

Cometabolism by Ammonia-Oxidizing Bacteria: Implications for Nitrification in Chloraminated Drinking Water Distribution Systems



2012 ESE Distinguished Alumnus Award Winner

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ABSTRACT

Nitrification is a significant problem in many drinking water distribution systems where chloramines are used as the disinfectant. A very rapid loss of the monochloramine residual is often associated with the onset of nitrification. A variety of factors may influence the likelihood of nitrification episodes including disinfectant concentration, chlorine:nitrogen (Cl₂:N) ratio, free ammonia concentration, temperature, and detention time. Ammonia-oxidizing bacteria (AOB) metabolize ammonia to nitrite, but also can cometabolize a wide variety of chemicals, including trihalomethanes (THMs) and monochloramine. To date, the role that AOB cometabolism may play in determining disinfectant residual concentrations in distribution systems subject to nitrification has been completely ignored in practice. The presentation will describe the kinetics of THM and monochloramine cometabolism and place this cometabolism in the context of the many abiotic and biotic reactions that determine the stability of monochloramine as a residual disinfectant within distribution systems. An improved understanding of AOB cometabolism will contribute to the overall goal of improving our ability to predict chloramine disinfectant residual concentrations in distribution systems and to anticipate conditions that might cause the onset of nitrification.

BIO

Speitel obtained his MS and PhD in Environmental Engineering from UNC in 1979 and 1985 respectively. He is currently John J. McKetta Energy Professor and Associate Dean for Academic Affairs at the Cockrell School of Engineering at the University of Texas at Austin, where he has been a professor since 1988. He served seven years as Chairman of the Department of Civil, Architectural and Environmental Engineering.

Dr. Speitel has over 20 years of experience in treatment processes for engineered and natural systems. Speitel's research has been recognized by national awards from the American Society of Civil Engineers, the American Water Works Association, and the Association of Environmental Engineering and Science Professors, all organizations with which he has been a long time active member.