



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: IA1601

Title: Occurrence and Formation of Nitrosamines in Drinking Water Distribution Systems

Focus Categories: Water Quality, Water Supply

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Abstract

Many nitrosamines, especially N-dimethylnitrosamine (NDMA), are potent carcinogens. A number of studies and observations as well as consideration of processes that may occur in water distribution systems, support the hypothesis that nitrosamine (NA) occurrence and formation could be an especially important problem in some Midwestern drinking water distribution systems. While the exact conditions and mechanisms leading to nitrosamine formation in the environment are not well understood, it is known that they are formed by reaction of nitrite with certain organic nitrogen containing (amine) compounds. These precursors to nitrosamine formation are ubiquitous in many Midwest drinking water sources or can actually be formed in distribution systems thus making these supplies particularly susceptible to nitrosamine formation. Additionally, recent observation in California suggests that NDMA formation may be related to disinfection practices, suggesting that at least this nitrosamine should also be considered a "new" disinfection by-product.

Little is known, however, about the occurrence and formation of nitrosamines in potentially susceptible Midwestern drinking water distribution systems. To date, no systematic studies have considered the potential for formation in distribution systems. No studies have investigated the relationship of nitrosamine formation to disinfection, or the role of the pipe-water interface and the presence of deposit material. The proposed study will assess the extent of this potential problem in several distribution systems believed to be "susceptible" to nitrosamine formation, and will determine how water quality, treatment, and distribution system characteristics influence this. Laboratory based studies will examine reaction mechanisms and kinetics, and explore several hypotheses that cannot be investigated in the field. These include the role of disinfection and the presence of pipes and attached deposit material. The information obtained in this study will be used to propose strategies to minimize exposure such as modifying treatment, changing source water, or perhaps instituting waste and agricultural management practices that minimize inorganic and organic nitrogen discharges to potential drinking water supplies.