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Bacterial Biofilms in Drinking Water Systems: Protecting Patient Health at the Alberta Children's Hospital

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When we hear of bacterial contaminated drinking water, we generally think of microscopic organisms swimming freely throughout the system. Although bacteria are found in this free living form, or planktonically, the majority of microorganisms in natural environments are in fact found growing on a surface. These surface adhered bacteria are called biofilms and can be found anywhere, ranging from implanted medical devices to drinking water pipes. Drinking water system operators use the multiple barrier approach to ensure the microbiological safety of the water. The approach includes primary treatment of the source water with chlorine or UV light; secondary chlorine treatment throughout distribution systems; and routine testing for indicator organisms, such as *Escherichia coli*. Thus, the presence of indicator organisms signifies that there has been a failure in the treatment process or a contamination in the water system. Regardless of chemical or irradiation treatment, normal flora biofilms continue to grow in these systems. It is theorized that these resident flora biofilms may incorporate and shield pathogenic organisms from chlorine disinfection. The Alberta Children's Hospital (ACH) water system has a unique design, engineered to reduce bacterial contamination and biofilm growth. This project, done in collaboration with Alberta Health Services and the ACH, aims to evaluate bacterial survival after exposure to low levels of chlorine. It is hypothesized that the chlorine levels maintained in our water systems for secondary treatment may be insufficient to disinfect biofilm growth. Eight isolates were obtained directly from chlorinated water systems, including the ACH. These isolates were tested both planktonically and as biofilms, grown using the Calgary Biofilm Device, under a range of chlorine concentrations. Minimum inhibitory concentration (MIC) and minimum biofilm eradication concentration (MBEC) assays have shown that biofilms can be 2-20 times more resistant to chlorine disinfection when compared to their more vulnerable planktonic counterparts.

References

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