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Risk from exposure to trihalomethanes during shower: probabilistic assessment and control.

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Source

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Abstract

Exposure to trihalomethanes (THMs) through inhalation and dermal contact during showering and bathing may pose risks to human health. During showering and bathing, warm water (35 degrees C-45 degrees C) is generally used. Warming of chlorinated supply water may increase THMs formation through enhanced reactions between organics and residual chlorine. Exposure assessment using THMs concentrations in cold water may under-predict the possible risks to human health. In this study, THMs concentrations in warm water were estimated by developing a THMs formation rate model. Using THMs in warm water, cancer and non-cancer risks to human health were predicted for three major cities in Ontario (Canada). The parameters for risk assessments were characterized by statistical distributions. The total cancer risks from exposure to THMs during showering were predicted to be 7.6×10^{-6} , 6.3×10^{-6} and 4.3×10^{-6} for Ottawa, Hamilton and Toronto respectively. The cancer risks exceedance probabilities were estimated to be highest in Ottawa at different risk levels. The risks through inhalation exposure were found to be comparable (2.1×10^{-6} - 3.7×10^{-6}) to those of the dermal contact (2.2×10^{-6} - 3.9×10^{-6}) for the cities. This study predicted 36 cancer incidents from exposure to THMs during showering for these three cities, while Toronto contributed the highest number of possible cancer incidents (22), followed by Ottawa (10) and Hamilton (4). The sensitivity analyses showed that health risks could be controlled by varying shower stall volume and/or shower duration following the power law relationship.

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