

# Toxic Algae and Their Environmental Consequences

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## Abstract

Harmful algae reproduction (HAB) occurs when algae producing toxins grow in water algae are microscopic organisms that live in an aquatic environment and through photosynthesis generate chemical energy from sunlight like higher plants. The growth of algae or algal blooms is visible with naked eye and are green layers, it might be blue, red or brown depending on the type of algae natural waters such as lakes, ponds and rivers always contain algae, but few species produce toxins In such algae, the production of toxins can be induced by environmental conditions like light, temperature and nutrients levels. The release of algae or algae toxins can have serious adverse effects on humans, fish, animals and other strata of the ecosystem.

**Keywords:** Algae; Blooms; Toxins; Causes; Effects

## Introduction

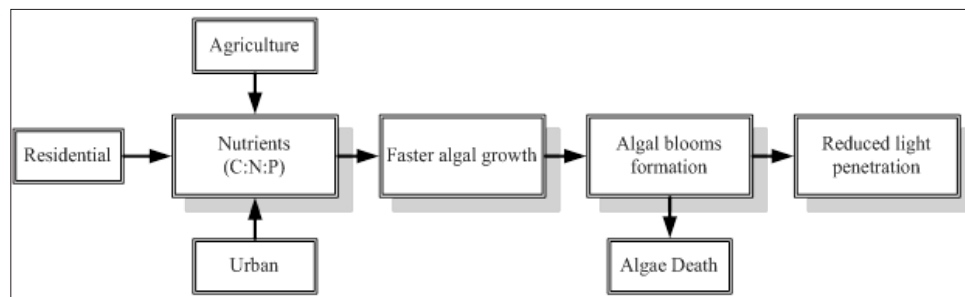
Algae are the class of autotrophic aquatic organisms which grow effectively in nutrient rich condictiones [1]. Algal blooming and water toxicities is a serious environmental problem in all 50 states of US blue-green algae Red tides, and cyanobacteria are examples of toxic algae that can result multiple serious impacts on fresh water ecosystems, human health and the economy [2]. Some forms of algae produce toxic chemicals the accumulation of this toxic algae is called a harmful eutrophication. These can be found in marine and freshwater environments. The toxins resulting from the spread of algae in the marine environment can affect shellfish and the human body that seaweed extracts from the affected or algae polluted water Under these conditions, algal blooms can be formed on the water surface. The colors vary from dark green to yellow brown or red but cannot be seen immediately. The harmful health effects of the algae depend on the type of algae present and the type of exposure [3]. Direct skin contact with algal toxins may cause skin problems and eye irritation. Inhalation of toxic algae droplets in may have a minor effect on the respiratory tract and may cause hay fever-like symptoms. This usually happens when you come in contact with recreational areas where toxic algae may flourish, such as swimming pools, water skiing and boating areas. Drinking water contaminated with algae and food (such as fish and shellfish) can cause gastroenteritis, which can cause vomiting, diarrhea, fever and headache. This toxin also affects the nervous system or may affect liver.

## Causes of Eutrophication

Harmful algal blooms are results of eutrophication that is caused by excessive release of nutrients water bodies. Other factors which are responsible for eutrophication are slow-moving water, sunlight algal spores and nutrients (nitrogen and phosphorus) eutrophication is caused by excessive algae growth due to the increased availability of one or more limiting growth factors needed for photosynthesis [4], these include solar radiations, carbon dioxide (CO<sub>2</sub>), and dissolved nutrient fertilizers coming from soil surface runoff. Eutrophication may occur naturally after the passage of large time spans over lakes over the stagnant water containing sediments [5]. However, human activities have increased the rate of eutrophication

by excessive addition of nutrients and non-petroleum emissions (e.g., cultural eutrophication) have also increased these activities such as nitrogen and phosphorus dissolution in water ecosystems. Aquaculture researchers and pond managers, for example, plan to add fertilizer to the pond to increase the primary productivity and density of the fish for high nutritional level. But in the 1960s and 1970s, scientists believed that algae spreading, and eutrophication

was concentrated due to nutrients additions by human activities ie agriculture, industry and sanitation. Known effects of cultural eutrophication include the proliferation of cyanobacteria (ie, blue-green algae) in contaminated drinking water, damaging the recreational opportunities and hypoxia. The cost of damage caused by eutrophication in the United States is estimated at 22 billion US Dollars a year (Figure 1).



**Figure 1:** Causes of algal blooms formation (eutrophication).

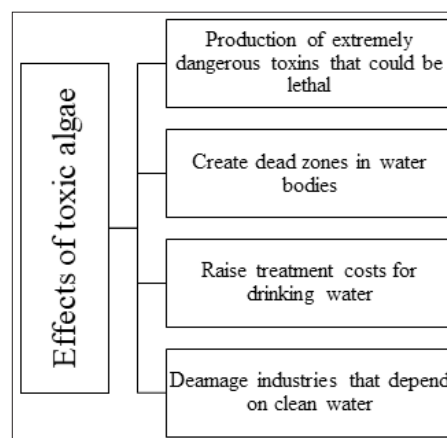
### Toxicity

Some algae are injurious to humans some species produce toxins that can concentrate on crustaceans and fish, making them dangerous or toxic for human consumption. Dinophyceae (the class of dinoflagellates) is the best-known producer of toxins paralytic shellfish toxicity is caused by at least one of the 12 related compounds produced by pigmented toxin (neurotoxin) producer or alexandria tamarensis ie diaphlagellate species and gymnodinium catenatum [6]. Diarrhea poisoning of mollusks is due to okadaic acid, which produced by a wide range of algae nutrient shellfish poisoning caused by the toxin released by gymnodinium breve is known to kill seafood on the florida coast. When red spots reach the coast, poisonous, windy cells can cause health problems by drinking water and inhaling that air to humans and other animals. The type of dinoflagellate, commonly known as marine optics are called *Noctiluca Scintillans*, is a type of algae that can grow in number and produce harmful substances for marine life [7] dignoflagellate algae do not produce all mollusc toxins. It is caused by domoic acid released by nitzschia pungens and N pseudodelicatissima and also produced by diatoms (*Bacillariophyceae*). People affected by addictive symptoms range from abdominal cramps, vomiting, amnesia, coma ultimately to death ciguatera is a human disease caused by ingestion of tropical fish that eat *Gambierdiscus* or *Ostreopsis* algae contrasting many other algae toxins, ciguatoxin and maitotoxin are concentrated in fish, not in Mollusca. Sometimes, very low concentration ie one part per billion (1 ppb) may be enough to cause human intoxication [8]. *Prymnesium parvum* a member of *prymnesiophyceae*, may cause massive death of fish in ponds, and *chrysochromulina polylepis* (*prymnesiophyceae*) have reported to kill large fish off the coast of scandinavia other algae such as heterosigma (*raphidophyceae* class) and dictyochoa (*dictyochopeceae* class) are also suspected of killing fish [9].

### Consequences

The most obvious effect of cultural eutrophication is the production of high density, toxic and aggressive phytoplankton

blooms, which reduce water transparency and affect water quality. Algal blooms easily restrict the regulated growth and kill coastal plants. In addition, high levels of photosynthesis associated with eutrophication can reveal reduce inorganic carbon and raise pH to extreme levels throughout the day [10]. The toxic effects of harmful algae as summarized (Figure 2).



**Figure 2:** Toxic effects of harmful algae.

High pH can lead to blindness in organisms, and their survival depends on the recognition of dissolved chemical signals affecting their chemical sensibility When this thick algal bloom finally die, microbial degradation creates a hypoxic or anaerobic “dead zone” that does not contain enough oxygen to deplete solute dissolved oxygen and carry most organisms. Many freshwater lakes also have blind spots in summer including Laurenia’s Great Lakes [11]. In addition, these hypoxic events have spread to more than 400 marine systems, especially in coastal marine environments, around large, nutrient-rich rivers of 245,000 square kilometers. In eutrophication the hypoxic and anaerobic conditions continue to be threatened with sustainable commercial and recreational fishing around the world some algal blooms are an additional threat because they produce harmful toxins such as microcystins and anatoxin [12].

Growth of harmful algal blooms (HAV) in the last century has been related to

- A. Deteriorating water quality,
- B. Destruction of commercial fishing, and
- C. Public health hazards. In freshwater ecosystems, cyanobacteria are the most important phytoplankton associated with HAV toxic cyanobacteria, such as *Anabaena*, *Microcystis*, *Cylindrospermopsis* and *Oscillatoria*, tend to dominate grown in freshwater systems due to their high nutrient concentrations and low nitrogen and phosphorus content, low brightness and high temperature [13]. Damage to animal and wildlife by toxic cyanobacteria are recorded worldwide. Cyanobacteria are also responsible for various non-edible compounds found in urban drinking systems and aquaculture. This causes serious financial losses for local and regional economies. The laboratory found that cyanobacteria not only posed a serious risk to public health, but also reduced the efficiency of the water supply energy's energy efficiency of zooplankton to consume algae which can control algae growth [14].

## Conclusion

Despite significant improvements in water quality due to great efforts to reduce eutrophication (ie 1970s Clean Water and Safe Drinking Water Acts), eutrophication and HABs still have an inordinate consequence of contaminated fresh water, which is an important issue in developing countries. The demand for freshwater resources is expected to increase dramatically, and depleting water resources will be one of the most serious environmental problems that will be exacerbated by climate change, intricate water infiltration and pollution. The water management and management of eutrophication is ultimately be solved by scientists, politicians, taking it as a complex problem and communities are required to take joint action along with scientists to reduce nutrients losses in water bodies, develop effective methods of long-term control of the growth of algal blooms and consequent toxicity.

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