The quality of drinking water treated by chlorination and distributed to consumers at Mostaganem region (western Algeria)-Algeria.

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Abstract

Chlorine is commonly used for the disinfection of drinking water in Algeria. During chlorination, chlorine reacts with organics matter in water to form the chlorination by-products including trihalomethanes. The high concentration autorised in drinking water is 100µg/l. These are carcinogenic compounds for humans. This problem leads us to undertake a study about hyperchloration and trihalomethanes analysis in drinking water, especially in Mostaganem region. For this, 18 samples of tap water are collected and analyzed using headspace solid-phase microextraction.

The results obtained have shown that the maximal concentration is 172.61µg/l was in Achaacha region and 17.54µg/l in Salamandre area. It was concluded that the drinking tap water distributed in Mostaganem region, contains a considerable amount of Trihalomethanes, chlorodibromomethane and bromoform are in majority, this could impact directly on consumer's health during a long period of time.

Key words: disinfection, tap water, analyse, trihalomethanes, , Mostaganem.

I. INTRODUCTION

Because of its effectiveness, chlorine is the disinfectant most often added to drinking water around the world. However, when chlorine is added to a water containing organic matter, disinfection by-products are formed from which trihalomethanes (THMs) are the most common form of these by-products, these compounds are considered carcinogenic for man [1, 2,3]. In Algeria, the only means of disinfection is chlorination applied to drinking water. Our objective is to determine the trihalomethanes contained in drinking water, feeding the region of Mostaganem, during the year 2017, the determination of these compounds is based on the method of micro-extraction in solid phase d free space (HS-SPME) [4-8].

Material and methods

2.1. Identification of the study area

Mostaganem is the 27th wilaya in the Algerian territorial administration. It is located in the northwest of Algeria on the Mediterranean, 350 km west of Algiers (Capital) and 80 km east of Oran; it is made up of ten dairas and 32 communes, covers an area of 2,269 square kilometers and has a population estimated in 2014 at 787,184 inhabitants, a density of 347 inhabitants per square kilometer[9].

2.2.Sampling

A total of 18 water samples were collected in 22 ml amber bottles, containing sodium thiosulphate (50 µl of a solution of 1.5 g / l $Na_2S_2O_3$), to prevent or minimize the production of trihalomethanes during transport and storage. The bottles were filled to the brim, sealed with teflon-filled capsules, transported to the laboratory in a cooler by the quickest route and stored in a cold room until analysis [7, 8] .

The method used to extract THMs in drinking water is HS-SPME (Head speace solid phase microextraction).

3. 1. Results and discussion

The determination of trihalomethanes's results contained in drinking water in Mostaganem region are shown in the figures below.

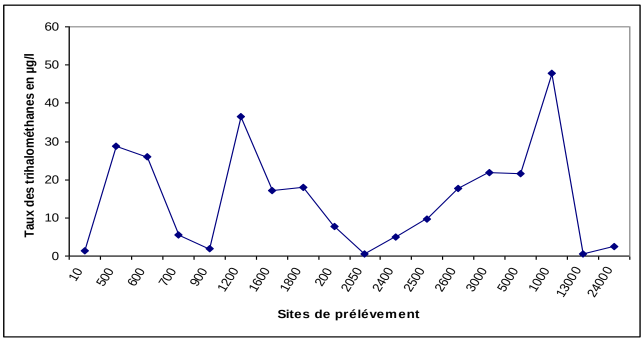

Fig. 02: Total trihalomethanes in µg/l.

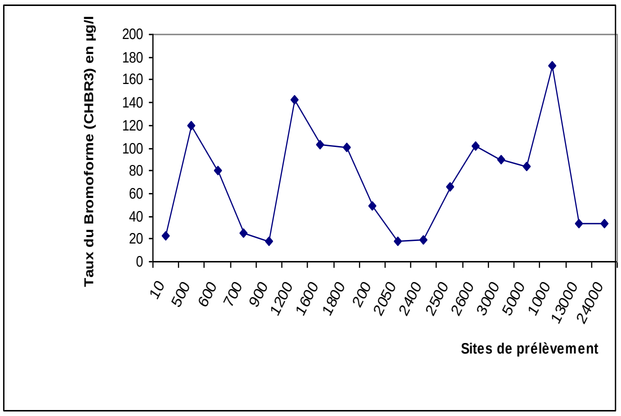

Fig. 03: Rate of bromoforme in µg/l.

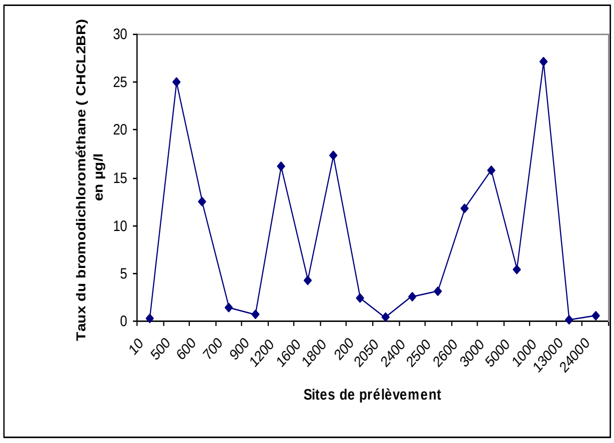

Fig. 4: Rate of bromodichloromethane (CHBRCL2) in µg / l

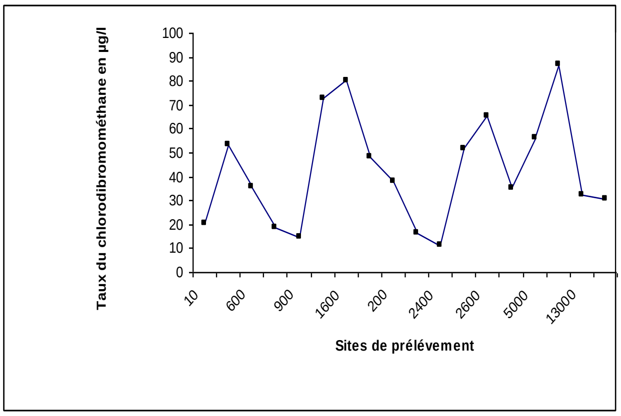

Fig. 5: Rate of chlorodibromomethane (CHCLBR2) in µg / l.

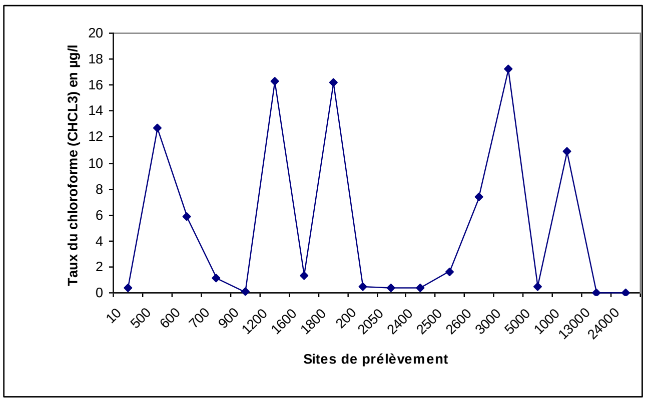

Fig. 6: Rate of chloroform (CHCL3) in µg / l

3.2.Discussion

It appears that almost all of the samples analyzed contain considerable amounts of total THM, we recorded a maximum of 172.61 µg / l in the Achaacha region, located 10 000 m from shore, this value exceeds the authorized limit. which is 100 µg / l [6, 7, 11]. The lowest rate (17.54 µg / l) is observed in an area 900 m from shore. The trihalomethanes found in drinking water are bromoform (CHBr3), chlorodibromomethane (CHClBr2), bromodichloromethane (CHBrCl2) and chloroform (CHCl3) respectively; These results prove the dominance of the brominated species in all the samples analyzed, taking for example Achaacha region (located 10 000 m from the shore) which marked the highest rate of total trihalomethanes (172.61 µg / ml). l), the concentration of bromoform (CHBR3) was 86.72µg / l, followed by chlorodibromomethane (CHClBr2) with 47.87µg / l, while bromodichloromethane (CHBrCl2) and chloroform (CHCl3) revealed lower levels compared to those mentioned above with 27.11 and 10.90 µg / l respectively. The dominance of brominated species than chlorinated species can be explained by water vapor mixed with precipitation, as well as discharges of industrial and petroleum brines that can contaminate water sources with bromine [12-14]. Sketchel et al. (1995) show the dominance of bromoform (CHBR3) and chlorodibromomethane (CHClBr2) in the Mediterranean regions [15-18]. Similar results are also observed in the region of Bizerte (Tunisia) [08], in addition, the presence of bromide ions favors the formation of brominated THM products more than chlorinated products [18, 19. In the presence of bromides, brominated THMs are essentially formed and chloroform concentrations decrease proportionately [18].

4. Conclusion

It should be noted that the drinking water distributed in Mostaganem region (western Algeria) is rich in brominated trihalomethanes, consumption of this type of water could have worrying consequences on the health of consumers in the long term.

5. References

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