10 micrograms / 1 kilogram body weight. Its lethal effect is to prevents the contact of the nerve channels.

III. Cytotoxins

These Compounds are Antimetabolites, some of them composed of fats and sugars, and the lethal effective dose is of 0.1 to 0.2 mg / I kg body weight, and excreted from some types of *Microcystis* and be fatal to mice within 24 hours. It has been noted by some researchers that blue-greens which have gas vacules (pseduvacules) are the most produced species for these cytotoxins, since these vacuoles will help the survival of these blue-

greens to floating in the upper region of the luminous surface of the water, which helps in the formation of toxins.

Also it was found that some marine filamentous blue-green algae such as *Lyngbya*, *Schizothrid*, & *Oscillatoria* cause skin infections to clients swimming (swimmers) in coastal marine life by these algae. Also found that some types of the genus *Anabaena* cause many diseases such as swollen lips, the sensitivity of the eye, ear piercing, cold and other for those who dine at a swim in the rivers or non-antiseptic swimming pools.