

Surface Waters: Ammonium is Not Ammonia – Part Two

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A previous article explained the difference between ammonium and ammonia, the relationship between the two nitrogen forms, and the implication of a combined (ammonium-N plus ammonia-N) analysis related to water quality criteria for aquatic life (ICM News, 4/21/2008' <http://www.extension.iastate.edu/CropNews/2008/0421JohnSawyer.htm>). This article focuses on the implication of ammonia and ammonium for chlorination of drinking water.

Drinking water is chlorinated (often by addition of hypochlorous acid) in order to control disease causing organisms and provide protection until water is consumed. Several water properties and constituents affect the efficiency of chlorination, and therefore affect the amount of chlorine that must be added to achieve levels of chlorine compounds that have disinfecting capability (hypochlorous acid, hypochlorite, and inorganic chloramine). Materials that react with chlorine and reduce or eliminate the disinfecting ability include ammonia, ammonium, organics, and reducing agents. Reaction products of chlorine and ammonia can have disinfectant capability, but are slow reacting and add unpleasant taste and odor at high levels. In addition, the chlorine disinfecting activity and reactions are slower at lower temperature and at higher pH, as is the breakdown of chlorine-ammonia reaction products. The “interfering” compounds reduce the disinfecting ability of added chlorine, and as their level increases, the amount of chlorine that must be added increases. Once the interfering materials have reacted with chlorine, additional chlorine becomes an effective disinfectant. At high levels of interfering compounds, however, it can be difficult for water treatment facilities to add enough chlorine to provide satisfactory levels of disinfecting compounds in the water and have reactions proceed at a rapid enough pace. It also adds costs for treatment.

In contrast to water quality criteria related to toxicity for aquatic life for which ammonia is important, for treating drinking water ammonium and other constituents are also important. Therefore, when a water system is being utilized for drinking purposes, the ammonia plus ammonium concentration must be considered. While ammonia and ammonium are not directly an issue for drinking water safety to humans, indirectly they are because of interference in disinfection for control of disease causing organisms. Therefore, having low concentrations of ammonia and ammonium in surface water systems is helpful for aquatic life and water treatment for human consumption.