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Differentiation of Volatile Organic Compounds Content of Source, Bottled and Tap waters by Purge and Trap GC-MS: Are There Human Health Risks from Con…

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Abstract Text:

Chlorination of finished drinking water is widely applied in many municipal drinking water treatment facilities around the world. Natural organic matter (NOM) in finished water may react with chlorine to form trihalomethanes (THMs) and other THMs (brominated compounds) may also be formed in the presence of bromine. Since THMs are known carcinogens, their concentrations in source, bottled and municipal waters should be assessed to safeguard the health of humans. This study differentiated the volatile organic compounds (VOCs) content including five major trihalomethanes (THMs) in bottled, municipal (tap water) and source waters by principal component analysis and evaluated the cancer risks posed to humans from consumption of drinking waters. Source (Missouri river, N = 30), tap (Mid Missouri region, N = 44), spring (3 brands, N= 25), purified (8 brands, N = 58), distilled (3 brands, N = 12) and flavored waters (5 brands, N = 34) were analyzed by purge and trap gas chromatograph-mass spectrometer (GC-MS) using US EPA Method 524.2. Internal standard and surrogates were used in method validation. The presence of organic precursors was confirmed in the analyzed waters. Chloromethane values were highest in tap water but Kruskal-Wallis Chi square approximation showed no significant difference across the drinking water groups ($P < 0.05$). Six tap water samples had total THMs exceeding the 100 µg/L International limit. Principal components 1 and 2 accounted for 91 % of the total variance of analytical data and four major THMs were moderately correlated with one another. The efficiencies of three adsorbents under batch conditions to remove VOCs from solution are also discussed.

Impact Statement:

Assessment of drinking water quality is important in safeguarding the health of humans. Volatile organic compounds in drinking waters can pose health threat to humans since some of the trihalomethane compounds formed during drinking water processes are known carcinogens. This type of research protects the general public from consumption of bad waters through knowledge sharing and education of consumers. Over all, consumers confidence on drinking water quality is increased by knowning what we drink.