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Study on migration of phenolic and volatile organic compounds from plastic pipes used in plumbing home networks into tap water

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ABSTRACT

Water pipe materials can have significant effect on tap water quality. Recent reports evidenced that plastic pipes used to construct water distribution network in homes can leach potential amounts of harmful organic contaminants into tap water. In this work, the migration of phenolic and volatile organic compounds into tap water has been investigated. For this purpose, 30 samples were collected from homes within Al Medina Al Munawarah municipal residential area and analyzed for the existence of 2-butanone, 1,1,1-trichloroethane, carbon tetrachloride, 1,2-dichloropropane, 2-chloroethanol, 4-methyl-2-propanone, 1,2-dinitrophenol, pentachlorophenol and 1,2,3-trichloropropane. The most frequent compounds such as 2-butanone, 1,2,3-trichloropropane, 1,2-dinitrophenol, 4-methyl-2-propanone and 2-chloroethanol were monitored in 90%, 76%, 66%, 60% and 60% of samples, respectively. Meanwhile the levels of the compounds, 2-butanone, carbon tetrachloride and pentachlorophenol exceeded the WHO limits in 40%, 16% and 30% of samples, respectively. The migration test indicated that five of the targeted compounds occur in deionized water samples incubated in pipes in laboratory scale experiment. This implies that these pollutants are more likely to migrate from polyethylene pipes comprising home plumbing network. Although the levels of some percolated compounds were below the allowable levels, their accumulation during lengthy consumption can potentially increase the exposure to harmful constituents in water. As a prevention step, the use of sorbent filtration kits is recommended.

Keywords: Drinking water; Plastic pipes PEX; Volatile and phenolic compounds; SPE

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