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Trihalomethanes (THMs) in Malaysian Drinking Water

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Abstract : Municipal water treatment plants in Malaysia use chlorination for drinking water disinfection due to its cost effectiveness and efficiency. Although, chlorination has worked well, the use of chlorine posed potential health risks due to formation of carcinogenic or mutagenic halo-organic compounds as disinfection by-products such as trihalomethanes (THMs). A study was carried out to assess the THMs level in drinking water supply from Selangor, West Pahang, Negeri Sembilan and Federal Territory-Kuala Lumpur for the years 1999, 2000 and 2001. The results of the study indicate that chloroform constituted the principal fraction of the THMs in all samples analyzed. For the year 1999, THMs were present in the range of 2 - 245 of µg/L (mean of 71 µg/L) for Selangor, 1 - 186 µg/L (mean of 39 µg/L) for West Pahang, 3 - 301 µg/L (mean of 82 µg/L) for Negeri Sembilan and 6 - 176 µg/L (mean of 48 µg/L) for Federal Territory -Kuala Lumpur. As for the year 2000, THMs were present in the range of 1 - 224 µg/L (mean of 59 µg/L) for Selangor, 2 - 264 µg/L (mean of 60 µg/L) for West Pahang, 1 - 239 µg/L (mean of 53 µg/L) for Negeri Sembilan and 2 - 280 µg/L (mean of 51 µg/L) for Federal Territory-Kuala Lumpur. For the year 2001, THM was present in the range of 2 - 221 µg/L (mean of 42 µg/L) for Selangor, 2 - 145 µg/L (mean of 38 µg/L) for West Pahang, 2 - 289 µg/L (mean of 53 µg/L) for Negeri Sembilan and 8 - 147 µg/L (mean of 35 µg/L) for Federal Territory -Kuala Lumpur. Comparison of the levels with the maximum permissible level (MPL) of 100 µg/L for total trihalomethanes (TTHMs), shows general compliance.

Key words : Trihalomethanes, Chlorination, Drinking water quality

Abstrak : Loji-loji rawatan air di Malaysia menggunakan proses penklorinan sebagai langkah disinfeksi kerana ianya cekap, murah dan berkesan. Walaupun proses disinfeksi efektif tetapi ianya didapati membahayakan kesihatan manusia atas pembentukan sebatian sampingan haloorganik yang karsinogenik dan mutagenik seperti trihalometana (THMs). Satu kajian telah dijalankan untuk memantau paras THMs dalam bekalan air minum di Selangor, Pahang Barat, Negeri Sembilan dan Wilayah Persekutuan-Kuala Lumpur untuk tahun 1999, 2000 dan 2001. Hasil kajian menunjukkan klorofom merupakan komponen utama dalam THMs untuk sampel yang dianalisis. Bagi tahun 1999, THMs wujud dalam julat 2 - 245 µg/L (min 71 µg/L) untuk Selangor, 1 - 186 µg/L (min 39 µg/L) untuk Pahang Barat, 3 - 301 µg/L (min 82 µg/L) bagi Negeri Sembilan dan of 6 - 176 µg/L (min 48 µg/L) bagi Wilayah Persekutuan-Kuala Lumpur. Untuk tahun 2000 pula, THMs wujud dalam julat 1 - 224 µg/L (min 59 µg/L) bagi Selangor, 2 - 264 µg/L (min 60 µg/L) bagi Pahang Barat, 1 - 239 µg/L (min 53 µg/L) bagi Negeri Sembilan dan 2 - 280 µg/L (min 51 µg/L) bagi Wilayah Persekutuan-Kuala Lumpur. Bagi tahun 2001, THMs wujud dalam julat 2 - 221 µg/L (min 42 µg/L) untuk Selangor, 2 - 145 µg/L (min 38 µg/L) untuk Pahang Barat, 2 - 289 µg/L (min 53 µg/L) bagi Negeri Sembilan dan 8 - 147 µg/L (min 35 µg/L) bagi Wilayah Persekutuan-Kuala Lumpur. Perbandingan aras THMs dengan aras maksimum yang dibenarkan (MPL) iaitu 100 µg/L untuk jumlah THMs, hasil analisis menunjukkan ianya mematuhi MPL yang ditetapkan.

Kata kunci: Trihalometana, Pengklorinan, Kualiti air minum

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Introduction

Disinfection is the most important stage in the treatment of drinking water supplies because it removes or inactivates pathogenic organisms responsible for waterborne diseases such as cholera, typhoid fever, and dysentery [1]. Most municipal water supply system in Malaysia use chlorination for water disinfections [2,3]. Chlorination is a widely used method of disinfections because it is extremely efficient and cost effective. Although, chlorination works well, it was discovered that the use of chlorine posed potential health risks due to the formation of carcinogenic halo-organic compound as disinfections by-products [4,5,6].

Due to the health risks pose by these substances, various limits for trihalomethanes (THMs) in drinking water were set by different countries. The United States Environmental Protection Agency (US EPA) has set a limit of 100 µg/L on acceptable total trihalomethanes (TTHMs) concentration in finished drinking water [7]. The Commission of the European Communities has proposed the values of 40 µg/L for chloroform