



TUFTS UNIVERSITY

School of Medicine

Public Health & Professional Degree Programs

Andrew DeGraca, PE
Water Quality Bureau Manager
San Francisco Public Utilities Commission (SFPUC)
1657 Rollins Road, Burlingame, CA 94010

April 19, 2007

Subject: Opinion as to use of chloramine in the SFPUC in the drinking water distribution system

Dear Mr. DeGraca:

Review of November 8, 2006 Letter to SFPUC

I have had the opportunity to review the letter sent to the SFPUC dated November 8, 2006 regarding the use of chloramine. I strongly concur with this opinion regarding the advantages of chloramine over chlorine for residual disinfection in the distribution system, including reduced formation of disinfection byproducts that are suspected carcinogens. There is a substantial body of literature that suggests that elevated levels of disinfection byproducts are harmful, and thus the use of chloramine as an alternative residual disinfectant is of clear public health benefit. SFPUC, as a precautionary measure, has in my view prudently moved to reduce disinfection byproducts given this information.

The literature documents that *Legionella* bacteria are a significant cause of human disease, causing pneumonia and other infections through the inhalation of aerosolized water containing this pathogen. The 'near elimination' of these bacteria from large buildings in San Francisco (as reported in the November 8 letter) should be viewed as a clear and significant public health improvement.

Based on the scientific literature, it is my opinion that the use of chloramine as utilized by the SFPUC does not pose a significant risk to humans, when ingested at the concentrations used for residual disinfection by SFPUC. In addition, there are significant health advantages when compared to the use of chlorine for residual disinfection. SFPUC continues to use chlorine for primary disinfection (at the treatment plants), and in my view, concerns about the use of chlorine for primary disinfection are unwarranted and its continued use for primary disinfection is appropriate. Chloramine is not used by SFPUC for primary disinfection, thus any concerns about its efficacy for that purpose are unwarranted.

Opinion on Reported Health Effects

The reports of adverse health effects of chloramine are both anecdotal, and at times biologically implausible. There is clear confusion around the issue of respiratory allergens (e.g. trichloramine) and the use of monochloramine as a residual disinfectant, as well as confusion around the fact that the use of chloramine *decreases* the concentrations of disinfection byproducts. Furthermore, there is no scientific

reason or basis to believe that chloramine can enter the blood stream through inhalation, since the lung epithelium is a barrier to this entry. There is no scientific literature to support the contention that chloramine, or ammonia, exposures of any significance occur because of respiration. The levels of ammonia found in chlorinated water do not act as a skin irritant given their very low levels, and the levels of ammonia found in chloraminated water are dwarfed by the amounts of ammonia found in foodstuffs. Thus concerns about dermal irritation, or health concerns for individuals with urea cycle disorders, hepatic (liver) or renal (kidney) disease are also unwarranted.

In my opinion, the materials compiled by the SFPUC on their website, and as transmitted in correspondence to concerned customers, are scientifically accurate and responsive to the concerns.

Respectfully yours,

A handwritten signature in black ink that reads "Jeffrey K. Griffiths". The signature is written in a cursive, flowing style with a long horizontal line extending from the end of the name.

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