



A Study of the Influence of Household Water Quality and Use Activities on Indoor Air and Internal Dose Levels of Trihalomethanes - Overview of Methods and Findings

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Abstract:

Individual exposure to trihalomethanes (THMs) in tap water can occur through ingestion, inhalation or dermal exposure. Studies indicate that activities associated with inhaled or dermal exposure routes result in a greater increase in blood THM concentration than ingestion. Previous studies of these exposure routes have focused primarily on the activities of showering and bathing. In this study, we determined the relative contribution of other household water use activities for THM exposure assessment. We conducted our study at a single residence in each of two water utility service areas, one with relatively high (median = 136 ug/L) and the other low (median = 38 ug/L) total THM in the residence tap water. To maintain a consistent exposure environment for 7 participants, we controlled air exchange, water flow and temperature, and non-study THM sources to the indoor air to the greatest extent possible. We collected reference samples for water supply (cold tap) and air (pre-water use activity), as well as source water, and ambient air samples for each of 11 water use activities. These activities included ingestion of hot and cold tap water beverages, showering, clothes washing, hand washing, bathing, hand dishwashing, and secondary shower exposure. We collected blood samples before and after each activity and exhaled breath samples, at the beginning of each day and post-activity, from each participant. Summary statistics for measured THMs in water, air, blood, exhaled air samples, and for temperature measurements of the water samples were calculated, as were ratios between post- and pre-activity blood and exhaled air concentrations. We found that showering (10 minutes) and bathing (20 minutes) activities consistently resulted in measurable increases in median blood THMs in the two study groups. For at least one site, smaller increases were also observed for hand dishwashing (10 minutes), use of and being proximate to automatic clothes and dishwashers (over 1 hour), hand washing, and secondary exposure to a showering event (13 minutes). These increases were observed for all species of THM, except bromoform, and regardless of whether the study site was characterized by high or low total THMs. The largest changes in median exhaled breath THM concentrations, regardless of study site, were due to showering and bathing activities, and to a lesser extent, hand dishwashing. Although our study population is small, our results indicate the importance of activity and individual differences for exposure assessment of THMs in epidemiologic investigations.