ISSN: 0975 -8542

Journal of Global Pharma Technology

Available Online at: www.jgpt.co.in

RESEARCH ARTICLE

Estimation Some Heavy Elements in Drinking Water in Baghdad City / Al Rusafa

Salem Saleh Al-Tamimi

Market Research and Consumer Protection Center / Univ. of Baghdad / Baghdad / Iraq.

Abstract

This study aimed to identify the drinking water content of bacteria, yeast, mildew colon bacteria and heavy metals in Baghdad city /Al-Rusafa. Fifteen water samples were collected from different cities including (Al-Karrada, Al-Dora, Palestine street , Obeidi, Zafaraniyah, Kamaliyya, Zayouna, Adhamiya, Ur district, Talbiya, Jamila, Al-Bnouk district, Shaab, Baladiyat, Al- Mustansiriya district), Heavy elements were estimated in these samples, which including (Chrome Co, Lead pb, Copper CU, Cadmium Cd and Nickel Ni), Some microbiological tests were performed including detection of the total number of bacteria, Yeasts and Mildew and colon bacteria by using Bac Trac device. Results showed that heavy elements concentrations ranged from 0.1000-2.787 ppm for chrome element and 0.021-0.338 ppm for Lead, 0.0096-0.2461 ppm for copper, 0.2108-0.3308 ppm for Cadmium, and 0.0065-0.6556 ppm for Nickel. Clearly it was shown that concentrations of lead, chrome and cadmium higher than the Iraqi standard specifications specified No. 417 on 2009 related with drinking water. The results of this study showed that all samples were free from all microbial content and this result were matching by the Iraqi standard specifications above mentioned.

Keywords: *Iraqi drinking water-Microbial content-heavy metal.*

Introduction

Heavy metal defined that any Metal with a relatively high density and considered poisonous into its low concentrations [1]. The heavy metal found as natural sources for Earth's crust and its continuous Environmental pollutants, because it cannot be decomposed or destroyed naturally or be related of another recourses, However, Its concentration has increased several fold as a result of various human activities [2].

Humans can be exposed to harmful heavy metals in many ways, starting with the consumption of contaminated food and Exposure to airborne particles or consumption the contaminated water, Where it accumulate over a period of time. Diseases caused by water can be attributed in many cases to exposure to high concentration of heavy elements for each of the organs and not organs Contaminants [3]. Providing safe drinking water is very important for human life, safe drinking water should not be caused serious risk on human, al thought that some of heavy elements necessary to health human. High concentrations can have negative effects [4].

Industrial processes generate wastes that are discharged mostly into the environment. Industrial activities, particularly electroplating, smelting, chemical industries and manufacturing processes, are sources of heavy metals found in water. Poor domestic, industrial and agricultural waste water contains high concentrations of metals that are often discharged into the environment.

Heavy metals such as mercury and lead may enter the atmosphere due to pollution of traffic and industrial activities that can be deposited in the soil around the reservoir and then enter the water with runoff [5]. A number of heavy metals can cause cancer, such as inorganic or non-carcinogenic arsenic, such as the risk of mercury in humans; Studies have indicated chronic and other chronic sub-effects of exposure to heavy metals. Previous studies indicate the presence of heavy metals in drinking water, including their types and quantities, and families that affect concentrations of metals, sources, human exposure, risk and evaporation. Despite significant progress, research is needed to ensure safe drinking

water. Communities, small and rural individuals often consume high-quality water more heavily than the values of guiding principles [6]. Many people struggle to obtain safe drinking water. Clean water and treatment for every home may be standard in Europe and North America, but in developing countries access to clean water and sanitation is not ideal and waterborne infections are common. Two and a half billion people can't access improved sanitation, and more than 1.5 million children died every year due to Diarrhea diseases [7].

According to the World Health Organization (WHO), the deaths of water-related diseases exceed millions of people annually. Of these, most of the intestinal is microbial; cholera is considered the first 50% infections. In general, the greatest microbial risk is associated with ingestion of water contaminated with human or animal feces. Freshwater, wastewater and coastal marine waters are the main source of fecal microorganisms, including pathogens [8, 9].Acute microbial diarrheal diseases a major health problem in developing countries. People affected by diarrheal diseases suffer from the poorest financial resources and the poorest health facilities. Children under 5 years of age, particularly in Asian and African countries, are the most affected by microbial diseases transmitted by water [10]. The microbial diseases of water also affect developed countries, in the United States of 560,000 American estimated that one person suffering from water-borne diseases annually, 7 and. Million suffer from mild infection 12,000 to moderate resulting in death. [11].

The current study aimed at estimating the concentration of elements of heavy water in the city of Baghdad /Al-Rusafa, as well as the assessment of microbial load in it and the extent of their conformity with Iraqi specifications and their impact on consumer health and safety.

Materials and Methods

Drinking Water

Drinking water samples were obtained from different areas of the city of Baghdad / Rusafa and are shown in the Table (1).

Table 1: Drinking water samples were obtained from different areas of the city of Baghdad / Rusafa

Seq.	City	Code
1	Palestine street	A1
2	Al-Karrada	A2
3	AL-Dora	A3
4	Obeidi	A44
5	Zafaraniyah	A5
6	Kamaliyya	A6
7	Ur district	A7
8	Adhamiya	A8
9	Al-Bnouk district	A9
10	Talbiya	A10
11	Zayouna	A11
12	Mustansiriya district	A12
13	Baladiyat	A13
14	Jamila	A14
15	Shaab	A15

Heavy Metals Analysis

Followed the method [12] of following metals (chrome, pb lead, Copper CU, Cadmium, Nickel Ni). The concentrations of these metals were measured using an atomic absorption type Shimadzu-AA 7000.

Microbiological Determination

The following tests were adopted in accordance to [13] of the total number of bacteria in the total number of bacteria and the promise of yeast and mold. Tests included:

Total Count of Bacteria

Nutrient agar The mean of the bacterial number was prepared using the middle and the leaves to melt 28 g of medium per liter of sterile water and sterilized the medium by the balances on the degree 121 degrees for 15 a minute. Normal 9 mal was added from the water sample of sterile saline using sterile saline tubes to produce a series of decimals for each sample of water samples. After that, one ml of each group was placed in sterile sterilized dishes. In addition, the middle of the plant was added under the sample (pour plate) the plates were incubated for 24 hours at a temperature of 37 m.

Yeast and Mold Counting

Sabouraud Dextrose Agar in yeast and mold, with 65 g of medium per liter of sterilized water dissolved and sterilized with 121 mm for 12 min for 1 minute. A series of decimal dilution was carried out for each sample of water samples, followed by 1 ml of each model and then incubated at 27 ° C for 24 hours. accounting colon bacteria by using(Bac Trac 4300): followed the method adopted in(2013 ,4300, Bac Trac), the preparation of the tumor medium of the growth of the colon bacteria 165A (28 per cent of the water) per liter of water Bimmedia of the measuring water was then distributed the plant medium on the pipes of the bac Trac Add one ml of each sample of water to be examined for each tube containing the plant medium, B 24 ml of Bac Trac for an hour at a rate of.

Results and Discussion

Microbiological Determination

All of results Microbiological tests showed for water sample Free all samples of bacteria Free all samples of bacteria and yeast and Molds, the test showed by bac trac free all of samples the examined water from colon bacteria. This results showed that watching to specified the [13] that not exceed numbers the air bacteria $1 * 10^{2}$ for each 1 mal that be free exactly from total colon bacteria (TC) and fecal coli forms and fecal streptococci (FS).

Municipalities are responsible for producing and delivering drinking water to consumers in Iraq, during the years 2004, 2005. Due to operations, the quality of drinking water in Iraq has significantly deteriorated the military and war in this country. The analytical laboratories of the Ministry of Environment and the Ministry of Health carried out chemical and microbiological tests and tests on drinking water in Iraq, and the percentage of water samples failed to be analyzed and tested was about 40% [15, 16]. Some efforts have been made to improve infrastructure and rebuild drinking water treatment systems. Several projects have been established in Iraq to supply bottled water and house water purification using disinfection units. A comprehensive study was conducted during the year 2006 for the evaluation of bottled water units and house purification units. The study showed the failure of some water bottles due to their high content limit [17]. Drinking water must be pure, disinfectant, suitable for human consumption and free from chemical contaminants such as lead, arsenic and benzene, as well as microbial contamination as a source of many epidemic diseases such as cholera Vibrio and viral hepatitis Hepatitis Parasites such as Cryptosporidium parvum which may pose a risk tolerance as well as the presence of glass parts and metal parts that cause certain health risks [18, 19].

Conducted a field survey of chemical and microbial contamination. The results of this study showed that a Zafaraniyah and al sadar city was free of microbial contamination, while cases of contamination were evident in some sectors of Sadr City. This was attributed to the nuts and bolts of the drinking water network in Zafaraniyah city. In the water network of the city and did not repel the full network modernization of all sectors of the city in a timely.

The Heavy Metals Concentration

The mentioned results showed of Table (2) that chrome concentration of studies water samples, high concentration for metals of 2.7875 ppm. (Part of million) in sample A9 follow the samples A3, A6 with concentration 2.3500 ppm. Than sample A7with 2.000 ppm. The metal concentration of 1.9125 ppm. Of all samples A1, A2. Although, the low concentration for chrome in sample A15 0.1000, than A13, A14, A11 WITH concentrations of 0.1625 and 0.2500, 0.6000 part of million, Ranges metal concentration in all samples between this values.

Table 2: Chrome concentration of studies water samples

Seq.	Concentration (part with million) p.p.m
A1	1.9125
A2	1.9125
A3	2.3500
A4	0.9500
A5	2.1750
A6	2.3500
A7	2.0000
A8	1.8250
A9	2.7875
A10	1.1250
A11	0.6000

A12	1.2125
A13	0.1625
A14	0.2500
A15	0.1000

The table (3) showed lead concentrations of drinking water under study, low concentration for lead appears of sample A8 it reach 0.0545 ppm. Than sample A4, A9, A15 with concentration of 0.0727 PPM. Than sample A12 with concentrations of 0.0758 PPM. While high concentration for metal reach of sample A1 0.8788 ppm. Followed by sample A2 with concentrations of 0.6667 ppm., and ranged concentrations the metal of all samples between this values.

Table 3: concentration lead of drinking water under study

Seq.	Concentration (part with million) p.p.m.
A1	0.8788
A2	0.6667
A3	0.3061
A4	0.0727
A5	0.1182
A6	0.1788
A7	0.1364
A8	0.0545
A9	0.0727
A10	0.0970
A11	0.1182
A12	0.0758
A13	0.3909
A14	0.3697
A15	0.0727

The mentioned results showed in table (4) concentrations of copper in tests samples that reached low concentration for metal 0.0096 ppm. of sample A15 than sample A13 with concentrations of 0.0380 ppm. Than samples A9, A10, A7 with concentrations of 0.0558 and 0.0618, 0.0677 part of million, respectively. High concentration for metsl ranged of sample A1 0.2461PPM.than samples A12, A3 with concentrations of 0.2223 and 0.2104 part of million respectively. Concentrations of metal ranged of all samples between these values.

Table 4: Concentration copper of drinking water under study

Seq.	*Concentration (part with million) ppm.*
A1	0.2461
A2	0.1747
A3	0.2104
A4	0.1747
A5	0.1569
A6	**0.0737**
A7	**0.0677**
A8	**0.1272**
A9	**0.0558**
A10	**0.0618**
A11	**0.1331**
A12	**0.2223**
A13	**0.0280**
A14	**0.1093**
A15	**0.0096**

The mentioned results showed in table (5) concentrations of Cadmium in drinking water under study that reached low concentration for sample A14, 0.2108 ` ppm. of sample A15 than sample A13 with concentrations of 0.0380 ppm. Than samples A9, A10, A7 with concentrations of 0.0558 and 0.0618, 0.0677 part of million, respectively. High concentration for metal ranged of sample A1 0.2461PPM.than samples A12, A3 with concentrations of 0.2223 and 0.2104 part of million. Respectively. Concentrations of metal ranged of all samples between these values.

Table 5: Concentration copper of drinking water under study

Seq.	Concentration (part with million) ppm.
A1	0.3082
A2	0.3036
A3	0.3308
A4	0.3217
A5	0.2629
A6	0.2901
A7	0.2561
A8	0.2584
A9	0.3059
A10	0.2765
A11	0.2244
A12	0.2606
A13	0.2923
A14	0.2108
A15	0.2199

The mentioned results showed in Table (6) concentrations of Nickel in drinking water under study that reached low concentration for sample A14, 0.0065 ` ppm. Than of samples A9, A13 with concentrations of 0.0148 and 0.0396 ppm. respectively. High concentration for metal ranged of sample A3 0.6556 PPM. Than samples A7, A15 with concentrations of 0.4901 ppm. And 0.4321 ppm. Respectively. Concentrations of metal ranged of all samples between these values.

Table 6: Concentration Nickel of drinking water under study

Seq.	*Concentration (part with million) ppm.*
A1	0.1425
A2	0.3908
A3	0.6556
A4	0.2915
A5	0.3990
A6	0.3659
A7	0.4901
A8	0.3825
A9	0.0148
A10	0.2713
A11	0.3249
A12	0.2749
A13	0.0396
A14	0.0065
A15	0.4321

The mentioned results showed above that concentrations each of lead, cadmium and Nickel were high which it specified with [20] related with drinking water, which specified lead concentration not increase about 0.010 ppm., cadmium not increases about 0.003 ppm. In addition, Nickel not increases about 0.020 ppm., while copper concentrations within the limits allowed with it about 1 ppm., The specification did not refer to chrome element. The many of studies dealt water specifications of Iraq and Efficiency of filter stations, which referred to existing great fluctuation of water content from the heavy metals, the researcher [21] to study Evaluation of water treatment at Asala water station of the left side of Mosul city and the results study showed to good efficiency for station of remove some impurities and not efficiency of remove another impurities. The results study showed which did [Mohsen, 22] to Asala water of New Mahaweel City that acceptable efficiency to some treatment station of removes the turbidity at the time, in which the station failed to remove sulphates and insoluble Ions and dissolved solids where the removal rate was given unacceptable.[Ghawi, 23] did with study to estimate concentration of the heavy metals including (aluminum, lead, nickel , Camidium and Mercury) if drinking water in Diwaniya city found that there was high concentrations from two metals aluminum and lead are high from the limits you have set [20]while the concentrations of the rest of the metals fall within the limits allowed by the specification mentioned. The high concentration of aluminum is attributed to the use of alum in the liquidation stages, while the lead is called to the exhaust of cars with high content, which moves to the atmosphere and then to the water, which requires the removal of these metals of drinking water using thrombosis. There is a relationship between the presence of heavy metals in water Drinking and the spread of certain diseases

such as kidney failure, cirrhosis of the liver, hair loss and chronic anemia. The prevalence of these diseases has increased significantly in the last few years due to air pollution and contamination of drinking water by heavy metals such as lead, cadmium, chrome, arsenic and mercury, which are dangerous to human health. Corrosion of water transport pipes or leakage from different sources causes the concentration of this metals in water These factors cause the collapse of the human immune system, which is the gateway to infection of the body diseases. These injuries are acute and chronic. Renal failure is associated with lead, cadmium and liver cirrhosis. It is related to copper, molybdenum, and chronic anemia in copper and cadmium. Cancer is also associated with several heavy metals, but the concentrations of these metals are rarely high in drinking water enough to cause or cause these harmful effects on the body [24].

A joint study between the Italian Red Cross and the environmental laboratories in Baghdad was carried out [25] evaluated the drinking water from a 16 residential area in Baghdad by chemical reference to samples of raw water and water directly from the purification stations, 17 Mineral metals The results of the study showed that the water samples were analyzed as good quality has been relatively high concentrations appeared zinc, iron, this concentrations have no effect on the quality of drinking water iron and manganese as they are removed together through water treatment efficiently, and can damage water pipes be one of the reasons of high iron concentration with it. In Malaysia [26] studied the concentrations of heavy metals in drinking water and evaluated health risks and biological monitoring studies from 2003 to 2013, showed study that the concentrations of these metals were below the allowable limits as proposed by WHO and Malaysian and Ministry of Health. The studies stressed the need to pay attention to the methods of collection, storage and transport of water and analyze it continuously to help risk managers to reduce exposure to high concentration of these metals and reduce their harmful impact on consumers.

Conclusion

Previously, drinking water (tap-water) in Iraq suffers from its bad quality and contaminated with many microbial and heavy metals, due to low efficiency of waters purification and that's affects on human health. But results of this study showed that there were not any contamination with any microbial growth and it's applied the Iraqi Standard Quality. So that a good impact and refer that an improvement in filtrations and purification of tap-water in the capital of Iraq.

References

1. Cobbina S, Michael K, Salifu L, Duwiejua A, Rainwater B (2013) Cr. quality assessment in the Tamale municipality. Int. J. Sci. Technol. Res., 2: 1-10.
2. Mason RP, Choi AL, Fitzgerald WF, Hammerschmidt CR, Lamborgh CH, Soerensen AL, Sunderland EM (2012) Mercury biogeochemistry cycling in the ocean and policy implications. Environ. Res., 119: 101-117.
3. Samuel JC, Abudu BD, Reginald Q, Samuel O, Noel B (2015) Comparative Assessment of Heavy Metals in Drinking Water Sources in Two small-scale Mining Communities in Northern Ghana. Int. J. Environ. Res. Public Health, 12 (19): 10620-10634.
4. Huang Z, Pan XD, Wu PG, Han JL, Chen Q (2014) Heavy metals in vegetables and the health risk to population in Zhejiang, China Food Control, 36: 248-252.
5. Alabdula'aly AI, Khan MA (2009) Heavy metals in cooler waters in Riyadh, Saudi Arabia. Environ Monit. Assess., 157: 23-28.
6. Who (World Health Organization) (2011) Guidelines of Drinking Water Quality. Fourth Edn. World Health Organiz.
7. Fenwick A (2006) Waterborne Diseases - Could they be Consigned to history? Science, 313:1077-1081.
8. George I, Crop P, Servais P (2001) Use of B-D- Galactosidase and B-D Galactosidase Activities for Quantitative Detection of Total and Faecal coliforms in wastewater. Can. Microbiol., 47: 670-675.
9. Seas C, Alarcon M, JC Beneit S, Quinonez M, Guerra H, Gotuzzo E (2000) Surveillance Of Bacterial Pathogens Associated With Acute Diarrhe in Lima, Peru. Int. J. Infect. Dis., 4: 96-99.
10. Joao PS (2010) Water Microbiology. Bacterial Pathogens and Water. Int. J.

Environ Res Public Health, 7 (10): 3657-3703.

11. Medema GJ, Payment P, Dufour A, Robertson W, Waite M, Hunter P, Kirby R, Anderson Y(2003) Assessing Microbial Safety of Drinking Water Improvement Approaches and Method. WHO & OECD, IWA Publishing; London, UK: Safe drinking water ongoing challenge, 11-45.
12. Frick F, Robbins W (1997) Trace Elements Analysis of Food and Beverages by AAS. Progress in Analytical Atomic Spectroscopy, 2: 185.
13. The Iraqi standards specifications No. 2270 part (16) Year (2006) the limits of microbes in the drinking water. Central Organization for Standardization and Quality Control, Republic of Iraq.
14. Bac Trac 4300. (2013) Microbiology of Food and Animal Feed. Method Validation, FDIS Published.
15. Barbooti MM, Hatam N, Akram B, Joseph F, Ibrahim S, .Fadhil A (2005) The Quality of Drinking Water in Baghdad Area after-the War. Proceedings of the) 1 st International Conference on Environmental Health in Iraq, Amman, 19-22.
16. Who (World Health Organization) (2005) "Trihalomethanes in Drinking Water" Background Document for Development of Who Guidelines for Drinking-Water Quality, 05.08/64.
17. Barbooti MM, Jassem IA, Kadhum R (2006) Evolution of DW Purification Units in Iraq, Report NO. 261, Ministry of Environment, Iraq.
18. OECD (2003) Assessing Microbial Safety of Drinking Water: Improving Approaches and Methods, IWA Publishing, Alliance House. London, UK.
19. Al Kindi, Gedahh Yassen, Al Bakerrre, Rasheed Saleh Abd Al-Rehdah, Al-Awad(2010) family of Raddam and Ajeel, Israa Atyiahh studied Field survey of chemical contamination and Meicropy for drinking water system in Zafaraniyah city and Sadar . The Iraqi newspaper, marketing research and protect the costumer, folder 2(3):1-5.
20. The Iraqi standards specifications No. 417 for Year (2009) drinking water. Central Organization for Standardization and Quality Control, Republic of Iraq.
21. Shaheen, Khaled (2004) evaluate studying for Water Treatment of Asala water left side for Mosul City. Altaqni newspaper, folder 17: 3.
22. Mohsen, Jassim Nasser (2010) valuation qualification performance to the combined unit for treatment water and new Mahaweel. Babylon university newspaper series (Science of morphology and applied sciences) folder 18 (3): 1347- 1338.
23. Ghawi, Ali Hadi (2017) Study of heavy elements concentration of drinking in Diwaniya city. Muthanna folder for engineering and Technology.
24. Hanaa M, Salem Eweida, A Eweida, Azza Farag (2000) Heavy Metals in Drinking Water and Their Environmental Impact on Human Health. /Cairo University, Egypt, September, page of 542-556.
25. Barbooti MM, Belzoni G, Mirza IA, Pelosi M, Barilli L, Kadhum R, Peterlongo G (2010)) Evaluation of Quality of Drinking water from Baghdad, Iraq. Science World Journal, 5 (2): 20.
26. Ab Razak NH, Praveena SM, Aris AZ, Hashim Z (2015) Drinking water studies: A review on heavy metal, application of biomarker and health risk assessment (a special focus in Malaysia). Journal of Epidemiology and Global Health, 0 (4): 297-310.

