Abstract

The protection of public water supplies against waterborne diseases greatly relies upon the use of disinfectants. However, reports from many water utilities in the US have shown that pathogens can survive in water systems, despite the presence of residual disinfectants. A growing number of studies have discussed the influence of extracellular polymeric substances (EPS) produced by microorganisms on bacterial regrowth and biofilm formation in water systems. EPS have significant impact on bacterial surface characteristics, which may alter biochemical properties of bacterial cells. The presence of EPS has been known to facilitate bacterial immobilization, proliferation, reattachment and regrowth. In addition to physical attributes that aid in resistance of microorganisms to free chlorine, many bacteria species defend against oxidative stresses by adopting resistance mechanisms that increase EPS production. Despite growing acceptance of the protective role of EPS against antimicrobial agents, previous studies predominantly focused on monitoring the bacterial survival rate and disinfectant consumption, without consideration of the physiochemical properties of the microorganism. Specifically, the chemical composition or the functional groups of bacterial EPS involved in the reaction with disinfectant reactions were not well characterized.

In this study, we sought to assess and compare the reactivity of EPS to chlorine based disinfectants using both qualitative and quantitative analysis. Additionally, multiple roles of biofilm EPS were assessed in respect to the susceptibility of biofilm and biofilm detachment upon the exposure to a model disinfectant.

About the Speaker

Youngwoo (Young) Seo is as an Assistant Professor in the Department of Civil and Engineering at the University of Toledo. He is also jointly appointed to the Department of Chemical and Environmental Engineering. He earned a B.S. and M.S. from Sunkyunkwan University in the South Korea and received
his Ph.D degree from the University of Cincinnati in Environmental Engineering. Before joining the University of Toledo, he worked for CDM Inc. as a project engineer where he participated in drinking water system design and water distribution modeling projects. He is currently a member of both the American Water Works Association Water Distribution Research Committee and Water Research Foundation Project Advisory Committee.

His current research involves the microscale analysis of biofilm formation and control, characterization and application of environmental microsensors, and drinking water quality control.