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Spatial and Temporal Evaluations of Disinfection By-Products Formation in Coastal City Distribution Systems of Turkey

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Abstract : Seasonal variations of trihalomethanes (THMs) and haloacetic acids (HAAs) concentrations were investigated within three distribution systems of a coastal city of Istanbul, Turkey. Moreover, total trihalomethanes and other organics concentration were also analyzed. The investigation was based on an intensive 16 month (2009-2010) sampling program, undertaken during the spring, summer, fall and winter seasons. Four THM (chloroform, dichlorobromomethane, chlorodibromomethane, bromoform), and nine HAA (the most commonly occurring one being dichloroacetic acid (DCAA) and trichloroacetic acid (TCAA); other compounds are monochloroacetic acid (MCAA), monobromoacetic acid (MBAA), dibromoacetic acid (DBAA), tribromoacetic acid (TBAA), bromochloroacetic acid (BCAA), bromodichloroacetic acid (BDCAA) and chlorodibromoacetic acid (CDBAA)) species and other water quality and operational parameters were monitored at points along the distribution system between the treatment plant and the system's extremity. The effects of coastal water sources, seasonal variation and spatial variation were examined. The results showed that THMs and HAAs concentrations vary significantly between treated waters and water at the distribution networks. When water temperature exceeds 26°C in summer, the THMs and HAAs levels are 0.8 – 1.1, and 0.4 – 0.9 times higher than treated water, respectively. While when water temperature is below 12°C in the winter, the measured THMs and HAAs concentrations at the system's extremity were very rarely higher than 100 µg/L, and 60 µg/L, respectively. The highest THM concentrations occurred in the Buyukcekmece distribution system, with an average total HAA concentration of 92 µg/L. Moreover, the lowest THM levels were observed in the Omerli distribution network, with a mean concentration of 7 µg/L. For HAA levels, the maximum concentrations again were observed in the Buyukcekmece distribution system, with an average total HAA concentration of 57 µg/l. High spatial and seasonal variation of disinfection by-products in the drinking water of Istanbul was attributed of illegal wastewater discharges to water supplies of Istanbul city.

Keywords : disinfection byproducts, drinking water, trihalomethanes, haloacetic acids, seasonal variation
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