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Short-term organic carbon release and chlorine disinfectant decay for cross-linked polyethylene (PEX) plumbing pipes

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ABSTRACT

The use of cross-linked polyethylene (PEX) plumbing pipes has grown in popularity for residential applications. However, PEX pipes can leach organic materials into water that can enable biofilm growth, cause off-tastes and -odors, and may react with disinfectants to form disinfection by-products (DBP). Varied manufacturing processes that are applied to create PEX pipes add to the complexity of understanding organic materials released. In this study, organic carbon release from three PEX pipe brands was monitored for up to five days using a series of stagnation periods. Seven stagnation periods of 1, 2, 4, 8, 24, 72, and 120 hours were conducted at 50 degrees Celsius with varying initial chlorine concentrations for a type A (PEX-a), type B (PEX-b), and type C (PEX-c) brand. Pipes were exposed to chlorinated tap water synthesized in the lab. Water exposed to these pipes was analyzed to determine total organic carbon (TOC), assimilable organic carbon (AOC), total chlorine, and free chlorine concentrations. Results show that all pipe brands had different chlorine decay rates and TOC concentrations. Chlorine residual decayed the slowest and fastest for PEX-A pipes and PEX-C pipes, respectively. Chlorine completely decayed in most pipes by 24 hours when the initial chlorine concentration was 2.0 mg/L. PEX-B leached the most amount of contaminants, with a TOC concentration that far exceeded 2.0 mg/L within 24 hours. AOC concentrations tended to increase over time for all pipes. Future work should include additional brands, aged PEX pipes, different flow conditions, temperatures, and longer stagnation periods.

KEYWORDS

PEX, plastic, water quality, plumbing, polyethylene, leaching