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Rural Water Scholarship Essay

Drinking water can come from different sources depending upon where you live. Treatment plants must take "raw" water from rivers or lakes and then purify it to make it safe for people to use and drink. Total Organic Carbon levels (TOCs) in that water can affect the quality of that purified water and its safety to drink.

All source water has organic carbon material in it. How much depends on multiple factors such as the climate of the area, the vegetation in and around the water source, and polluting factors such as the local industry waste or sewage wastewater that gets into the water system. TOCs can come from natural decaying vegetation and organic material as well as bacteria that normally live in natural water sources. Other organic carbons in the water can come from industrial wastewater, agricultural products such as pesticides and herbicides, and chemicals such as detergents that are man-made products. The levels of TOCs in the source water can vary greatly. They might be higher after a spring season of heavy rainfall where there is a lot of runoff flowing into the waterways which might carry with it the residue of agricultural chemicals used locally. It might also be elevated if there is a large amount of decaying vegetation entering the water system like in the autumn when leaves fall from the trees or when it is hot in the summer and there are algae blooms in warm water.

All water that flows into our homes must undergo a regulated purification process to ensure that it is safe to drink, cook with, and bath in. Total Organic Carbon levels in that source water can have a huge impact upon the safety of that water for consumers. Although municipal water goes through several steps of purification even before it reaches the stage of chlorination, some of the byproducts of this process can be a problem by themselves. When there is high levels of organic carbons (TOCs) in the water being treated, that carbon reacts with the disinfection chemicals themselves and can create byproducts that could be potentially hazardous to people. Some of the disinfection byproducts (DBPs) created from carbon in the water interacting with chlorine are trihalomethanes (THMs). There are four kinds of THMs which includes the byproduct chloroform. The higher the TOCs in the original source water the higher the amount of DBPs is found in the water going out to the public. These byproducts are not easily removed from the water through regular filtration. The TOCs must be reduced before chlorination to keep the levels lower. These varying levels of TOCs must be continually monitored so that the water treatment plants can try to control the amount of treatment byproducts get into the water supply.

The major concern of having high levels of chlorination byproducts such as THMs is that there is some evidence that long term exposure is linked to certain types of cancer, especially bladder cancer. Reproductive issues have also been shown in long term studies. The evidence is strong enough that the EPA has set new lower limits on the acceptable levels of disinfection byproducts that is allowable in our water.

So the challenge for water treatment facilities is not only to disinfect the drinking water to prevent waterborne diseases from spreading to the public but to also keep the disinfection byproducts to a minimal level so that long term use isn't a health concern as well. The key to this is to find a way to keep the Total Organic Carbon levels lower either at the source or at the early stages of the purification process before chlorination occurs.