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DRINKING WATER RESEARCH GROUP

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The Analysis of Emerging Disinfection By-Products: Halogenated Furanones (MX) and Iodinated Trihalomethanes (Iodo-THMs)

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Figure 1: Hewlett Packard 5890 Series II Plus Gas Chromatograph (Mississauga, ON) using an electroncapture detector (GC-ECD)and aDB 5.625 capillary column

The practice of disinfection for distributed drinking water is regarded as a major public health accomplishment, reducing the risk of infections due to waterborne pathogens. However, the use of oxidative disinfectants can convert natural organic matter (NOM) into disinfection by-products (DBPs), which are genotoxic and pose chronic health risks. The two largest classes of DBPs (by weight basis), trihalomethanes (THMs) and haloacetic acids (HAAs) are monitored and regulated in many countries. However, identified DBPs account for less than 50% of the total organic halide (TOX) produced in chlorinated drinking water. Recent studies have indicated that emerging DBPs, such as halogenated furanones (MX) and iodinated THMs may be more cytotoxic and genotoxic than regulated DBPs. Although emerging DBPs are present at levels lower than THMs and HAAs, the augmented toxicities and lack of regulations increases concerns over exposure.

Several factors influence DBP formation: source water characteristics such as NOM concentration and composition, NOM removal capabilities of conventional coagulation/flocculation treatment, and type of disinfectant used. This research focuses on establishing the interdependent relationships between these factors in order t optimize coagulation and disinfection treatments to minimize the formation of emerging DBPs, starting with MX and iodo-THMs.

NOM present in source waters will be analyzed, using LC-OCD for NOM fractionation. By comparing the NOM fractinations present with the abundance and type of DBPs formed after specific treatments, DBP formation mechanisms can be better understood. This research will provide invaluable information for optimizing treatment trains to control and minimize DBP formation.

Figure 2: - Vacuum manifold for solid phase extraction of MX in water

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