



Ultrasound & Toxin Release

By
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"What happens to the toxins released when the cell is broken (killed)". Apparently there is concern about killing the algae prior to the treatment process, thereby releasing the toxins which will result in taste and odor complaints

Virtually all of the toxins that algae can release are created as defense mechanisms to either ward off other organisms or combat changes in water chemistry. For example, sudden changes in pH, salinity, other prolific algae populations (i.e. competition), organic wastes and other pollutants can cause a toxic response as the algae begin to produce chemicals that help them cope with the change. Since the ultrasound does not provoke a toxic response as they perceive the vibration from the ultrasound as water turbulence and not a physical or chemical change. The ultrasound does not break the external sheath of the algae but causes internal damage as blue-green algae gas vesicles are broken or the plasmalemma inner cell wall linings of green algae are separated from the outer sheath. The former causes the cells to sink due to loss of buoyancy and the latter interrupts the fluid transfer in and out of the cell as the plasmalemma becomes separated from the contractile vacuole on the outer algae sheath. In the former case, the blue-green algae simply are taken from their ability to get sufficient light and they slow down and stop reproduction. In the latter case, the internal cell material begins to die slowly as it cannot get sufficient food nor can it get rid of waste. Once the plasmalemma is torn from the outer sheath and an

internal cell pressure cannot be maintained, bacteria invade the cell and begin eating it from the inside.

I know of no algal response to the application of low intensity ultrasound that has caused an increase in toxin levels or caused an increase in taste and odor issues. Many people see the technology and mistakenly assume that it is similar to cavitation ultrasound that can be used to break the outer algal sheath. You need about 300 times more energy than the Sonic Solutions device to do this. By scanning a bandwidth of frequencies that match the resonance of these algae internal cells, the device can disable them slowly and methodically without breaking them apart at the algal outer surface. Eventually as the cells decay, the outer sheath will begin to disintegrate and break down, but at that point the cell has no capacity to produce taste, odor, or toxic materials.

In summary: Under the influence of ultrasound the algae do not sense they are under attack which means they don't produce the toxins of concern. Reducing the algae population is the key to preventing them from being in sufficient quantity to produce enough chemicals to cause taste, odor and toxicity problems.